

A Framework for Boreal Caribou Range Planning

Discussion Document: Appendices



Boreal Caribou Range Planning Framework – Discussion Document - Appendices

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Appendix A: Population Status and Trends of Boreal Woodland Caribou in the NWT

The following information is a summary of more detailed information provided in the 2012 status assessment of boreal caribou in the Northwest Territories (NWT) (Species at Risk Committee 2012), the 2017 NWT recovery strategy for boreal caribou (Conference of Management Authorities 2017), and new monitoring data that has become available since the status report and NWT recovery strategy were released.

In 2012, boreal caribou were assessed by the NWT Species at Risk Committee as Threatened¹ in the NWT (Species at Risk Committee 2012). Boreal caribou were subsequently listed as a Threatened species under the territorial *Species at Risk (NWT) Act* in 2014. This means boreal caribou are likely to become Endangered² in the NWT if nothing is done to reverse the factors leading to its extirpation or extinction.

Boreal caribou in the NWT inhabit an extensive area of boreal forest east of the Mackenzie mountains as far north as Tuktoyaktuk. The range is continuous with northern Alberta (AB) and northern British Columbia (BC) to the south, although boreal caribou there are considered to be different populations for management purposes. The NWT's population (called NT1) also extends slightly into northeastern Yukon (YT). Boreal caribou are naturally found at low densities, either individually or in small groups. They do not form cohesive herds in the NWT; rather they are one continuous population of loosely distributed individuals. Major rivers and habitat fragmentation may affect movement.

A.1 Population Size

There are an estimated 6,000 to 7,000 boreal caribou in the NWT. This is a crude estimate based on the probable density of caribou in different regions (derived from community and scientific knowledge), multiplied by the size of the range in each region (Figure A1). The estimate is rough and it is recognized that better population estimates are needed. Boreal caribou are currently considered to be one continuous population across the NT1 range, however there are ongoing studies assessing whether evidence exists of sub-population structure based on genetic analyses, traditional knowledge (TK), and movements of collared individuals (Polfus et al. 2016, Manseau et al. 2017, Wilson et al. 2017).

A.2 Population Trend

The NWT boreal caribou population was classified as '*likely self-sustaining*' by Environment Canada (EC) in 2012 based on habitat conditions at that time and the current understanding of a single NWT population with a continuous range (Environment Canada

¹ **Threatened in NWT:** A species that is likely to become an endangered species in the NWT if nothing is done to reverse the factors leading to its extirpation or extinction.

² **Endangered in NWT:** A species that is facing imminent extirpation from the NWT or extinction.

2012). 'Likely self-sustaining'³ was determined based on EC's disturbance management threshold of 65% undisturbed habitat which provides a 60% probability for a population to be self-sustaining.

Determining an overall population trend for the NT1 range is difficult as trends vary among regions. Traditional and community knowledge compiled in 2012⁴ suggests that boreal caribou population trends are stable or increasing in the Inuvialuit Settlement Region (ISR) and Sahtú Settlement Area (SSA), increasing in some parts of the Gwich'in Settlement Area (GSA), and declining in other parts of the GSA. In different areas of the Dehcho region, TK suggests that boreal caribou population trends are increasing, stable or declining depending on the area. There is concern that caribou may be declining in Wek'èezhii and the North Slave region overall. In some areas, boreal caribou group sizes have been smaller in recent years than in the past.

Boreal caribou are difficult to census based on their low population density and low detectability in areas with dense canopy cover, which limits the feasibility of measuring population trend based on repeated estimates of population size or density over time. Population trend is instead monitored based on a sample of collared adult females in different study areas. Population monitoring programs have been carried out in nine study areas to date in the NWT, and programs are ongoing in six study areas (Table A1; Figure A2). The Department of Environment and Natural Resources (ENR) attempts to maintain a sample size of roughly 30 individuals per study area, although numbers vary from year to year (note that for the Dehcho region, the ~30 collars are distributed across the Dehcho South and North study areas). Estimates of population growth are based on annual survival rates of collared adult females and spring composition surveys which are used to determine calf recruitment rates (calf:cow ratios). For each year, the finite rate of population increase is estimated from annual recruitment of females (assuming a 50:50 sex ratio in calf production and equal survival of sexes to time of census) and annual adult female survival using the formula outlined by Hatter and Bergerud (1991). The finite rate of population increase (λ ; Lambda) is determined using a stochastic version of Hatter and Bergerud's (1991) equation [$\lambda = \text{adult female survival} / (1 - \text{female calf recruitment})$] following Latham et al. (2011). Lambda values >1 indicate an increase population, $\lambda = 1$ indicates a stable population and λ values of <1 indicate a decreasing population. It should be noted that in most study areas adult female survival and calf recruitment can vary substantially from year to year, and the combination of these two measures can result in some years with λ values <1 and other years with $\lambda > 1$. Lambda values averaged over time provide an indication of whether caribou population trend in each study area is increasing, stable or decreasing.

To interpret how local growth rates may affect the NWT population as a whole, it is important to understand how estimated density and abundance of boreal caribou vary in different parts of the NWT current range (Figure A1). In general, there is evidence of

³ A self-sustaining population is one that on average demonstrates stable or positive population growth over the short-term (≤ 20 years), and is large enough to withstand stochastic events and persist over the long-term (≥ 50 years), without the need for ongoing active management intervention (Environment Canada 2012).

⁴ Species at Risk Committee. 2012. Species Status Report for Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories. Species at Risk Committee, Yellowknife, NT.

population decline in the southern part of the territory, where it is believed that the majority of NWT's boreal caribou occur. It is estimated that roughly 53% of NWT boreal caribou are found in areas where caribou numbers have been stable or declining (Dehcho and South Slave ENR administrative regions) and roughly 8% of NWT boreal caribou are found in areas where caribou numbers have been increasing (Gwich'in region). The remaining 39% are found in areas where the trend is currently unknown (Inuvialuit, Sahtú and North Slave regions).

Table A1. Boreal caribou population monitoring study areas in the NWT and average estimates of population trend (λ) over the duration of those studies. Lambda values are based on adult female survival and calf recruitment rates determined from collared female caribou.

Study Area	Start Year	End Year	Average ^b (range) λ
Dehcho South ^e	2005	Ongoing	0.97 (0.72-1.28)
Dehcho North ^e	2005	Ongoing	0.94 (0.72-1.60)
Hay River Lowlands ^{f, g}	2005	Ongoing	0.97 ^c (0.74-1.12)
Cameron Hills ^h	2006	2010	0.87 (0.74-1.00)
Pine Point/Buffalo Lakes	2015	Ongoing	Not yet available
Mackenzie	2015	Ongoing	Not yet available
Sahtú ^a	2003	2011	Not Available
North Slave	2017	Ongoing	Not yet available
GSA North ^{h, i}	2003	2007	1.08 ^d
GSA ^{h, i} South	2005	2007	1.20 ^d

^a Collar-based population monitoring program was initiated in the SSA in 2003, but no estimates of λ were produced. A total of 27 individuals were collared.

^b Average λ values are based on the geometric means.

^c Lambda values were not available between 2011-2013 for the Hay River Lowlands study area.

^d The range of λ values for the Gwich'in North and South study areas were not provided in Nagy (2011) or Species at Risk Committee (2012).

^e Larter, N.C. and D.G. Allaire. 2017. Dehcho Boreal Caribou Study Progress Report, April 2017. ENR, GNWT, Dehcho Region, Fort Simpson, NT.41pp.

^f Kelly, A. and K. Cox. 2013. Boreal caribou progress report: Hay River Lowlands Study Area, 1 April 2012 – 31 March 2013. ENR, GNWT, South Slave Region, Fort Smith, NT. 16pp.

^g Kelly, A. unpublished data.

^h Species at Risk Committee. 2012. Species Status Report for Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories. Species at Risk Committee, Yellowknife, NT.

ⁱ Nagy, J.A.S. 2011. Use of space by caribou in northern Canada. Ph.D. dissertation, University of Alberta, Edmonton, AB. 184pp.

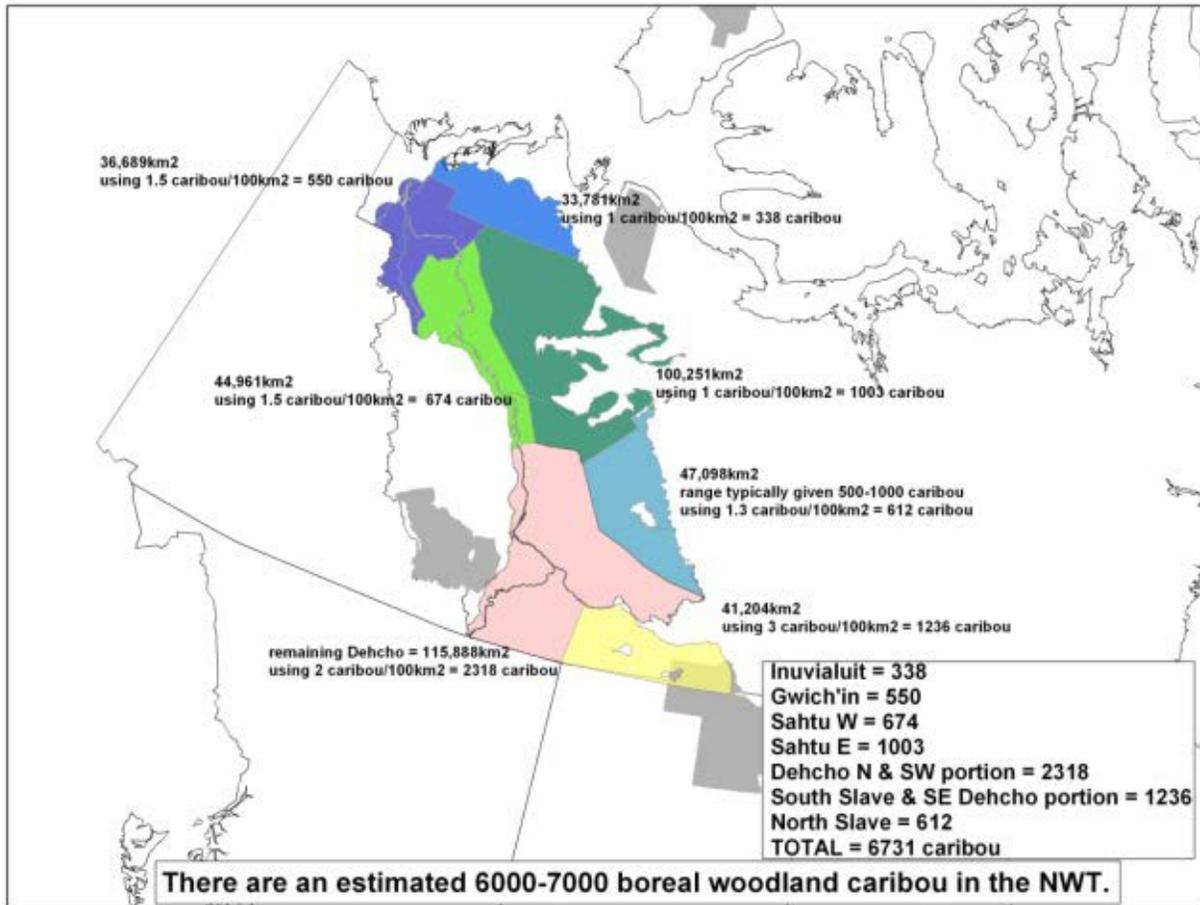


Figure A1. Population estimate of boreal caribou in the NWT based on regional density estimates; reproduced from Species at Risk Committee (2012).

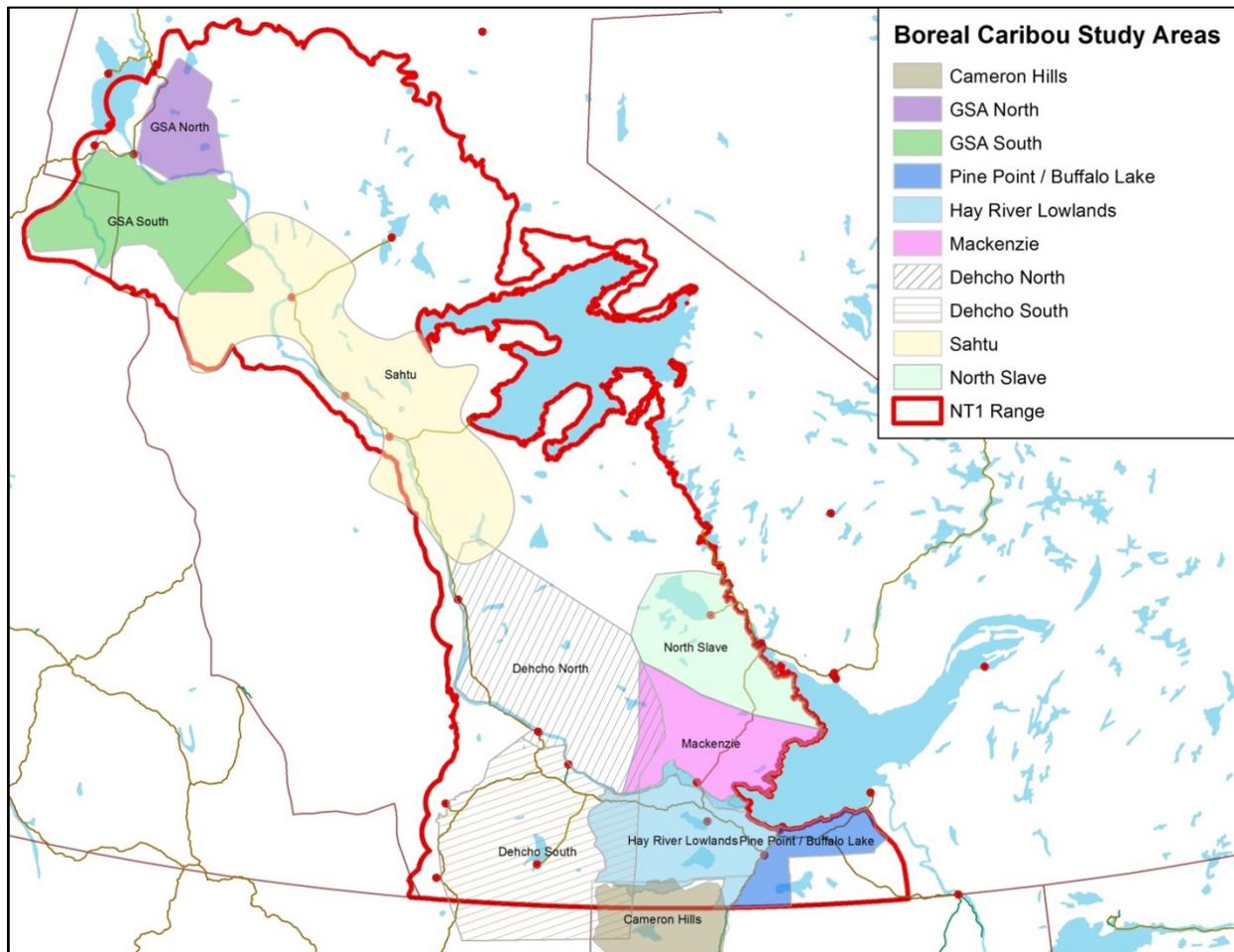


Figure A2. NWT study areas for boreal caribou population monitoring based on collared adult females. Study areas are delineated in part based on collared caribou movements, and some study areas overlap due to movements of collared boreal caribou between areas. Although a collaring program was carried out in the SSA from 2003-2011, no estimates of population trend were available from this program.

A.3 References

- Conference of Management Authorities. 2017. Recovery Strategy for the Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories. Species at Risk (NWT) Act Management Plan and Recovery Strategy Series. Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT. 57 + x pp.
- Environment Canada. 2012. Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa, ON. xi + 138pp.
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- Latham, A.D.M., M.C. Latham, N.A. McCutchen and S. Boutin. 2011. Invading white-tailed deer change wolf-caribou dynamics in north-eastern Alberta. *Journal of Wildlife Management* 75(1): 204-212.
- Manseau, M., P. Priadka, C.F.C. Klütsch and P.J. Wilson. 2017. Boreal caribou population genetic structure and diversity across the southern Northwest Territories. Report submitted to GNWT. 22pp.
- Polfus, J.L., M. Manseau, C.F. Klütsch, D. Simmons and P.J. Wilson. 2016. Ancient diversification in glacial refugia leads to intraspecific diversity in a Holarctic mammal. *Journal of Biogeography* 44(2), pp.386-396.
- Species at Risk Committee. 2012. Species Status Report for Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories. Species at Risk Committee, Yellowknife, NT.
- Wilson, S., G. Sutherland and T. Nudds. 2017. Sensitivity of estimates of range condition and integrated assessments of self-sustainability to variation in woodland caribou local population range delineation. Report prepared for Tolko Industries Ltd. 37pp.

Appendix B: Effective Protection of Critical Habitat

B.1 What is “Effective Protection” of Critical Habitat?

The federal Minister of the Environment will use range plans developed by provinces and territories in forming an opinion on whether critical habitat is **effectively protected** on non-federal lands. If the Minister is of the opinion that effective protection of critical habitat is not being provided on non-federal lands, the Minister is required to recommend to the Governor in Council (GiC) that a protection order be made under federal *Species at Risk Act (SARA)* (s.61(4)). The federal Minister must consult with the Government of the NWT (GNWT) before making such a recommendation. The decision about whether to issue a protection order is ultimately made by GiC, and GiC can consider other factors such as conservation agreements that are in place and socio-economic impacts.

Under the draft *SARA* policy for critical habitat protection on non-federal lands⁵, critical habitat is effectively protected if it is either a) deemed to be protected by legal instruments, either under the laws of the territory or the federal government, *or* b) deemed to be at “low risk” of destruction from the impacts of human activity, after consideration of conservation measures (non-legal tools) that are in place and are reducing the risk of destruction. When evaluating the territorial laws that might be used to protect critical habitat, the federal government will assess whether such laws are mandatory and enforceable, and whether they have a history of application in the NWT.

B.2 What Activities are considered Likely to Destroy Critical Habitat?

The national recovery strategy for boreal caribou identifies broad types of activities that are likely to destroy critical habitat. It is important to note that natural disturbances such as fire are not included. The list of activities includes:

- Activities that result in:
 - Direct loss of critical habitat (agriculture, forestry, mining, infrastructure)
 - Degradation of critical habitat leading to reduced but not total loss of habitat quality and availability (pollution, drainage, flooding)
 - Fragmentation of critical habitat by human-made linear features (roads, seismic, pipelines, hydroelectric)
- There is a higher likelihood that critical habitat will be destroyed if an activity (or combination thereof):
 - Compromises ability of the range to maintain or be restored to 65% undisturbed habitat
 - Reduces connectivity
 - Increases predator and/or alternate prey access to undisturbed areas
 - Removes or alters biophysical attributes necessary for boreal caribou

⁵ ECCC. 2016. Policy on Critical Habitat Protection on Non-federal Lands [Proposed]. *SARA: Policies and Guidelines Series*. ECCC, Ottawa, ON. 9pp.
www.sararegistry.gc.ca/virtual_sara/files/policies/CH_Protection_NFL_EN.pdf

In practice any human activity that would disturb areas of undisturbed habitat that contribute to the 65% that is considered critical habitat for boreal caribou would likely be considered destruction of critical habitat. Therefore the term “destruction” used in federal *SARA* is considered to be synonymous with habitat “disturbance”, where that term is used to refer to habitat disturbance from human activity throughout the rest of the Framework document.

B.3 Range Plans as a Tool to Demonstrate Compliance

A range plan itself can be considered a strong conservation measure that delivers a low risk of critical habitat destruction if it meets Environment and Climate Change Canada’s (ECCC) criteria for *coverage, relevance* and *reliability*⁶. Specifically:

The range plan should cover the critical habitat, and address relevant pathways of effect. Specifically, it should identify the current or forecasted 65% undisturbed habitat and outline a clear plan to manage activities in a way that does not result in critical habitat destruction.

To be considered reliable, the range plan should include, or be accompanied by, policy or program statements that are formally adopted by the jurisdiction and reflect the jurisdiction’s commitment to the range plan outcomes, along with resourcing commitments to implement the range plan and monitor the outcomes. Further, the jurisdiction should have a strong history of following through with policy statements or provides other evidence that the policy position will be reliable as a mechanism to prevent destruction of critical habitat.

⁶ ECCC. 2016. Range Plan Guidance for Woodland Caribou, Boreal Population. www.sararegistry.gc.ca/document/default_e.cfm?documentID=2993

Appendix C: Technical Details of Proposed Approach to Range Planning

This section provides additional technical detail for the proposed approach to range planning described in the main body of the Framework document.

C.1 Disturbance Management Thresholds

C.1.1 Long-term Regional Maximum Total Disturbance Limits

Long-term limits are values for total maximum habitat disturbance that are believed to be achievable in the long term (50 years), in consideration of region-specific fire history. Figure C1 shows the range of footprints of fires 40 years old and younger by region, including the entire NT1 range. Each value is the size (percent of each regional area) of footprints in eleven 40-year windows beginning in 1965.

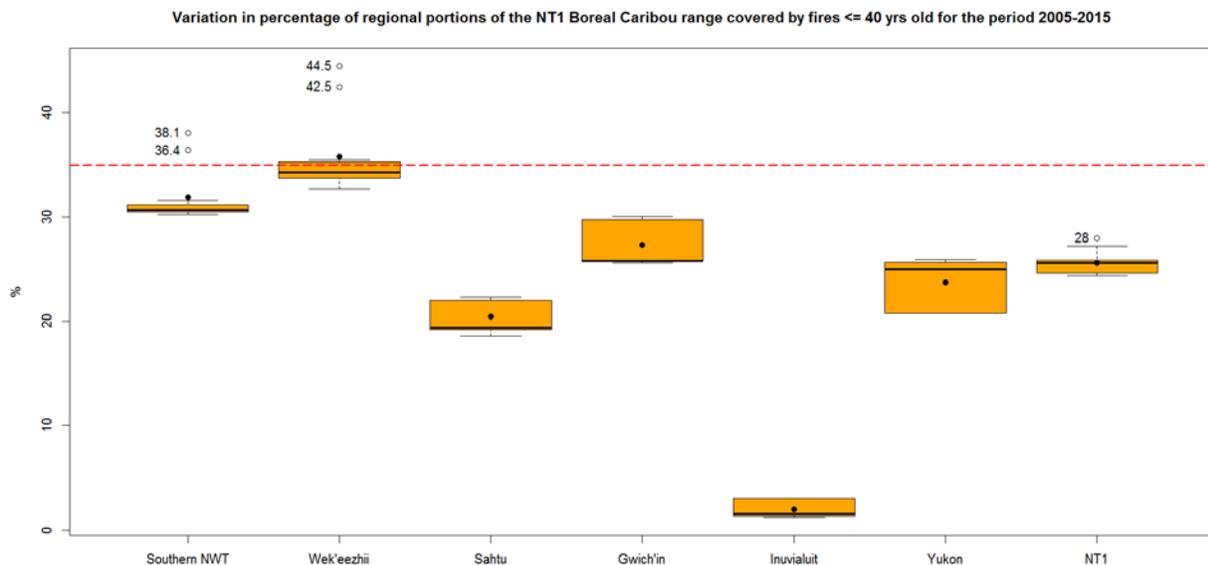


Figure C1. Regional natural variation in disturbance footprint of fires ≤ 40 years old based on GNWT's fire history data from 1965-2015. Solid lines within boxes represent the median (the middle value). Solid dots within boxes represent the mean. Upper and lower boundaries of the box represent 75th (Q3) and 25th (Q1) percentiles of the data, respectively. The upper and lower whiskers represent the 95th and 5th percentiles, and hollow circles represent values that exceed the 95th percentile. The red dashed horizontal line represents the 35% disturbance threshold used to define critical habitat for boreal caribou under SARA.

Each region's long-term maximum limit is based on the regional fire history, but includes an allowance for human disturbance. This allowance is based on the difference between the amount of disturbance expected based on the median regional 40-year fire footprints, and the 35% range wide maximum disturbance limit that defines critical habitat. The allowance is divided among each region in proportion to its size, and is added to the median regional 40-year fire disturbance footprint (Table C1). It produces a maximum long-term limit of 35% total disturbance across the NT1 range, but some regions have limits <35%, and others >35%.

Table C1 – Calculation of long-term regional maximum disturbance limits.

Regional Portion Range	Area (ha)	% of NT1 Range	Median % Area Fires ≤40 Years Old	Median 40-year Fire Area (ha)	35% NT1 Threshold (ha)	Leeway (35% Threshold – Median NT1 40-Year Fire)	Proportional Allocation of Leeway by Region Size (ha)	Median 40-year Fire + Leeway (ha)	Long-term Regional Maximum Disturbance Limit (%)
Inuvialuit	3,439,298	7.8	1.5	50,171			360,713	410,884	11.9
Gwich'in	3,866,210	8.7	25.8	998,646			405,487	1,404,134	36.3
Sahtú	14,901,479	33.6	19.4	2,895,155			1,562,864	4,458,019	29.9
Southern NWT	16,241,765	36.7	30.7	4,991,190			1,703,433	6,694,623	41.2
Wek'èezhii	4,950,506	11.2	34.3	1,698,400			519,208	2,217,608	44.8
NWT Total (Sum of NWT Sub-regions)	43,399,259	98.0		10,633,562			4,551,706	15,185,267	35.0
YT	892,790	2.0	25.0	223,314			93,636	316,950	35.5
NT1 (Sum of All Sub-regions)	44,292,049	100.0		10,856,876	15,502,217	4,645,341	4,645,341	15,502,217	35.0

C.1.2 Human Disturbance Thresholds to Define Management Tiers

To calculate human-disturbance management thresholds, the minimum and maximum 40-year fire footprints observed in each region are subtracted from each long-term regional maximum total disturbance limit. The difference between the two defines the upper and lower bounds of a “cautionary” range of human disturbance (Table C2). If human disturbance in each region is maintained within these “cautionary” bounds, then there is a 50% chance that we would be below the long-term regional limits in any given year, if fire stays within the same range of variation that we have observed in the past. A “low-risk” threshold for human disturbance is defined as anything below the lower bound of the “cautionary” range, and the “high-risk” threshold is anything above the upper bound of the “cautionary” range (Table C3). If all regions managed human disturbance to within the “cautionary” thresholds, this should keep the NT1 range within ~5% of the ECCC 35% total disturbance threshold.

Table C2. Calculation of upper and lower bounds defining the “cautionary” human disturbance threshold for each region

Region	Long-term Maximum Total Disturbance Limit (%)	40-year Fire Footprint %		Human Disturbance - Cautionary Range %	
		Min	Max	Lower (LT Target – Max.)	Upper (LT Target – Min.)
Inuvialuit	12	1	3	9	11
Gwich'in	36	26	30	6	11
Sahtú	30	19	22	8	11
Southern NWT	41	30	38	3	11
Wek'èezhìi	45	33	45	3*	12
YT	36	21	26	10	15
NT1	35	24	28	7	11

* Because the range of 40-year fire footprints in the Wek'èezhìi region is highly skewed (the median is quite close to the minimum value) there would be little room for human disturbance when the fire footprint is at its maximum, which is why the lower end of the cautionary range works out to zero. As there will always be some permanent human disturbance footprint within the Wek'èezhìi portion of the range, and there is likely a desire for further development, the lower end of the cautionary range for the Wek'èezhìi region was reset to three percent, to be consistent with the Southern NWT region.

Table C3. Regional human disturbance thresholds.

Region	Low-risk %	Cautionary %	High-risk %	Current Human Disturbance % (2015)	Current Human Disturbance Threshold
Inuvialuit	<9	9-11	>11	1.3	Low-risk
Gwich'in	<6	6-11	>11	6.9	Cautionary
Sahtú	<8	8-11	>11	6.9	Low-risk
Dehcho and South Slave	<3	3-11	>11	16.1	High-risk
Wek'èezhìi	<3	3-12	>12	0.8	Low-risk
YT	<10	10-15	>15	4.4	Low-risk
NT1	<7	7-11	>11	9.1	Cautionary

These thresholds define “high-risk”, “cautionary”, and “low-risk” levels of human disturbance that relate to the risk of exceeding the long-term regional limits, and of being out of compliance with ECCC’s range-wide 35% disturbance threshold. Together with habitat importance (described below), these thresholds define management classes that specify increasingly stringent management oversight.

C.2 Mapping Important Areas for Caribou

C.2.1 Considerations for Important Areas Mapping

A robust and defensible approach to mapping important areas for boreal caribou will be required to make defensible decisions about delineation of management classes in regional range plans.

The goal behind identifying important areas for caribou is to map out areas that currently provide the biophysical attributes and/or habitat configuration (large patches) required for caribou persistence, or which are likely to provide them the future. Maps of relative habitat importance will then be used to inform decisions about delineating management classes in regional range plans, with the intent of applying more stringent management actions to areas where they will have the greatest positive outcome for caribou.

Available information on habitat importance and boreal caribou distribution shows that a great deal of the NT1 range may be good habitat for boreal caribou. Therefore, mapping for boreal caribou will recognize that importance is measured on a relative scale, and that even areas on the “low” end of this scale may be important. Two approaches to mapping important areas are currently being evaluated.

C.2.2 Approach #1

The first approach combines multiple lines of evidence using a subjective scoring system to rank different areas of the range as high, medium or low importance, based on the following factors:

- 1) Areas identified as being important based on community input. Areas identified at community meetings are ranked as high, medium or low importance based on local and TK about caribou use of these areas. These meetings have already been completed in the Southern NWT region.
- 2) Undisturbed patch size. Boreal caribou do better in large (e.g. >500 km²) patches of undisturbed habitat⁷. Large undisturbed patches are ranked as being of high importance, smaller undisturbed patches are of medium importance, and disturbed patches are of low importance.
- 3) Known use based on collar data. Areas of known use are identified using information from collared female boreal caribou. Ninety-five percent utilization distributions are mapped to represent boreal caribou home ranges based on the kernel density home range method and these are ranked as being of high importance to caribou.
- 4) Seasonal selection of land cover types. This is a way of mapping the biophysical features required by boreal caribou to carry out life processes. Habitat types are classified as selected, avoided, or used in proportion to their availability for two seasons (summer and winter) based on the results of habitat selection analyses. Land cover types selected in both seasons are ranked as being of high importance, types selected in one season or used in proportion to availability in both are ranked as medium importance, and other types are ranked as low importance.

Example of Approach #1: Southern NWT Pilot Project

A pilot project was undertaken to evaluate this approach to mapping important areas using data available for the Dehcho and South Slave portion of the range. This pilot project provided a practical example of how Approach #1 could be implemented.

Spatial data layers for each of four lines of evidence (community identified areas, undisturbed patch size, known use based on collar data, and seasonal selection for different land cover types) were represented as raster layers with grid cell sizes of 30m². Pixels in each raster layer were assigned values ranging from one to three, representing low to high value for boreal caribou. Pixel values from rasters representing each input factor were summed together with each input layer having equal weighting. A sum of the scores for each cell from each of the input layers produced a mosaic of scores from 2 to 12. Two of the inputs, collar data and community information, did not have complete coverage. Therefore, the summed pixel values were standardized by dividing the summed score by the number

⁷ Nagy, J.A.S. 2011. Use of space by caribou in northern Canada. Ph.D. dissertation, University of Alberta, Edmonton, AB. 184pp.

of inputs in the given cell to deliver a score ranging from 1 to 3. Standardized pixel scores were then binned into three groups to classify the landscape into three levels of importance: high, medium, and low.

Further detail on the input layers used in the pilot project and how they were combined is provided below.

Approach #1 Pilot Project: Input Layers

Community Identified Important Areas

A series of workshops took place in each of the Southern NWT communities within the boreal woodland caribou range. Participants drew on maps of their local area indicating areas of known boreal caribou occurrence, what time of year caribou were seen in those areas, the relative quality of the area, and whether boreal caribou were harvested in that area. Information was also provided about areas where caribou were very rarely or never seen due to unsuitable topography or the habitat being of greater suitability for other ungulates such as moose and bison. The information from the maps was digitized and placed into high and low importance categories by ENR staff as outlined in Table C4. Information from multiple communities was combined into a single composite layer (Figure C2). A large proportion of the landscape is identified as high importance for boreal caribou.

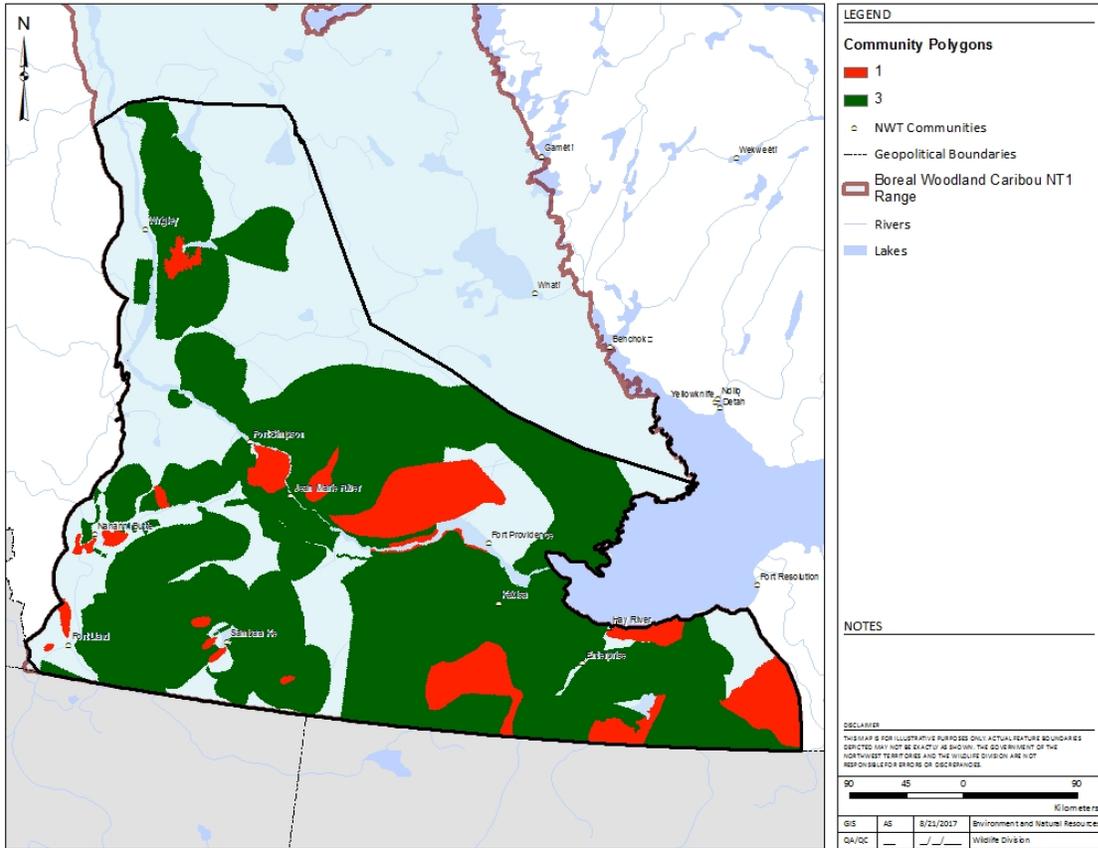


Figure C2. Combined community data for the Southern NWT study area showing high (3) and low (1) importance areas for boreal caribou. Information from multiple communities was combined by dissolving polygons the same importance together. Clear areas within the Southern NWT region indicate areas about which no information was provided by communities or which could not be placed in high or low importance categories. Community-specific areas are not shown to protect confidentiality of the data.

Table C4. Community data ranking and rationale.

Input	Score	Rationale
“High” ranked community identified areas	3	Areas where boreal caribou were reported as present for all or part of the year, areas identified as travel corridors for boreal caribou (e.g. river crossings), areas described as good habitat for boreal caribou, and areas where boreal caribou are frequently harvested.
“Low” ranked community identified areas	1	Areas where caribou are rarely or never seen and areas that are better for other big game such as moose and bison. Included areas where topography was not conducive to caribou use.

Undisturbed Habitat Patch Size

Undisturbed habitat, as defined by ECCC in their 2011 scientific assessment (Environment Canada 2011)⁸, includes areas of boreal woodland caribou range where the following conditions apply: no fire in the last 40 years and no human disturbance footprint visible on 1:50,000 Landsat imagery within 500 m. Maps of undisturbed habitat were based on ECCC’s (2012) 500 m buffered human disturbance layer, and fire history data from 1975-2015. Nagy (2011) demonstrated that boreal caribou with access to large patches (>500 km²) of secure habitat (that is, habitat not disturbed by human sources) and secure unburned habitat are more likely to exhibit stable or positive population trends. Therefore, the landscape was divided into patches of undisturbed habitat that are greater than 500 km², patches that are less than 500 km², and habitat that is disturbed. These were ranked high (3), medium (2), and low (1), respectively, to indicate their relative importance to caribou (Table C5). The resulting input layer is shown in Figure C3.

⁸ Environment Canada. 2011. Scientific Assessment to Inform the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada: 2011 update. Ottawa, ON. 102pp. + appendices.

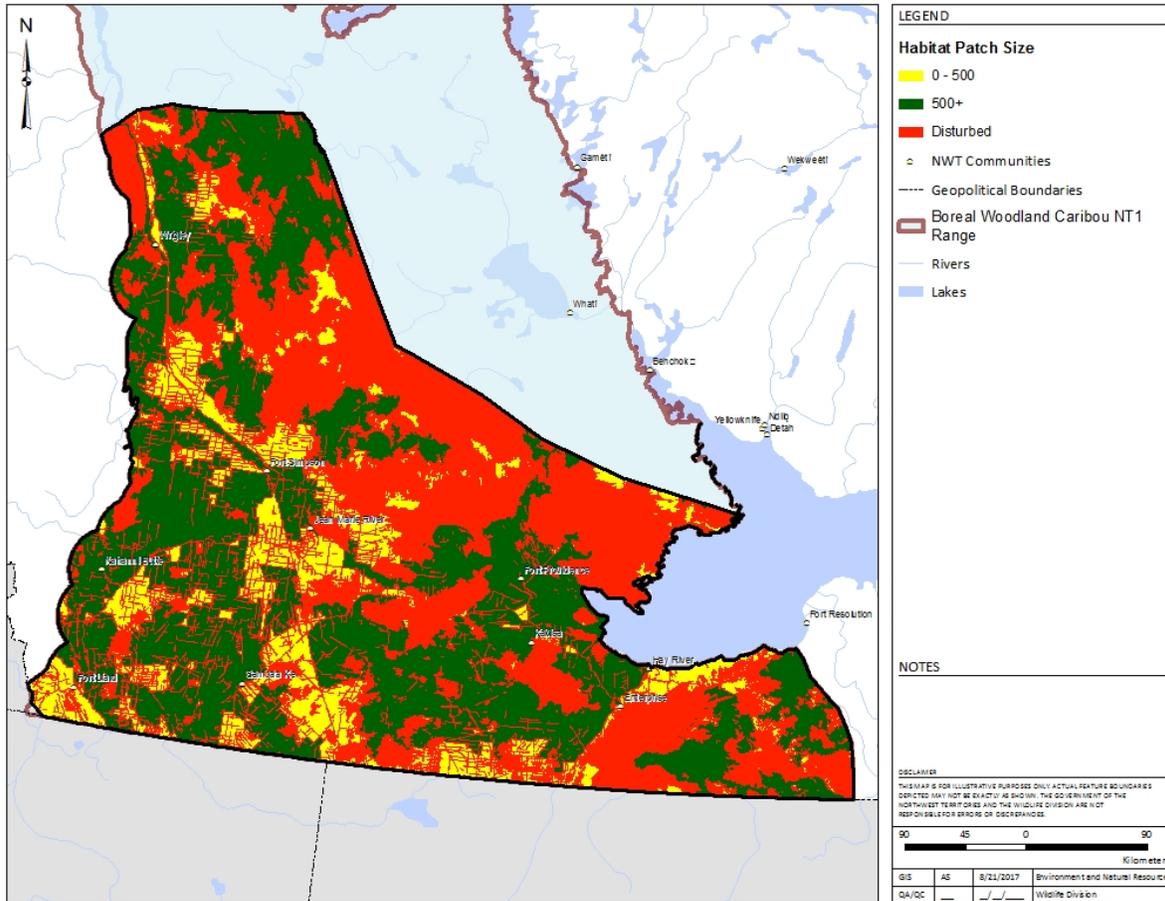


Figure C3. Habitat patch size for the Southern NWT study area. Undisturbed patches >500 km² (green) were assigned a score of three. Undisturbed patches <500 km² (yellow) were assigned a score of two. Disturbed patches (red) were assigned a score of one.

Table C5. Habitat patch size ranking and rationale.

Input	Score	Rationale
Large undisturbed habitat patches (>500 km ²)	3	Work by Nagy (2011) indicates that boreal caribou that have access to large undisturbed patches are more likely to exhibit stable or positive population trend.
Small undisturbed habitat patches (<500 km ²)	2	Undisturbed habitat is more important to caribou than disturbed habitat even when it occurs in patches <500 km ² .
Disturbed habitat	1	Disturbed habitat is of lower importance, as it does not contribute to critical habitat as defined in the national recovery strategy.

Known Use Based on Collar Data

The Southern NWT regions have had boreal caribou collaring programs in place for more than 10 years (see Appendix A, Table A1 and Figure A2). Their collar data (Figure C4) was employed to define areas of high known use by caribou. Multi-year core home ranges were mapped using the 95% contour of individual kernel density home ranges. Individuals with less than 30 total collar return points were discounted from the analysis. The plugin bandwidth estimator from the R package 'ks' was used to parameterize the density surfaces. The resulting 95% contour polygons from individual caribou were then merged together to represent areas of high known use. This merged area was assigned a score of three to indicate high importance to caribou (Figure C5). This presence-only data is influenced by where collars are deployed and should not be taken as an indication of a lack of caribou presence elsewhere. As such, no score was applied outside of the merged polygon (Table C6). The layer represents known areas of use that, while not comprehensive, cannot be discounted in identifying areas that are important for boreal caribou. In study areas with collaring programs, the collar data show that a large proportion of the landscape is used by boreal caribou.

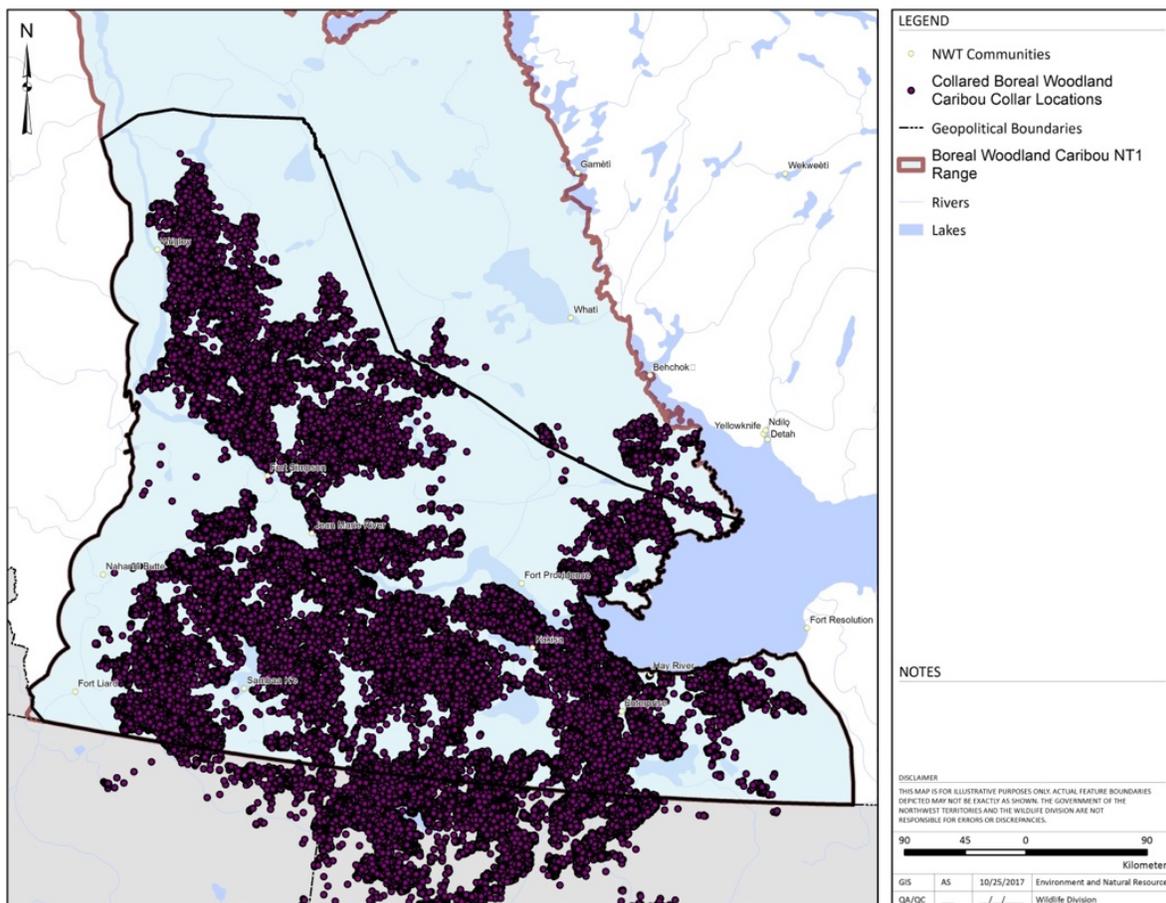


Figure C4. Boreal caribou satellite collar locations from the Southern NWT collaring programs. Data are from Dehcho North, Dehcho South, Hay River Lowlands, Cameron Hills, Pine Point/ Buffalo Lakes and Mackenzie study areas.

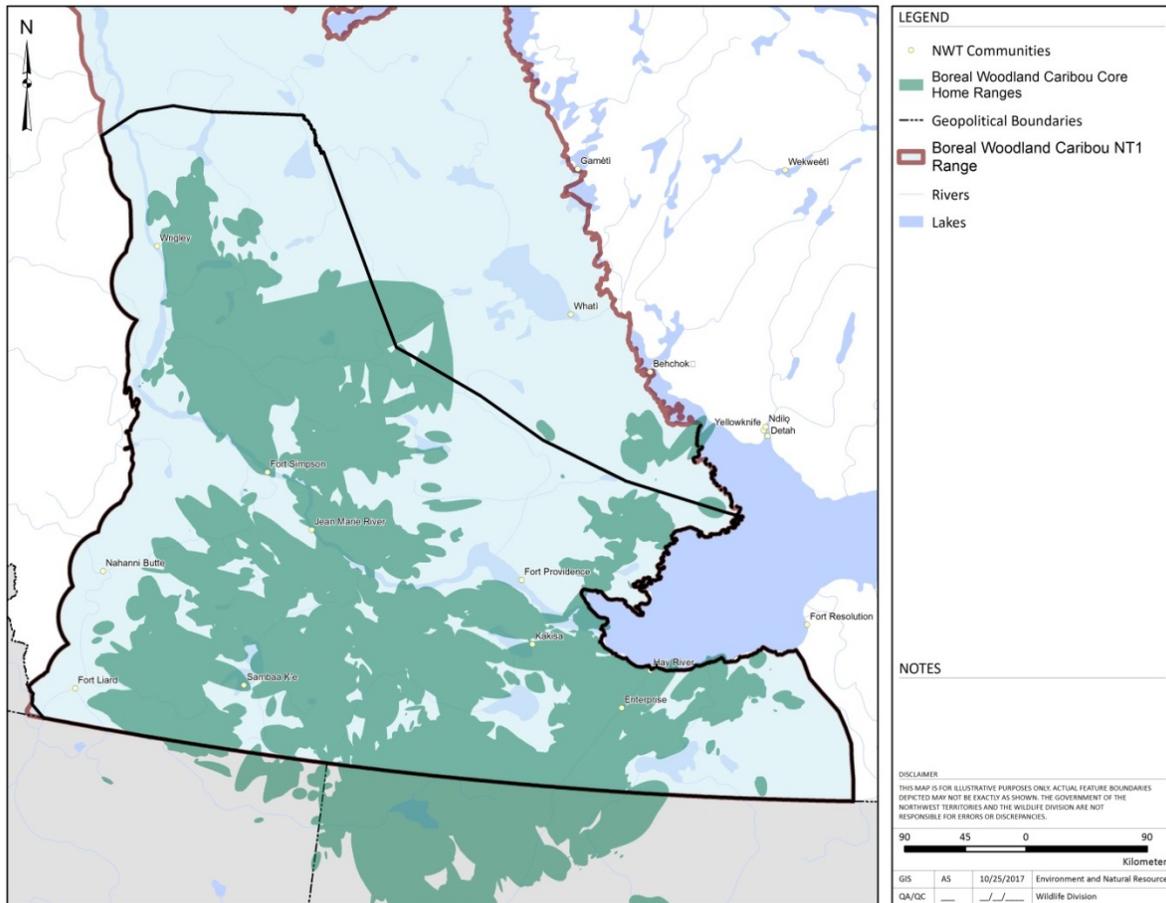


Figure C5. Areas of high known use by boreal caribou in the Southern NWT study area based on merged 95% contour polygons from kernel density surfaces from individual collared caribou. These areas were assigned a score of three to indicate high importance.

Table C6. Known use ranking and rationale.

Input	Score	Rationale
Known use (95% contours)	3	Boreal caribou 95% utilization distributions represent areas of concentrated use by collared female caribou, relative to the full extent of areas that they use throughout their lifespan. These are areas of known high use.

Seasonal Habitat Selection for Different Land Cover Types

Kelly (unpublished)⁹ used resource selection function (RSF) analyses to evaluate habitat selection by boreal caribou in the Southern NWT region. An interpretation of her preliminary findings indicates that some land cover classes, as defined by the Earth Observation for Sustainable Development project (EOSD; Wulder et al. 2008)¹⁰ (Figure C6), are more or less preferred by boreal caribou during summer and winter. This analysis provides an indication of habitat selection and avoidance by boreal caribou. Land cover types that were selected in either summer or winter were assigned a score of three, land cover types that were avoided in both summer and winter were assigned a score of one, and land cover types that were used in proportion to their availability on the landscape (neither selected nor avoided) were scored as two (Tables C7, C8). The assumption is that boreal caribou exhibit selection for those land cover types that enhance their reproductive fitness or survival, and avoid those habitat types that do not provide food or cover or are riskier in terms of predation. The resulting input layer is shown in Figure C7.

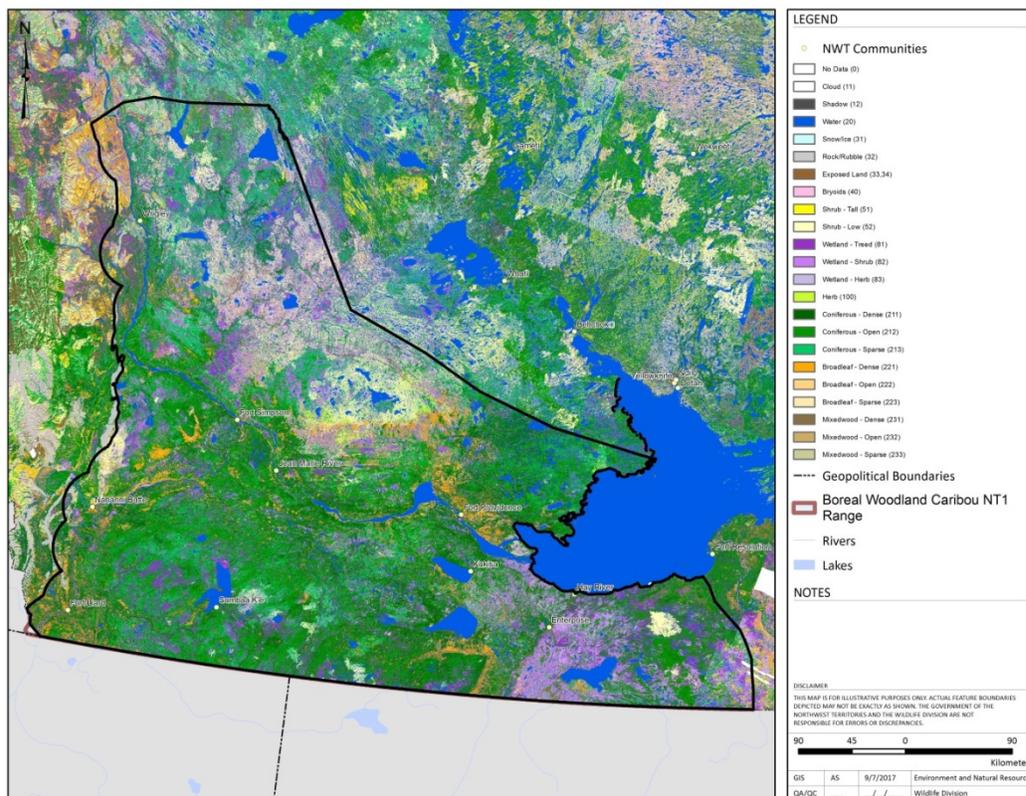


Figure C6. EOSD land cover data (2000/2007) prior to being ranked according to seasonal selection by boreal caribou.

⁹ Kelly, A. 2014. Seasonal variation in resource selection by adult female boreal caribou in the southern Northwest Territories. Unpublished report. 16pp.

¹⁰ Wulder, M.A., J.C. White, M. Cranny, R.J. Hall, J.E. Luther, A. Beaudoin, D.G. Goodenough and J.A. Dechka. 2008. Monitoring Canada's forests. Part 1: Completion of the EOSD land cover project. Canadian Journal of Remote Sensing, 34(6), pp.549-562.

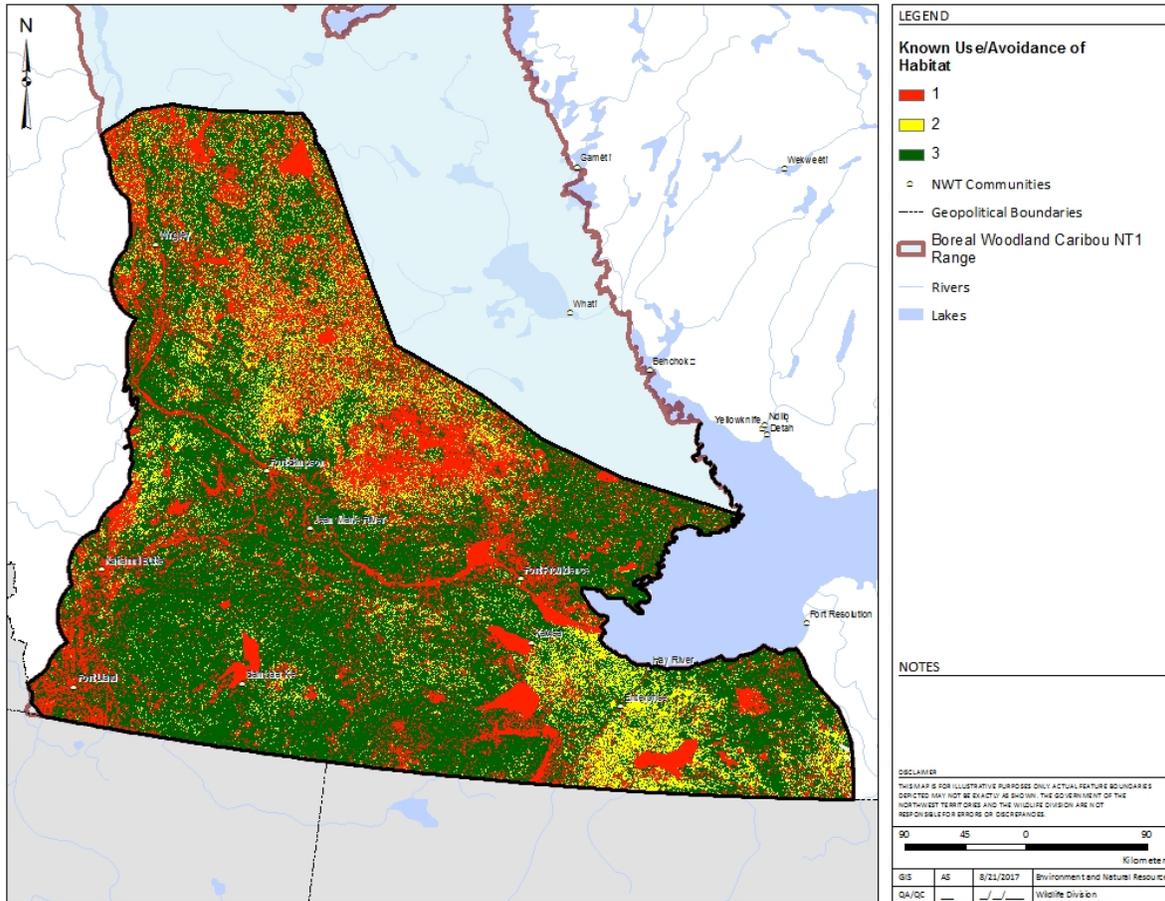


Figure C7. Known preference, use and avoidance of land cover types in the Southern NWT study area as interpreted from Kelly (unpublished). A score of three indicates land cover types selected in summer or winter, two indicates land cover types that were neither selected nor avoided, and one indicates land cover types avoided in both seasons.

Table C7. Known selection/avoidance ranking and rationale.

Input	Score	Rationale
Cover types selected in either summer or winter (i.e., used more than expected based on availability)	3	Boreal caribou exhibit selection for those land cover types that enhance their reproductive fitness or survival because they provide better food, shelter or lower risk of predation, therefore these land cover types are of higher importance to caribou.
Cover types used in proportion to availability (in both summer and winter)	2	These types are neither selected nor avoided, and are therefore of medium importance to caribou.
Cover types avoided in both summer and winter (i.e., used less than expected in both seasons based on availability)	1	Boreal caribou avoid these land cover types in both summer and winter provides, providing a strong indication that they are of lower importance to caribou.

Table C8. Ranking of EOSD land cover classes according to their selection or avoidance by boreal caribou in winter and summer. Land cover classes that were neither selected nor avoided are marked as “select/avoid”.

EOSD Land Cover Type	RSF Class	Winter Selection	Summer Selection	Ranking Score
No Data	Other	Avoid	Avoid	1
Shadow	Other	Avoid	Avoid	1
Water	Water	Avoid	Avoid	1
Rock/Rubble	Other	Avoid	Avoid	1
Exposed/Barren Land	Other	Avoid	Avoid	1
Developed	Other	Avoid	Avoid	1
Bryoids	Other	Avoid	Avoid	1
Shrub Tall	Deciduous	Avoid	Avoid	1
Shrub Low	Deciduous	Avoid	Avoid	1
Wetland-treed	Treed Wetland	Select	Select/Avoid	3
Wetland-shrub	Shrub/Herb Wetland	Select/Avoid	Select/Avoid	2
Wetland-herd	Shrub/Herb Wetland	Select/Avoid	Select/Avoid	2
Herbs	Other	Avoid	Avoid	1
Coniferous-dense	Dense Conifer	Avoid	Select	3
Coniferous-open	Open Conifer	Select	Select	3
Coniferous-sparse	Sparse Conifer	Select	Avoid	3
Broadleaf-dense	Deciduous	Avoid	Avoid	1
Broadleaf-open	Deciduous	Avoid	Avoid	1
Mixed Wood-dense	Mixed Wood	Avoid	Avoid	1
Mixed Wood-open	Mixed Wood	Avoid	Avoid	1

Approach #1 Pilot Project: Combining Input Layers

The pixel scores from the resulting maps in Figures C2, C3, C5 and C7 were added together and standardized by dividing the summed score by the number of inputs in the given cell to deliver a score ranging from one to three. These standardized scores are presented on a continuous scale in Figure C8. The standardized scores from these combined inputs were then binned into three classes of importance: high, medium, and low. Cut-off values for the “low” importance and “high” importance classes were chosen such that no category for an input that scored as “low” (value of one) contributed to an area of “high” importance, and no category for an input that scored as “high” (value of three) contributed to an area of “low” importance. The binned scores are presented in Figure C9.

The next step would be to convert high/medium/low pixel classes into patches where there are adjacent pixels of the same class. This step was not done as part of the pilot project.

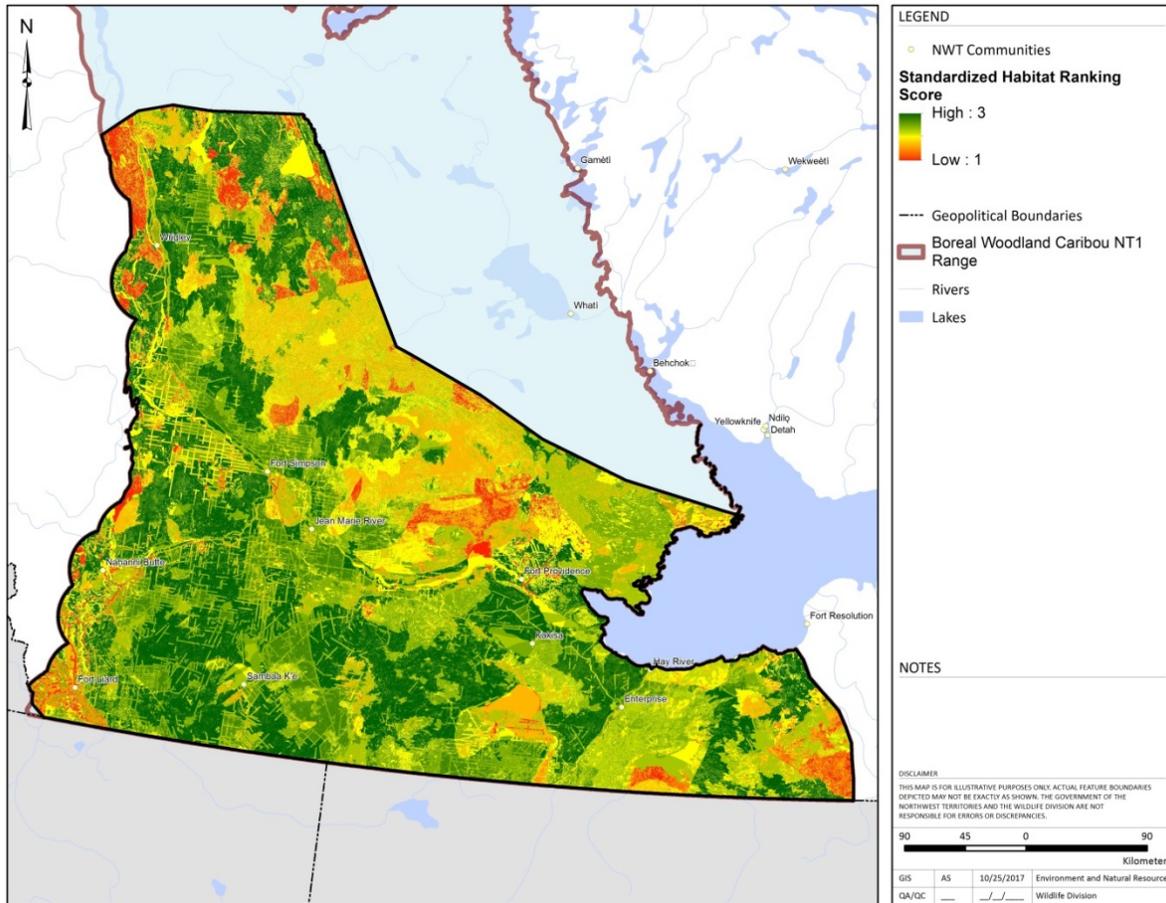


Figure C8. Example of standardized habitat scoring across the Southern NWT regions within boreal caribou range. The scores are stretched across a spectrum: green indicates high importance areas, yellow medium importance areas, and red low importance areas.

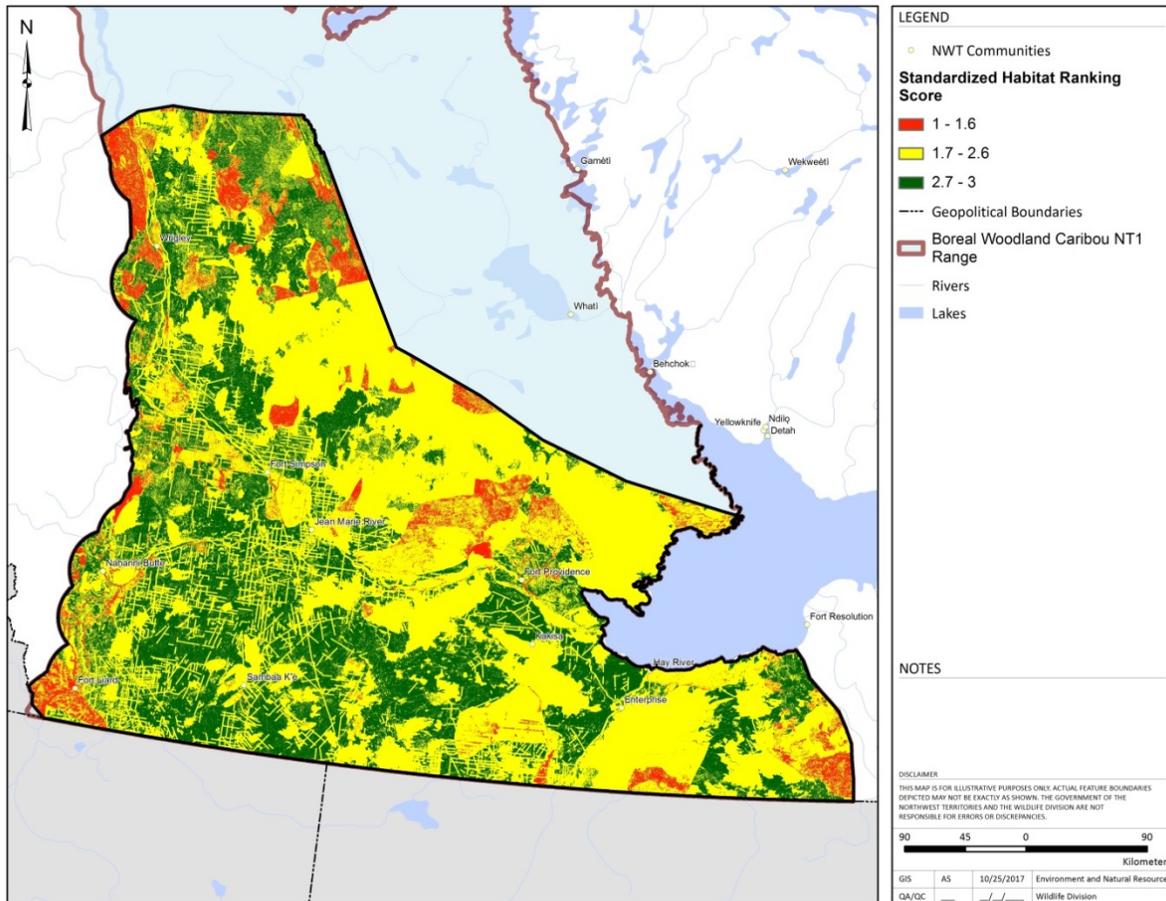


Figure C9. Example of standardized habitat scoring across the Southern NWT regions within boreal woodland caribou range. The scores are binned into three categories: green indicates high importance areas, yellow medium importance areas, and red low importance areas.

Challenges with Approach #1

- Although local and TK are key sources of information that must inform regional range planning, information collected at workshops with communities to date has typically been at a relatively coarse scale. Combining polygons identified by communities with the other information sources that are mapped at a finer resolution can result in delineation of areas that may not be detailed enough for the purpose of making decisions about delineating management class areas. It also resulted in polygons with hard edges or shapes that do not correspond well with natural features of the landscape. Rather than trying to combine the community identified important areas with other spatial habitat layers into a single composite map of relative habitat importance, it may be more appropriate to use the community identified areas as a stand-alone layer to help in selecting and delineating areas that would make up the basic, enhanced and intensive management class areas.

- This approach does not account for the potential value of currently disturbed habitat, for example the value of habitat that may be >40 years old but is within the 500 m buffer of human-caused features, or the future value of large contiguous patches of disturbed habitat that will transition to undisturbed habitat in the near future. Large water bodies also currently contribute to the undisturbed patches and inflate patch sizes, but may be of lesser value to caribou than terrestrial habitat.
- Information from community-identified important areas and collar data is not available throughout the range. For some areas of the range, the ranking may only be based on two lines of evidence (undisturbed patch size and seasonal selection of land cover types).

C.2.3 Approach #2

The second approach being evaluated is the use of RSF models based on analysis of boreal caribou collar data to identify important areas. RSFs would be used as a separate and distinct line of evidence, in addition to complementary maps of habitat importance based on local/TK. RSFs model the probability that boreal caribou will select different areas of the range based on different habitat attributes such as land cover type, time since fire, human disturbance footprint and other topographic variables. The underlying assumption is that caribou are more likely to select areas (pixels on the landscape) that maximize their fitness, thus areas that are more likely to be selected are also areas that provide the biophysical attributes required by caribou. The models also allow us to predict (extrapolate) selection of areas where there is no collar data or community data available, which is currently a limitation of the first approach.

Up-to-date RSF models and resulting maps of relative probability of habitat selection are not currently available throughout the entire NT1 range. In the meantime, the National RSF model and maps for boreal caribou developed by ECCC in 2011 (EC 2011 – Appendix 7.3)¹¹ have been used to illustrate how important areas can be mapped and subsequently used to inform decisions about assigning different areas to management classes, using the Southern NWT region as an example. It is appropriate to use this RSF model for illustrative purposes because 30% of the collared individuals that contributed data to the national model came from the NWT, and NWT collar locations constituted almost 50% of the data used in the model. Even though the RSF maps from this model reflect landscape conditions in 2010, new collar data collected between 2011-2017 within the NWT aligns remarkably well with areas with higher RSF scores (i.e., areas more likely to be selected in 2010 still appear to be highly used since that time).

Figure C10 shows the range of RSF scores on a continuous scale (higher values indicate higher relative probability of selection by caribou). It is obvious from the map that a large proportion of the landscape has a high relative probability of selection by caribou.

There are several options in ESRI's ArcMAP GIS software that can be used to bin the continuous RSF scores into areas of low, medium and high relative importance for

¹¹ Environment Canada, 2011. Scientific Assessment to Inform the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada: 2011 update. Ottawa, ON. 102pp. + appendices.

caribou.¹² The option chosen will influence the proportion of the landscape that is placed into low/medium/high importance categories. The *Framework for Boreal Caribou Range Planning: Discussion Document* includes an expectation that roughly one third of each range planning region will be placed into different management classes (basic/enhanced/intensive), and that this delineation will be informed by maps of low/medium/high importance habitat (Framework, Figure 4). To align with this expectation, equal area bins based on quantiles were used to provide three bins with a roughly equal area of landscape in each bin (Figure C11).

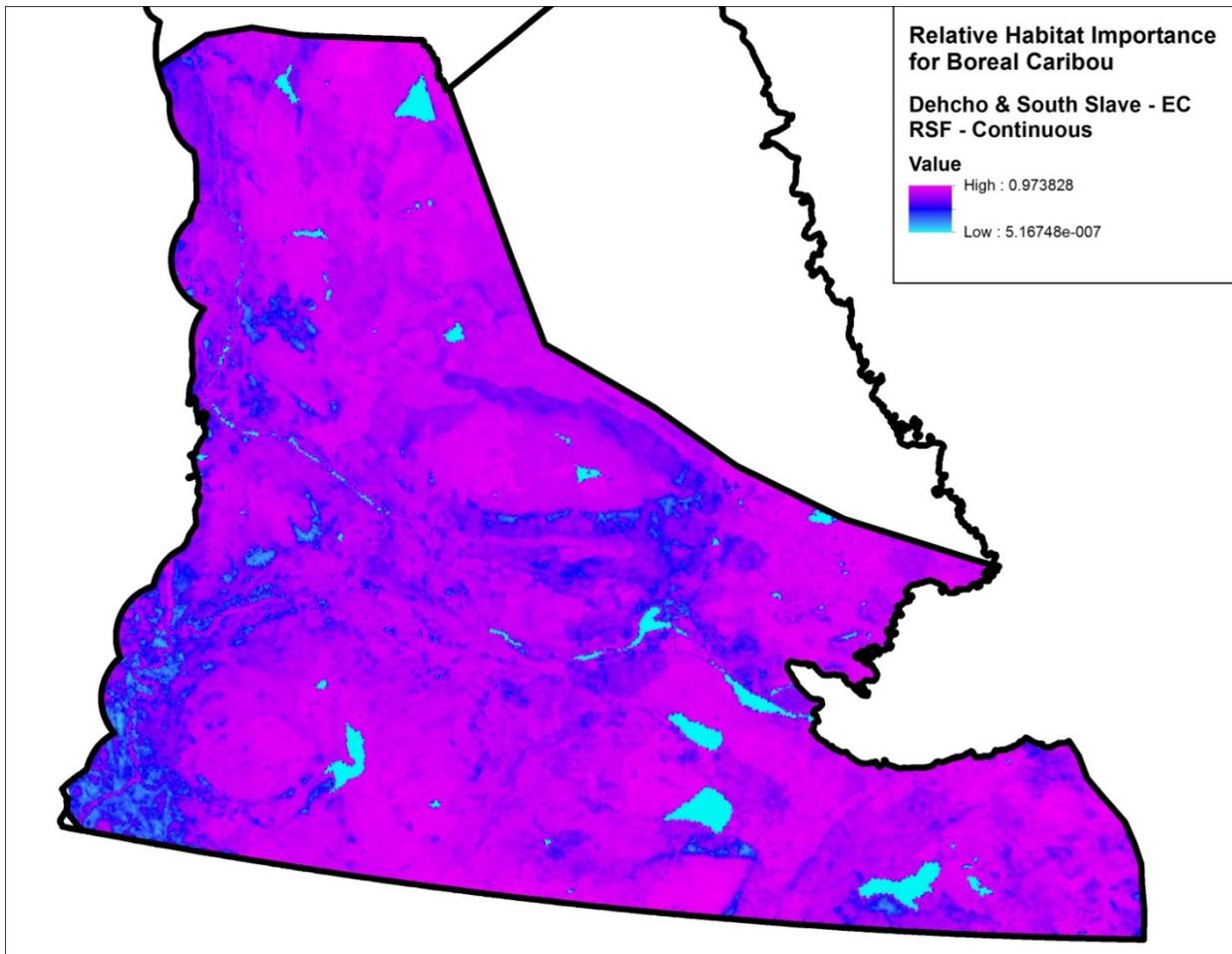


Figure C10. RSF map from ECCC’s 2011 National RSF for boreal caribou, clipped to the Southern NWT portion of the NT1 range. RSF scores indicate the relative probability of selection by caribou, with higher scores indicating a higher relative probability of selection.

¹² <http://pro.arcgis.com/en/pro-app/help/mapping/symbols-and-styles/data-classification-methods.htm>

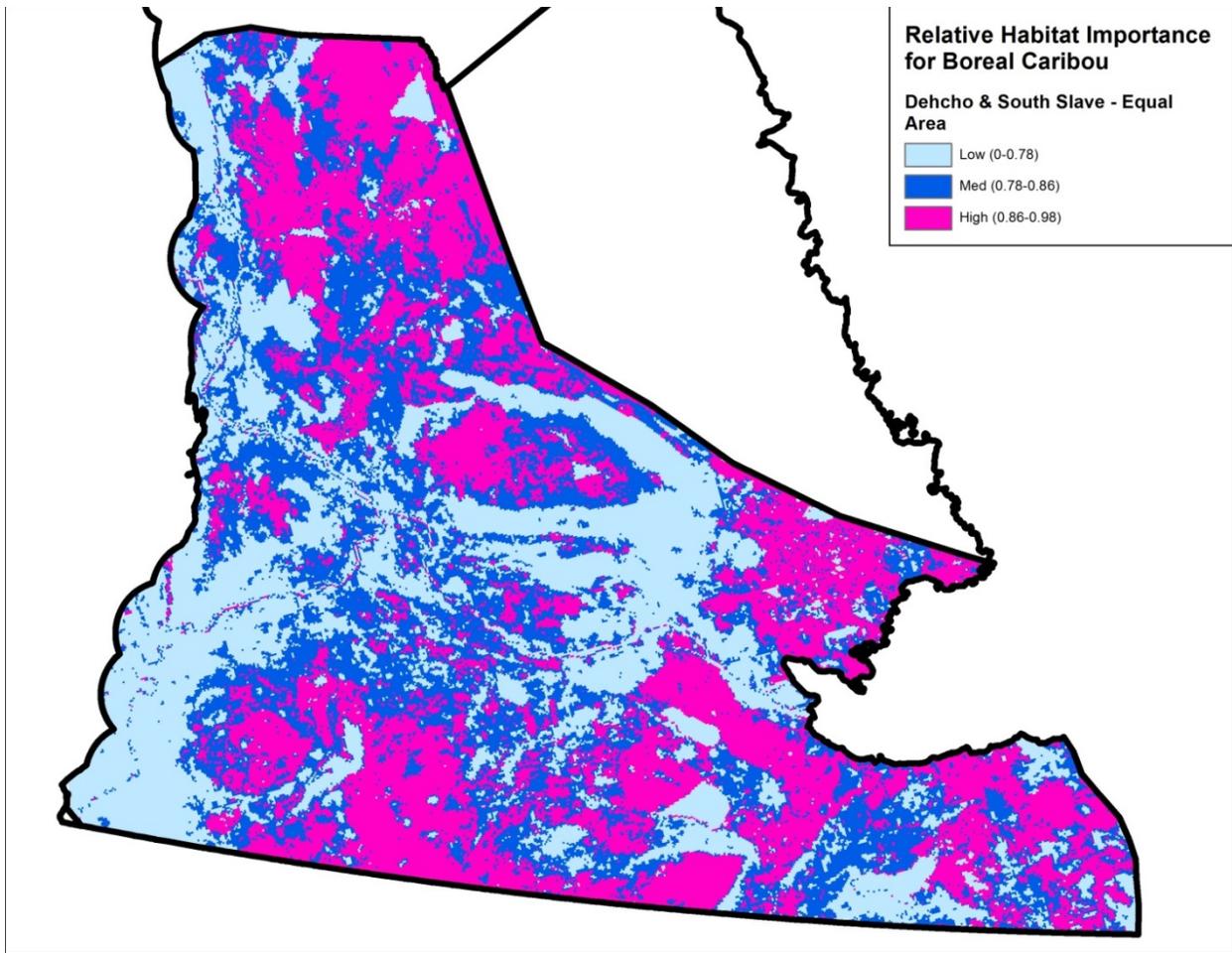


Figure C11. RSF scores binned into high, medium and low importance categories based on equal-area binning using quantiles. This example map is used in the Framework to illustrate how maps of relative habitat importance can help to define management classes (Framework, Figure 6).

C.3 Management Actions

This section describes a menu of possible caribou range management actions that are designed to avoid, minimize, restore or offset disturbance of boreal caribou habitat. Decisions about which actions are most relevant to any particular region will be made at the regional range planning stage. The list contained here represents a starting point for discussion, and it is expected that the proposed management actions will be further refined through engagement on the Framework and the development of regional range plans. Some of the proposed actions are already required by land use regulations or land use plan (LUP) conformity requirements. Other proposed actions that are not currently required by existing legislation or LUP conformity requirement could be integrated by amending the existing *Northern Land Use Guidelines*, developing new sector-specific guidelines for operating in boreal caribou habitat, or through amendments to LUPs in the future.

It is recognized that managing both the human-caused and fire disturbance footprint will be important to achieving range plan objectives. Although management classes are defined by human disturbance thresholds, fire management options are considered an essential part of the tiered management approach and are discussed in the section C.3.5 of this document.

Management classes are defined spatially, based on the condition of the range in each planning region relative to the human disturbance thresholds, and by using important areas maps to inform the selection of areas that fall within each class (as explained in the *Framework for Boreal Caribou Range Planning: Discussion Document*, section 3.6). In the proposed Framework, human disturbance thresholds define which management classes should apply to a region, as shown in Figure C12 below.

Human Disturbance Thresholds	Relative Importance of an Area for Boreal Caribou		
	Low	Medium	High
High-risk			
Cautionary			
Low-risk			

Figure C12. Illustration of how disturbance thresholds and relative habitat importance are used to determine basic (green), enhanced (yellow) and intensive (orange) management classes that apply to a given region. Reproduced from Figure 4 in the *Framework for Boreal Caribou Range Planning: Discussion Document*.

Management actions applied in the enhanced and intensive classes (yellow and orange boxes, respectively) are designed to help ensure no net loss of undisturbed boreal caribou habitat within those areas due to anthropogenic activities for the duration of the range

planning period (ten years). Restoration and offsetting requirements in the intensive management class will be more stringent than in the enhanced class. The actions proposed in these classes are intended to help regions that are currently within the high-risk human disturbance threshold to reduce their human disturbance footprint over time to within the cautionary range, and to help regions that are currently within the cautionary range to remain there. Regions that are currently in the low-risk range for human disturbance could add more human disturbance over time, but having a portion of those regions in enhanced management classes helps to ensure that there are areas where boreal caribou conservation is the priority.

A combination of legislative and policy tools will be used to achieve these outcomes and ensure the specific management actions in each class are implemented; implementation tools are discussed in detail in Appendix C4. For example, in enhanced and intensive management areas, authority under the *Wildlife Act* and *SARA (NWT)* to designate habitat and wildlife conservation areas and create regulations for these areas could allow GNWT to require certain conditions on development that would achieve no net loss of undisturbed habitat. Other tools to make guidelines and best practices enforceable could include the requirement for developers to have approved Wildlife Management and Monitoring Plans (WMMP) under the *Wildlife Act*, and GNWT recommendations to include specific terms and conditions on permits and licences issued by Land and Water Boards (LWB) as part of GNWT input on screenings and environmental assessments (EA). Habitat designations under the *SARA (NWT)* for intensive management areas could also require that developers apply for permits for activities that would otherwise be considered to destroy designated habitat, and the issuance of such permits could be subject to similar conditions as are required under federal *SARA* to issue a permit to destroy critical habitat.

Management actions outlined in Tables C9 through C11 are focused on limiting or reducing the human disturbance footprint to maintain or reduce the human disturbance in certain regions to within the cautionary disturbance range, in order to provide a higher likelihood that the region will stay below its long-term disturbance limit, and that the NT1 range as whole will be maintained within +/- 5% of the 35% total disturbance threshold after accounting for fire disturbance. Regions that are currently within the “low-risk” disturbance range can increase human disturbance to within the cautionary range without risking the range as a whole going >5% above the 35% threshold. Additionally, the management actions are grouped according to a standard conservation hierarchy, which seeks to (a) avoid new disturbance, then (b) minimize necessary new disturbance as much as possible, and lastly (c) restore and/or offset any residual disturbance. Table C12 includes additional actions for managing natural disturbance.

For now, the tables are focused on the four primary development sectors that have the potential to affect the greatest area of the NT1 range – oil and gas (including geophysical exploration), forestry, linear infrastructure (roads, pipelines and utility corridors), and mineral exploration and mining. Other sectors that contribute less to the human disturbance footprint will be added to the table in the future. Although the management actions outlined in the tables below focus on avoiding, minimizing, restoring and offsetting habitat disturbance, further sector-specific guidance could also be developed to address sensory disturbance to boreal caribou. This could include measures such as seasonal

restrictions on certain activities to minimize sensory disturbance during sensitive periods for boreal caribou (e.g. late winter, calving and post-calving).

C.3.1 Avoiding New Disturbance through Land Tenure, Rights and Resource Allocation Decisions

These management actions are related to decisions about whether to:

- Open areas to calls for nomination (aka expression of interest) and calls for bids for oil and gas exploration, which could then lead to issuance of exploration licences and subsequent applications for permits to carry out exploration work (land use permits and water licences).
- Entering into or defining boundaries for forest management agreements (FMAs) for commercial timber harvesting, and defining annual sustainable timber harvest volumes in consideration of disturbance thresholds and high importance caribou habitat.
- Issuance of surface tenures on territorial lands for industrial and commercial development (e.g. licences of occupation for roads, easements for utility corridors, commercial leases) are not included in this category, as these types of tenure are usually not issued until other permits such as land use permits and/or water licences have been obtained. They are therefore not considered as an appropriate instrument to avoid disturbance.
- Issuance of prospecting permits and mineral claims are not included in this category due to the NWT's free entry system.

Table C9. Management actions to avoid new disturbance through land tenure, rights and resource allocation decisions

Sector	Basic	Enhanced	Intensive
Oil and Gas Issuance of exploration rights (i.e., calls for nominations, calls for bids)	Areas can be opened up to calls for nominations and calls for bids.	Areas can be opened up to calls for nominations and calls for bids.	Do not open up new areas in this management tier to calls for nominations or bids.
	Applicants are notified in calls for bids that conditions imposed on exploration activities within lease areas may be subject to change according to the condition of the range which may bump an area up to a higher management class. ¹³	Applicants are notified in calls for bids that: (a) conditions imposed on exploration activities within lease areas will be more stringent, and (b) changes in the condition of the range may bump an area up to a higher management class in which even more restrictive conditions on development approval would apply. ¹²	
	Exploration licences issued as per usual.	Exploration licences issued as per usual.	
Forestry (Issuance of long-term FMAs)	Issuance of long-term FMAs as per usual.	Issuance of long-term FMAs with condition that long-term forest management plans will be required to demonstrate ongoing supply of large undisturbed habitat patches within the management class area.	Only issue FMAs for salvage logging in recently disturbed habitat in this management tier. Forest management plans for salvage logging must demonstrate avoidance of undisturbed habitat when accessing cut blocks.
Forestry (defining Allowable Sustainable Timber Harvest [ASTH] levels)	Encourage consideration of boreal caribou habitat in determination of ASTH.	Large patches of suitable caribou habitat within FMA planning areas should be removed from calculations of ASTH; or, Caribou habitat supply targets and caribou habitat patch size constraints should be included in ASTH analysis.	Areas with evidence of intensive use by boreal caribou should be removed from consideration in calculating ASTH volumes for salvage logging.

¹³ This reclassification would occur only as range plans are revised.

C.3.3 Avoiding and Minimizing New Disturbance from Developments during Project Design, Project Review and Issuance of Permits or Licences

The actions proposed in this section focus on project design and location to minimize new habitat disturbance. These actions could include:

- the use of existing disturbances, dimensions/configuration of new disturbance (e.g. limits on linear feature width, well pad dimensions, aggregation of cut blocks);
- locating new disturbance to be within close proximity or parallel to existing disturbance (to ensure overlapping buffered disturbance footprints and minimize the contribution of a project to the existing buffered disturbance footprint);
- sharing access (multiple proponents using same access);
- complete avoidance of undisturbed habitat and of disturbed habitat that will transition into undisturbed habitat in the next 10 years;
- avoidance/minimization of fragmentation of large patches of undisturbed or currently disturbed habitat that will transition into undisturbed habitat in the next ten years.

Table C10. Management to avoid and minimize new disturbance from developments during project design, project review and issuance of permits or licences.

Sector	Basic	Enhanced	Intensive
<p>Oil and Gas Issuance of land use permits and water licences to carry out exploration for or production of oil and gas (<i>excluding geophysical/seismic surveys</i>).</p> <p>Applies to well pads, camps, and other facilities required for oil and gas exploration or production except access roads and pipelines (addressed under linear developments).</p>	<p>Encourage developers to use areas of existing disturbed habitat to the greatest extent feasible to minimize new disturbance.</p>	<p>Require developers to demonstrate that they have minimized the amount of new habitat disturbance to the greatest extent possible by using areas of existing disturbance.</p> <hr/> <p>Camps and processing facilities: use areas of existing disturbance, located as close to associated linear developments as possible.</p>	<p>Require developers to demonstrate that they have minimized the amount of new habitat disturbance to the greatest extent possible by using areas of existing disturbance that will not transition into undisturbed habitat within the next 10 years.</p> <p>If complete avoidance of undisturbed habitat and/or disturbed habitat 30-40 years old is not feasible, require developers to demonstrate that all reasonable alternative means of undertaking the activity have been considered, and the alternative adopted will result in the smallest footprint in undisturbed and/or disturbed habitat 30-40 years old possible.</p>
<p>Forestry Issuance of timber harvesting permits, licences</p> <p><i>Applies to short-term (five yrs. or less) permits and licences, not to long-term FMAs.</i></p>	<p>Issue timber harvesting permits and licences as per usual.</p> <hr/> <p>Notify applicants that management class designation applied to an area may change in during future revisions of the regional range plan.</p>	<p>Issue timber harvesting permits and licences as per usual.</p> <hr/> <p>Require applicants to demonstrate use of harvest patterns that emulate natural disturbance, spatial aggregation of cut blocks to reduce dispersion of forest harvesting areas and associated amount of road access, and creation of future large patches of undisturbed</p>	<p>Do not issue new timber harvesting permits that would result in new disturbance footprint in undisturbed habitat</p> <hr/> <p>Do not issue new timber harvesting permits that would result in new disturbance footprint in disturbed habitat that will be transitioning to undisturbed habitat in next 10 years.</p>

<p><i>Unless permit/licence applications are for salvage logging, it's assumed that they will affect undisturbed habitat.</i></p>		habitat.	
		Require use of existing linear features to access timber to greatest extent possible and avoid routing new access through undisturbed habitat patches that will not be harvested where possible. Require that access avoid large contiguous patches of undisturbed habitat that do not contain merchantable timber.	Licences and permits for salvage logging can be issued subject to avoidance of undisturbed habitat and disturbed habitat 30-40 years old.
<p>Linear Developments Issuance of land use permits and water licences for linear developments (roads, utility corridors, pipelines; excluding ground-based geophysical surveys [seismic]).</p> <p><i>Note that both linear and polygonal developments may be grouped under the same land use permit or water licence.</i></p>	Encourage developers to minimize creation of new linear features and access by using existing linear features or sharing access. ¹	Require developers to demonstrate that existing linear features and access will be used/shared to the greatest extent feasible. ¹	Require developers to use existing linear features and access. ¹
	Where new access is required, encourage the use of construction practices, seasonality of use, routing and road design that will minimize impacts to boreal caribou and their habitat.	Where new access is required, developers shall demonstrate that construction practices, seasonality of use, routing and road design will minimize impacts to boreal caribou and their habitat to the extent feasible for the project.	Where new access is required, developers shall demonstrate that construction practices, seasonality of use, routing and road design will minimize impacts to boreal caribou and their habitat to the extent feasible for the project.
		Use narrowest class of access road required.	New access permitted adjacent to existing linear features only where the density/height/canopy closure of regeneration on the linear feature exceeds that of the surrounding habitat.
		Minimize sightlines by using doglegs or meandering route as much as safety permits.	
<p>Oil and gas Ground-based geophysical surveys</p>	Encourage use of low-impact seismic techniques.	Require use of low-impact seismic techniques.	Only seismic exploration using hand cut lines <3 m wide, meandering lines, and avoidance cutting techniques will

<p>(seismic), but could also apply to cut lines used in mineral prospecting).</p>			<p>be permitted. If helicopter assisted portable seismic techniques are proposed, they will only be permitted to take place outside of the late-winter, calving and post-calving periods.</p>
<p>Mineral Exploration and Mining (excluding associated access roads)</p> <p>Issuance of land use permits and water licences to carry out exploration for or production of mineral resources.</p> <p>Includes activities such as line cutting, ground-based geophysical surveys, drilling, stripping, pitting, trenching, blasting, mining infrastructure including mills, surface building, camps, power lines, open pit mines, tailings impoundments that may require clearing land.</p>	<p>Encourage use of existing linear features to conduct geological mapping and sampling, claim staking and delineation, access drilling locations.</p> <hr/> <p>Minimize the length and width of new lines cleared to delineate or stake claims</p> <hr/> <p>Encourage the use of existing clearings and disturbed areas for camps, drilling locations, bulk sampling, mining facilities, waste rock piles, tailings facilities, etc.</p>	<p>Require developers to demonstrate that they have minimized the amount of new habitat disturbance to the greatest extent possible by using areas of existing disturbance.</p> <p>Require developers to demonstrate that the length and width of new lines cleared to delineate or stake claims is minimized (e.g. by using lines <1.5 m wide), and to use hand cutting techniques that leave large trees standing. Leave vegetation breaks to limit predator travel and search efficiency.</p> <p>Require developers to demonstrate that mining infrastructure will be located within existing clearings to the greatest extent feasible, and as close to associated linear developments as possible.</p>	<p>Require developers to demonstrate that they have minimized the amount of new habitat disturbance to the greatest extent possible by using areas of existing disturbance that will not transition into undisturbed habitat within the next ten years.</p> <p>If complete avoidance of undisturbed habitat and/or disturbed habitat 30-40 years old is not feasible, require developers to demonstrate that all reasonable alternative means of undertaking the activity have been considered, and the alternative adopted will result in the smallest footprint in undisturbed and/or disturbed habitat 30-40 years old possible.</p>

¹ *Note:* S.10 of the *Mackenzie Valley Land Use Regulations* and S.13.1 of the *NWT Land Use Regulations* already prohibit, unless explicitly authorized by a permit, the clearing of a new line, clearing or right-of-way, where an existing line, trail or right-of-way can be used.

C.3.4 Balancing/Offsetting New Disturbance through Habitat Restoration

Reclamation requirements for development projects are often determined on a case-by-case basis, and there are currently no clear guidelines, standards or objectives in place in the NWT that outline expectations related to restoration of boreal caribou habitat. Closure objectives may involve reclamation, re-vegetation, rehabilitation or restoration but these are not equivalent concepts. For example, the guidelines for closure and reclamation of advanced mineral exploration and mine sites in the NWT¹⁴ define reclamation as “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.” Re-vegetation is usually limited to the establishment of plant cover at a disturbed site, but does not guarantee that the site will be set on a successional trajectory to pre-disturbance composition and structure. At the other end of the spectrum, restoration tends to focus on returning an area to pre-disturbance conditions.

The current requirements for restoration of lands following the completion of most development projects are to prepare disturbed sites in a manner that will facilitate natural re-vegetation, and to initiate active re-vegetation in areas where there is a threat of significant erosion, there is little to no organic matter left, the site is so large that the centre is too far from seed sources and colonizing plants to be revegetated, it is not acceptable to wait ten to 20 years for natural vegetation to develop, or there is a threat of invasive plants outcompeting native colonizers¹⁵. There are typically no requirements or standards in place to ensure that disturbed areas are set on a successional trajectory to recover to pre-disturbance vegetation composition or structure, or to restrict or impede the use of linear features by humans and predators once they are no longer needed to carry out a development project.

Although the national recovery strategy for boreal caribou provides criteria for when fire-disturbed habitat transitions back to undisturbed habitat (i.e., when fires turn 41 years old), no such criteria were provided for human disturbance. Ray (2014)¹⁶ provides a comprehensive review of habitat restoration concepts as they relate to boreal caribou habitat restoration, but stops short of providing measurable criteria to determine when disturbed areas can be considered restored. As such, criteria will need to be developed that are relevant to the NT1 range to determine when human-disturbed areas can be considered restored from a boreal caribou perspective. Restoration of boreal caribou habitat is often described in terms of “functional restoration” and “ecological restoration”.

¹⁴ Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories

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

¹⁵ MVLWB Standard Land Use Permit Template

[https://mvlwb.com/sites/default/files/mvlwb/documents/MVLWB%20-](https://mvlwb.com/sites/default/files/mvlwb/documents/MVLWB%20-%20Standard%20Land%20Use%20Permit%20Conditions%20Template%20-%20Public%20Version%20-%20Feb24_17.pdf)

[%20Standard%20Land%20Use%20Permit%20Conditions%20Template%20-%20Public%20Version%20-%20Feb24_17.pdf](https://mvlwb.com/sites/default/files/mvlwb/documents/MVLWB%20-%20Standard%20Land%20Use%20Permit%20Conditions%20Template%20-%20Public%20Version%20-%20Feb24_17.pdf)

¹⁶ Ray, J. 2014. Defining habitat restoration for boreal caribou in the context of national recovery: A discussion paper. Report prepared for Environment Canada. 54pp.

www.sararegistry.gc.ca/document/default_e.cfm?documentID=2854

“Functional restoration” is generally focussed on reducing the ability of predators and humans to use linear features as travel corridors that increase the odds of encounters with caribou and caribou mortality in the short-term, or to prevent repeated disturbances caused by vehicular traffic which may impede longer-term regeneration of vegetation. Functional restoration can be achieved by attaining a sufficient height and density of re-vegetation on linear features to impede movement of predators and people or by using line blocking treatments such as piling slash and debris, bending trees over the line or erecting barriers and fences. Functional restoration is therefore intended to address functional habitat loss for boreal caribou due to avoidance of these features, but does not necessarily address the numerical response of predators to increased alternate prey levels associated with disturbed habitat.

“Ecological restoration” focuses on ensuring or accelerating the longer-term recovery of vegetation in disturbed areas that will provide biophysical attributes required by caribou (e.g. restoration of lichen ground cover, or conifer-dominated forest cover), and the return of an area to pre-disturbance composition and structure. This may also involve advancing recovery of disturbed areas to a point where they no longer provide early-seral vegetation that may contribute to increased densities of alternate prey species such as moose and deer. In practice, active ecological restoration may involve site preparation, creating favourable microsites using woody debris, and planting or seeding with native species that are characteristic of pre-disturbance conditions. As Ray (2014) points out “Re-establishing caribou habitat, if successful, will take several decades to achieve in a given area, and will not immediately compensate for the loss of habitat caused by the ongoing and future projects. This means that embarking on restoration now will not lead to immediate improvements in range condition”.

Management actions proposed for the enhanced and intensive management classes focus on functional and ecological restoration of new temporary disturbances created by development projects once those areas are no longer in use by a developer, and offsetting new permanent disturbance from development through offsite functional and ecological restoration of existing areas of disturbance. Temporary disturbances could be considered those where the combined operational lifetime and predicted time for the feature to be functionally restored once no longer needed would be <40 years. Permanent disturbances could be considered those where the operational lifetime of the footprint plus the predicted time for the disturbance to be functionally restored would be >40 years. These proposed definitions of temporary versus permanent disturbances are intended to recognize that even when development footprints are only in use for short periods, not all sites can be quickly or easily restored, or restored at all, which could result in a net increase in human disturbance footprint over time if they are not offset by habitat recovery elsewhere.

If, after demonstrating that all reasonable alternative means of undertaking development activities have been considered, and creation of new disturbance cannot be avoided, offsets could be required to compensate for new permanent disturbances in enhanced and intensive management class areas. In addition, on-site restoration activities could be required to accelerate recovery of disturbed areas after the lifespan of development activities. The intent of these management actions is to offset new permanent disturbance through functional and ecological restoration of existing/legacy disturbances elsewhere

and to promote more rapid functional and ecological restoration of new temporary disturbance from development. These measures would help to ensure that the pace of habitat recovery of existing disturbances equals or exceeds the pace of new human-caused disturbance.

Offsetting ratios for new permanent disturbance should be higher in intensive management class areas than in enhanced management class. This is intended to reflect the higher priority placed on boreal caribou habitat protection in intensive class areas. Offsetting ratios are intended to address uncertainty about the positive benefits of habitat restoration for caribou, given that (a) the impacts of new habitat disturbance today are not immediately offset by restoration, and (b) restored habitat may not be of equivalent value to caribou as naturally intact habitat. For example, it could take at least 40 years for an area to be considered as “restored” caribou habitat, but it may still not be of the same value to caribou as an equivalent area of 80+ year old habitat. Additionally, there is uncertainty that restored areas will meet ecological criteria within predicted timelines. These factors all contribute to the development of appropriate offset ratios. Appropriate offsetting ratios would be determined through further research and the development of policies and guidelines related to offsetting.

Given limited experience with implementing functional and ecological restoration of boreal caribou habitat in the NWT, and the lack of current policy and guidance for requiring, implementing, and monitoring offsets for disturbance, these measures would be phased in gradually over time. Initially, developers could be required to contribute directly or indirectly to research and development of functional and ecological restoration practices for boreal caribou habitat. This could include initiatives such as identifying and prioritizing areas that require restoration, on-the-ground restoration trials, and the development of policy, guidelines and standards surrounding restoration practices and the use of offsets.

Table C11. Management actions to balance/offset new disturbance through habitat restoration.

Sector	Basic	Enhanced	Intensive
Functional Restoration Oil and gas (except low impact seismic) Linear developments Forestry (<i>applies only to logging roads</i>) Mineral exploration and mining	Current closure and reclamation requirements apply.	For permanent linear disturbance footprints: Unavoidable disturbance in undisturbed habitat will be offset using functional restoration methods to impede predator travel and human access, and must be applied within intensive or enhanced management class areas.	For permanent linear disturbance footprints: Unavoidable disturbance in undisturbed habitat will be offset at a higher ratio than in the enhanced category. Functional restoration methods will be applied to linear restoration offsets to impede predator travel and human access, and must be applied within intensive or enhanced management class areas.
		For temporary disturbance footprints: Temporary linear features that are part of the project footprint will be functionally restored as soon as they are no longer in use.	For temporary disturbance footprints: Temporary linear features that are part of the project footprint will be functionally restored as soon as they are no longer in use. Linear features that will be in use intermittently for multiple years, will be functionally restored once no longer needed for the project.
Ecological Restoration Oil and gas (except low impact seismic) Linear developments Mineral exploration and mining	Current closure and reclamation requirements apply.	For temporary linear and polygonal disturbance: if disturbance of undisturbed habitat is unavoidable, re-vegetation using methods that will ensure more rapid return to pre-disturbance vegetation composition and structure will be required.	For temporary linear and polygonal disturbance: if disturbance of undisturbed habitat, and disturbed areas that are 30-40 yrs. old, is unavoidable, re-vegetation of areas using methods that ensure more rapid return to pre-disturbance vegetation composition and structure will be required.
		For permanent linear and polygonal disturbance footprints:	For permanent linear and polygonal disturbance footprints:

Sector	Basic	Enhanced	Intensive
		<p>Unavoidable permanent disturbance in undisturbed habitat will be offset.</p> <p>Require re-vegetation of offset areas using methods that ensure more rapid return to pre-disturbance vegetation composition and structure.</p>	<p>Unavoidable permanent disturbance in suitable boreal caribou habitat (presently disturbed or undisturbed) will be offset at a higher ration than in the enhanced category.</p> <p>Require re-vegetation of offset areas using methods that ensure more rapid return to pre-disturbance vegetation composition and structure.</p>
<p>Forestry (<i>applies only to cut blocks</i>)</p>	<p>As per current standard operating procedures.</p>	<p>For harvest of conifer-dominated stand types, active reforestation that ensures a more rapid return to pre-disturbance conifer dominated stand type will be required. This measure does not apply to salvage harvesting of burned stands.</p>	<p>For harvest of conifer-dominated stand types, active reforestation that ensures a more rapid return to pre-disturbance conifer dominated stand type will be required. This measure does not apply to salvage harvesting of burned stands.</p>

755 **C.3.5 Managing Natural Disturbance**

756 Fire is inevitable across most of the territory, and is an important part of the natural boreal
757 forest ecosystem. Resources (i.e., people, equipment, airplanes, etc.) are limited, and
758 directing resources to fighting fires in caribou habitat mean that other resources are
759 needed to protect communities and property. Many of the fires that would be most
760 meaningful to caribou habitat are very large and remote, which are nearly impossible to
761 control.

762 The primary mechanism for GNWT to consider caribou habitat in responding to wildfire is
763 through their “values at risk” (VAR) hierarchy, outlined in the NWT *Forest Fire*
764 *Management Policy*¹⁷. Human life and infrastructure/property are the top priorities that
765 guide GNWT’s decisions about fire response, but natural resource values (such as caribou
766 habitat) can factor in as an additional priority. Fuels treatments such as prescribed burns
767 and fire breaks can be used in some cases (and under the right conditions) to attempt to
768 protect areas of interest.

769 Approaches such as prescribed burns and re-vegetation have been used only rarely. GNWT
770 does not have a well-developed prescribed burning program and currently only conducts
771 burns to protect communities. GNWT does not replant after fires because the burned areas
772 are often too large to replant effectively, and because natural regeneration is often as
773 successful or more successful than planted seedlings. The large-scale application of these
774 types of treatments is limited by the large expanse of the taiga forest in the NWT and the
775 costs associated with taking action in remote areas. Nonetheless, there may be
776 opportunities to take action in some years recognizing that the benefits of that action may
777 be negated by fires in the future.

778 Feasibility studies into fuels treatments to protect older patches of forest and re-vegetation
779 of burned areas would allow the assessment of the effectiveness, costs (both financial and
780 human), logistics and the potential application of these approaches more broadly.

781 The management actions described below are focussed on reducing fuel loads to limit the
782 spread or intensity of forest fires should they occur within specific areas, and whether and
783 how to respond to fires that do ignite within different management class areas.

¹⁷ Northwest Territories Forest Fire Management Policy 53.04.
www.enr.gov.nt.ca/sites/enr/files/documents/53_04_forest_fire_management_policy.pdf

Table C12. Fire management actions.

Sector	Basic	Enhanced	Intensive
Fire - Reduction of fuel loads or creation of fuel breaks.	None	Prescribed burns.	Prescribed burns.
		Timber harvesting to reduce fuels or create fuel breaks.	Timber harvesting to reduce fuels or create fuel breaks.
Fire - Active response to fires.	Follow current fire management policy	Identify undisturbed patches within these areas as VAR.	Identify undisturbed patches and disturbed patches 30-40 years old as VAR.
Fire - Regeneration of burned areas.	None	None	Feasibility studies and trial of re-seeding and/or replanting burned areas in strategic locations.

C.4 Implementation Tools

C.4.1 Introduction

GNWT departments undertook an evaluation of different legal and policy tools that could be used to implement both the Bathurst (barren-ground) caribou range plan¹⁸ and boreal caribou range plans. This section summarizes the different options evaluated and their relative performance with respect to a set of specific criteria.

Both types of range plans focus on managing or reducing the level of disturbance (human and wildfire) affecting caribou and caribou habitat to support Bathurst caribou herd recovery and to enable boreal caribou populations to be self-sustaining into the future. The primary elements under consideration in the range plans to manage or reduce disturbance include:

- Establishing tiered management thresholds or classes, with associated actions;
- Protecting key habitat;
- Minimizing sensory disturbance of caribou; and,
- Managing impacts of roads.

These are described for each range plan in Table C14 below:

Table C14: Range plan implementation elements.

Implementation Elements	Bathurst Caribou Range Plan	Boreal Caribou Range Plan
Establish tiered thresholds and/or management classes.	Thresholds define <i>desired, cautionary and high risk</i> levels of land disturbance. Management responses are triggered at each level and become more intensive as disturbance increases. Offsets are expected to be a key management instrument for seeking “no net loss”. ¹⁹	Disturbance thresholds are set for each region. Management classes are defined and mapped within each region based on range status and relative habitat importance. Management and decision-making are tailored to each class. Offsets are expected to be a key management instrument for seeking “no net loss”.
Protect key habitat.	In addition to broad disturbance thresholds, the range plan calls for the protection of specific key habitats e.g. water crossings and land bridges used for migration.	Important areas for boreal caribou will be mapped based on habitat attributes selected by caribou. Enhanced or Intensive management classes are more likely to apply to high importance areas to minimize further habitat disturbance.
Minimize sensory disturbance of caribou.	Measures to guide the timing, intensity and location of human land use activity to minimize the impact.	Not currently included in the scope of the <i>Boreal Caribou Range Plan Framework</i> .

¹⁸ Bathurst Caribou Range Plan Interim Discussion Document. www.enr.gov.nt.ca/en/files/bathurst-caribou-range-plan-discussion-paper-december-2016

¹⁹ ENR has contracted Poulton Environmental Strategies to investigate the advisability and potential effectiveness of developing an offset policy.

Implementation Elements	Bathurst Caribou Range Plan	Boreal Caribou Range Plan
Manage impacts from roads.	This may include road construction methods, orientation, traffic management, and features that facilitate crossings. Community guardianship programs will be an important component to reduce disturbance and potential over-harvesting risks.	Under consideration with respect to minimizing habitat disturbance footprint, avoiding fragmentation, and promoting shared access.

While there will be many similarities in the applicability of policy, regulatory and legal instruments for the two types of range plans, there are several key differences in the plans that may influence the evaluation and selection of appropriate instruments:

- For Bathurst caribou, disturbance is being considered both spatially (habitat areas to protect from loss) and temporally (activities that create a sensory disturbance when caribou are present within a ‘zone of influence’). For boreal caribou, disturbance is being considered on a spatial basis only (no temporal sensory disturbance considerations related to presence/absence of caribou in the range plans).
- For Bathurst caribou, the location of specific habitat areas or habitat features is a key management focus (e.g. water crossings, calving grounds). For boreal caribou, the location of critical habitat will be dynamic over time. Critical habitat may be deemed to be effectively protected (and compliance achieved) if 65% undisturbed habitat within the overall range is maintained.
- Boreal caribou are currently listed and subject to compliance requirements under the federal *SARA*; barren-ground caribou (including Bathurst) are recommended for listing both federally and in the NWT.
- Because both Bathurst and boreal caribou ranges overlap Indigenous- owned lands and neighbouring jurisdictions, collaboration will be needed for management consistency.

C.4.2 Range Plan Implementation Options

Any instruments proposed for the implementation of range plans will need to work within the existing land and resource co-management system. Within this system, there are multiple governing bodies and regulatory organizations with different mandates and responsibilities (see Section C.4.5 for more detail).

Effective implementation of range plans will require policies, guidelines and regulations that can influence LUPs, the issuance of rights, EA processes, regulatory processes as well as utilizing authority for wildlife and habitat management provided under the *Wildlife Act* and *SARA* (NWT).

Figure C13 shows how range plan implementation will occur through multiple decision-making pathways. Some instruments and pathways will have more influence on land and resource decision-making than others and some will be easier to implement and/or more

efficient, but no one instrument alone will be sufficient for full implementation. It is important to note that a multifaceted approach will be required for range plan implementation to ensure clarity, consistency and efficiency for government and industry.

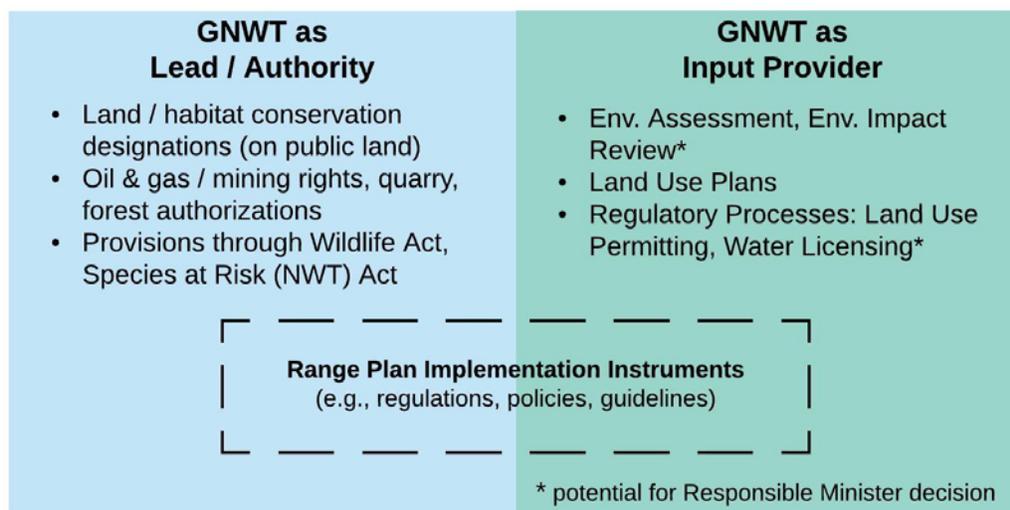


Figure C13: Pathways of range plan influence on decisions within the integrated land and resource management system.

C.4.3 Results of Evaluation

Four criteria were used to assess a variety of implementation instruments under different pieces of legislation or land management processes (Table C15). Departments were asked to use ranking criteria to provide feedback on implementation options. Rankings were assigned on a scale from one to five, with five indicating that a particular instrument fully meets that criterion.

Table C15: Evaluation criteria for implementation instruments.

Criterion	Related Questions
Effective:	Does the instrument address the relevant activities and issues that are causing impacts? Is the instrument enforceable and mandatory (e.g. through legislation), and therefore reliable? Can the instrument provide wide coverage (e.g. geographically)?
Ease of implementation:	How easily could the instrument be implemented or established within existing processes (e.g. the integrated land and resource management system)? How significant are the timelines and required decision-making processes to implement the instrument?
Adaptable:	Can the instrument be applied in a way that allows for change over time , particularly in the face of changing conditions? Does it allow for flexibility in decision-making processes, or for innovation in management actions?
Clear:	Is the instrument intuitive, logical and easy to communicate to proponents and land administrators? Are the conditions for exceptions and/or ministerial discretion transparent ?

The results of the evaluation of implementation instruments are presented below in Table C16. It is important to note that full implementation of range plans will require a combination of instruments and approaches (Figure C13).

For more details on each instrument, see Section C.4.4.

Table C16: Overall rankings for the evaluation of implementation instruments.

Implementation Instrument	Effective	Ease	Adaptable	Clear	Total
Land Use Plans	4	3	4	4	15
GNWT Range Plan Implementation Policy	4	3	4	3	14
<i>Wildlife Act</i> : Wildlife Management and Monitoring Plans (WMMP)	4	3	4	3	14
Oil and gas rights issuances	3	4	3	4	14
<i>Wildlife Act</i> : Conservation Areas	4	2	3	4	13
<i>Wildlife Act</i> : Habitat Protection	4	2	3	4	13
<i>Species at Risk (NWT) Act</i> : Habitat designation	4	2	3	4	13
<i>Species at Risk (NWT) Act</i> : Habitat conservation	4	2	3	4	13
<i>Mackenzie Valley Resource Management Act (MVRMA)</i> Ministerial Policy direction to the LWB and the Mackenzie Valley Environmental Impact Review Board	3	3	3	4	13
<i>Wildlife Act</i> : Minister Submissions	2	4	4	2	12
<i>SARA (NWT)</i> : Minister Submissions	2	4	4	2	12
Forest Fire Management Policy (53.04)	2	4	4	2	12
<i>Forest Management Act</i> , Commercial Timber Harvest Planning and Operations Standard Operating Procedures Manual	3	3	3	3	12
<i>SARA (NWT)</i> : Agreements respecting habitat conservation	2	2	4	3	11
<i>SARA (NWT)</i> : Species at Risk permitting	3	1	2	3	9

C.4.4 Overview of Implementation Instruments

This section describes how range plans and supporting policy or strategy instruments can influence decision-making at key entry points in the integrated land and resource management system.

GNWT Range Plan Implementation Policy

Consideration may be given toward developing a broad GNWT caribou and habitat management policy that describes how the GNWT will, as a whole, consider caribou and these range plans when making decisions regarding land and resource use (e.g. input into preliminary screenings and EAs, input into LUPs, issuance of rights). This policy may discuss how GNWT departments will implement the range plan under various processes based on the level of a particular disturbance in an area of the range.

Examples:

Land Use Plans (LUP) – GNWT would focus on identification and consideration of critical habitat, sensitive features and thresholds in conformity requirements, zoning boundaries and designations, in its submissions to the development/renewal of LUP. This could also lead to requests to amend LUPs.

Issuance of Rights – depending on the status of an area within the tiered management Framework, the policy would provide guidance to relevant departments on where rights could be issued (e.g. oil and gas), or the types of requirements that a right holder would need to meet (mitigations or offsets) as the project progresses through regulatory screenings.

Environmental Assessment/Regulatory – GNWT would provide comments and recommendations on development proposals undergoing preliminary screenings and Environmental Assessments (EAs) that are consistent with the proposed mitigation and management measures outlined in the range plans. There will be stand-alone regulations and guidelines for WMMPs that outline how range plans may trigger the requirement for a development to have a WMMP.

Land Use Plans (LUPs)

ENR would rely on range plans and ensure that the guidance they offer forms a part of the coordinated GNWT input into LUP processes (both new LUPs and LUP renewals). Range plans could offer specific guidance and examples to LUP processes regarding: 1) how cumulative disturbance thresholds can be set, and 2) where important habitat areas are that should be considered for protected area or conservation zone status. This approach could be strengthened through specific policy direction (see previous section) prescribing that the GNWT will not approve future LUPs unless they adequately consider and reflect the guidance provided by caribou range plans. The GNWT could also consider working with the respective Renewable Resources Boards (RRBs) to jointly propose amendments to a LUP that reflect range plans.

However, it is important to highlight that land use planning is not a quick process. LUP development typically takes years and there are differences in coverage between areas. Approved LUPs are currently only in place in the Sahtú and Gwich'in regions, and on Tłı̨chó government lands.

Therefore, while LUPs offer an important means of achieving range plan goals, they can only be viewed as a medium to long-term opportunity, and other options should be considered in the interim.

EA Process

Range plans can be viewed as complementary to the project-specific assessment and EA processes in the NWT. Range plans would provide cumulative effects thresholds and mitigation options to EA processes to improve project screenings. Range plans will give EA review boards the ability to assess the significance of a project's contribution to overall cumulative effects on caribou and caribou habitat.

In the case of boreal caribou, there is also the requirement under federal *SARA* (S.79) for review boards to consider impacts on species at risk, including critical habitat. If the definition of critical habitat is tied to a cumulative disturbance threshold, review boards must consider it in their EA decisions.

However, it is important to highlight that project-specific EAs occur very late in the overall system of land and resource developments. If, for example, a review board would refer to a range plan and recommend mitigation, offset or monitoring measures due to an area being in an enhanced or intensive management class zone, then it would be better for all involved parties to know this was a likely outcome much earlier in the project development cycle.

Therefore, while EAs offer an important means of implementing range plans, they can only be viewed as a last step opportunity, and the GNWT must consider other means in parallel.

Issuance of Land and Resource Rights

The issuance of land and resource rights is the earliest point in the regulatory process where there may be an opportunity for range plans to influence decision-making. In fairness to development proponents, it is important to provide information regarding caribou and habitat considerations within range plans that may influence later land use permitting or EA phases. Opportunities for cumulative effects management at the rights issuance stage may be greater for oil and gas rights and surface leases than for sub-surface mineral rights acquired through the free entry system. This could include not opening up areas to expressions of interest for defined periods of time.

The GNWT Lands Advisory Committee, which includes ENR, reviews and comments on land lease/tenure applications. This process provides a forum for the GNWT to promote compliance with range plans. For example, if a proposed project is in an enhanced or intensive management class, then ENR could request that Department of Lands include specific information directly to the proponent about the range plan recommendations for enhanced mitigation, offset and monitoring measures that may be required for subsequent land use authorizations. The different types of rights and tenure that GNWT issues include:

- Oil and Gas Rights Issuance
- Mineral Rights Issuance

- Quarrying Rights Issuance
- Other large-scale land tenures

Wildlife Act

Conservation Areas (S.89 and S.173(1)(z.60)) – *can be established by Executive Council through regulation.*

Conservation Areas (CAs) are spatially delineated. CAs may describe the time period or periods during which the area is a CA and the circumstances under which the regulation applies. Regulations established for the CA may include: taking conservation actions; prohibiting activities that may adversely affect wildlife or habitat; imposing restrictions on harvesting and against damaging habitat, controlling, restricting or prohibiting any use of, access to, or activity in the CA; and respecting management plans for CAs.

Habitat Protection (S.93, and S.173(1)(z.61)) – *can be established by Minister.*

This provision allows for protection of specific habitat features (e.g. salt licks), and can be identified spatially or described more generally and qualitatively (e.g. water crossings, land bridges). Regulations can include: requiring the taking of measures that may protect habitat; prohibiting activities that may adversely affect habitat; imposing prohibitions against damaging or destroying habitat; and controlling, restricting or prohibiting any use of, access to, or activity in habitat.

WMMPs (S.95, S.173(1)(z.64)) – *can describe measures to mitigate impacts to wildlife and habitat. WMMPs are site and project specific.*

WMMPs regulations may include: circumstances, developments or other activities that require a WMMP; reporting requirements, monitoring processes and inspections; and prohibitions and penalties in respect of WMMPs.

The draft WMMP process requirement guidelines currently describe the types of development more likely to require WMMPs. The draft *WMMP Content Requirement Guidelines* describe a system of three tiers for a WMMP, scaled to the size and type of development.

Minister Submissions (S.97) – *to responsible body if a development may affect wildlife or its habitat.*

The Minister may refer to the range plan to determine if there is likely to be an impact on caribou. This provision gives the Minister the ability to use the range plan to influence land and resource management decisions, but does not require it. A GNWT-wide policy could create the expectation that the Minister would use the range plan, as one of multiple factors in preparing such submissions.

SARA (NWT)

Note: *SARA (NWT)* has higher penalties than the *Wildlife Act*.

Habitat Designation (S.80, S.153-154) – *allows specific habitat to be designated for the conservation of the species or its habitat.*

The Minister can establish regulations designating habitat or components of habitat, if the habitat is considered to be essential to the survival or recovery of the species and if the designation is necessary for the conservation of the species or its habitat (S.153). Once habitat is designated there is a prohibition against destroying it (S.80). The Minister can also establish regulations respecting the conservation of designated habitat (S.154). Possible regulations include but are not limited to: requiring conservation actions to be taken; prohibiting activities that may adversely affect the habitat; prohibiting damage of the habitat; and controlling, restricting or prohibiting access or use.

Habitat Conservation (S.152) - *allows for making of regulations respecting conservation of habitat.*

The Minister can establish regulations respecting the conservation of habitat or the area in which the habitat is located, or surrounding area. Possible regulations include but are not limited to: requiring conservation actions to be taken; prohibiting activities; prohibiting damage or destruction of habitat/area; controlling, restricting or prohibiting access or use; and controlling, restricting or prohibiting release of substances.

Agreements Respecting Habitat Conservation (S.79) – *for private lands.*

The Minister may enter into an agreement with an owner of private lands for the purpose of habitat conservation. Most private lands in the territory are on settled lands owned by Aboriginal Governments (AG). Before making an agreement, the Minister may by order exempt activities that would contravene S.80. An order may restrict or specify the circumstances of authorized activities and establish terms and conditions to: *conserve the species and its habitat, minimize the impact of the authorized activity on the species and its habitat, or provide for the recovery of the species.* An order may also contain conditions requiring the owner to remedy the damage or destruction to habitat or to enhance another area.

Species at Risk Permitting (S.84, S.151-155) – *allows for exceptions to destruction of habitat prohibition in S.80, if the strict criteria set out in the Act are met.*

The Minister may issue a permit authorizing the recipient to engage in an activity that, except for the permit, would contravene section 80 [destruction of habitat] or a regulation made under S.151, 152, 154 or 155. Permits allow for exemptions of protection measures established under *SARA (NWT)*. Regulations designating habitat would first be required.

Minister Submissions (S.76-78) – *to responsible body if a development may affect a listed species or its habitat.*

These sections state that the Minister shall make a submission to a responsible body if he or she considers that any of the following may affect a pre-listed species or a listed species or its habitat or the area in which the habitat is located of the surrounding area: if a development proposal undergoes a preliminary screening or a screening or is referred for EA of an environmental impact review (S.76); and application for a land use permit or water licence (S.77).

Forest Fire Management Policy (53.04)

The policy outlines principles and priorities for GNWT forest fire management services on forested areas. The primary mechanism for Forest Management Division (FMD) to consider caribou habitat in responding to fires is through their VAR hierarchy. Human life and infrastructure/property are always the top two priorities that guide FMD's decisions about which fires to respond to and how to respond, but natural resource values (such as caribou habitat) can factor in as the third priority. Appendix C.3, Section C.3.5 outlines different management actions that could be taken with respect to forest fire that are consistent with the forest fire management policy.

Forest Management Act, Forest Management Regulations, Commercial Timber Harvest Planning and Operations Standard Operating Procedures Manual

The *Forest Management Act*, Forest Management Regulations and standard operating procedures allow the Minister to issue FMA, timber cutting permits and licences, and attach conditions to these agreements and permits; determine annual sustainable harvest levels; define reforestation fees; and designate forest management areas, units and zones.

Appendix C.3 outlines different management actions that could be taken with respect to the management of timber harvesting and reforestation.

C.4.5 Authorities and Decision-Making Roles

Table C17. Authorities and decision-making roles in the NWT.

Administrative Body and Authority	Role in Decision Making Process	Phase
<p>MVRMA LUP Boards</p> <p>Responsible for developing and monitoring implementation of a LUP for respective settlement areas established through land claim agreements. LUP boards are established in the Sahtú and Gwich'in regions.</p> <p>Tłı̨chǫ LUP is done by the Tłı̨chǫ Government's Land Protection Division, which manages implementation on Tłı̨chǫ Lands. Dehcho Land Use Planning Committee was established under the <i>Dehcho First Nations Interim Measures Agreement</i>.</p>	<ul style="list-style-type: none"> • Develop and monitor implementation of regional LUPs in areas with settled land claim agreements. • Can carry out conformity checks, grant exceptions or amend the LUP. • Develop plans that include legally binding zoning measures. • LUPs contain conformity requirements that guide the EA and regulatory processes. • Screen applications referred by the LWB for conformity with LUP. 	LUP
<p>EA/Impact Review Boards</p> <p>The Mackenzie Valley Environmental Impact Review Board conducts EA and environmental impact reviews of developments in the Mackenzie Valley. The Environmental Impact Screening Committee/Environmental Impact Review Board carries out these functions in the ISR.</p>	<ul style="list-style-type: none"> • Conduct EAs and recommends approval (with or without mitigation measures) or rejection to responsible Ministers. • Orders environmental impact review if a more comprehensive assessment is required. • The independent panel conducts the environmental impact review and similarly recommends approval (with or without mitigation measures) or rejection. 	EA
<p>LWB/Inuvialuit Water Board</p> <p>Under the MVRMA (Mackenzie Valley, Sahtú, Gwich'in, and Wek'èezhii LWB), and the <i>Waters Act</i> (Inuvialuit Water Board) regulate the use of land and water, and the deposit of waste, through the issuing of Land Use Permits and Water Licences.</p>	<ul style="list-style-type: none"> • Preliminary screener regardless of whether an EA is required, or not. Conducts public review on a proposed development (potential for significant adverse impacts may be a cause for public concern). • Ensure conformity with LUP (refer to LUP Boards when necessary). • Issue Land Use Permits and Water Licences with terms and conditions. 	Screening/ Regulatory
<p>Regulators <i>other than LWBs</i> e.g. GNWT, DFO</p>	<ul style="list-style-type: none"> • Preliminary screener regardless of whether an EA is required, or not. GNWT authorizations that require preliminary screening are listed in the <i>Preliminary Screening Requirement Regulations</i> (these regulations have not been amended to reflect authorizations issued by GNWT post-devolution). Conducts public review on a proposed development (potential for significant adverse impacts may be a cause for public concern). • If issuing any authorization for the use of land, water, or deposit of waste, the authority must ensure conformity 	Screening/ Regulatory

Administrative Body and Authority	Role in Decision Making Process	Phase
	<p>with applicable LUP (refer to LUP Board if necessary).</p> <ul style="list-style-type: none"> • Write lease, licence or permit terms and conditions for land and resource management activity (including timber harvesting, oil and gas, and mineral development). Licences and permits include terms and conditions and other measures provided by the regulator/informed by EAs and Environmental Impact Reviews. • The responsible Ministers make consensus decisions on recommendations, often with associated mitigation measures, from the Review Board. For projects not on federal land, the GNWT Minister of Lands signs the decision on behalf of all the responsible Ministers. • GNWT ENR approves Type A Water Licences, or Licences where a public hearing has been held. 	
<p>RRBs</p> <p>Regional authority responsible for managing wildlife habitat (forests, plants and protected areas) and commercial activities related to wildlife in the settlement region. In the Mackenzie Valley, RRBs have been established through land claim agreements in the Gwich'in, Sahtú and Tłı̄chǫ regions. The Wildlife Management Advisory Council (NWT) serves a similar function for the Inuvialuit region.</p> <p>*No RRBs in the Dehcho or Akaitcho regions.</p>	<ul style="list-style-type: none"> • Review proposals for wildlife management or wildlife management plans, consult with proposal submitting party and other managing bodies, and make final recommendations or determinations on the proposal. Each party can accept, reject or vary recommendations. • Contribute advice and information on renewable resource values to land use planning processes • Contribute advice and information on renewable resource values to preliminary screenings and EAs as part of regulatory processes. 	<p>Wildlife Management Plans</p>
<p>Land Administration: GNWT and respective Indigenous Governments and Organizations (IGOs).</p>	<ul style="list-style-type: none"> • IGOs are responsible for administering and managing tenure issuances on settlement lands. This can include both surface and subsurface rights. The GNWT consults with IGOs on all other settled and unsettled lands. • On public land, the GNWT Industry, Tourism and Investment issues sub-surface mineral rights through the <i>Northwest Territories Lands Act</i> and its <i>Mining Regulations</i>, as well as sub-surface oil and gas rights through the <i>Petroleum Resources Act</i> and the <i>Oil and Gas Operations Act</i>. • On public land, the GNWT Department of Lands is responsible for the disposal of land through sales agreements or leased rights for occupying land (either exclusively or shared access), including: quarry permits and leases, recreational/cabin leases, licenses of occupation, easements, reserves (for other federal or territorial government departments that require tenure), commercial leases, etc. See: <i>Northwest Territories Devolution Act</i>, <i>Northwest Territories Lands Act</i> and 	<p>Issuance of Land Rights and Tenures</p>

Administrative Body and Authority	Role in Decision Making Process	Phase
	<p><i>Regulations, and Commissioner’s Lands Act and Regulations.</i></p> <ul style="list-style-type: none"> • On public land, the GNWT ENR issues FMAs, timber harvesting licences and timber harvesting permits. • On parcels of land where land administration was not transferred to the GNWT via the <i>Northwest Territories Devolution Act</i>, Indigenous and Northern Affairs Canada is responsible for the disposal of lease agreements or leased rights for occupying land (either exclusively or shared access) via the <i>Territorial Lands Act and Regulations</i>. Mineral rights are issued via the <i>NWT/NU Mining Regulations</i>. 	

Appendix D: Previously Considered Range Planning Options

This section summarizes options previously considered for each of the range plan elements described in the *Framework for Boreal Caribou Range Planning: Discussion Document*.

D.1 Delineating Critical Habitat vs. Tiered Management based on Maps of Important Areas and Regional Thresholds

The federal guidance on range planning recommends that range plans indicate which areas make up the 65% that is considered critical habitat. It is not clear whether this is a strict requirement or if it's optional when the range has >65% undisturbed habitat. However, the draft federal policy on effective protection of critical habitat on non-federal lands outlines the process for looking at protection of different portions of critical habitat that fall outside federal land. This assessment would be more difficult if the range plans don't indicate which areas make up the 65%.

Previously considered options on the delineation of critical habitat and importance mapping are described below. The use of habitat importance maps in combination with regional disturbance thresholds to define and delineate tiered management classes was proposed as a more flexible approach to range management than delineating critical habitat and protecting it with strict legal tools.

Option 1 – Manage to a 65% undisturbed habitat target but do not delineate areas contributing to the target. Under this option, the range is managed to short/long term thresholds without specifically designating one area or another as critical habitat. This doesn't preclude ranking the relative importance of different areas and basing decisions about human development based on the relative importance of an area. If fire pushes the range below the disturbance threshold, either halt further development in undisturbed habitat, or evaluate whether in the next five-year period the extent of habitat recovery is expected to be enough to bring then range back up above the threshold, in which case we continue to approve new developments in spite of having missed the threshold.

Option 2 – Delineate the most important habitat as critical habitat. Under this option, the most important areas for caribou would be delineated on maps, and would be managed so there is no new disturbance in undisturbed habitat from development in these areas on a temporary basis (e.g. subject to review every five years). The total area delineated would be less than the range-wide 65% undisturbed habitat threshold. Transparent and defensible criteria for defining these areas would be developed based on existing data.

Option 3 – Delineate all undisturbed habitat that contributes to the 65% that is critical habitat. Under this option, all undisturbed habitat that contributes to the 65% range-wide undisturbed habitat threshold would be delineated on maps, and no new disturbance from development would be allowed in any of these areas. If one of these areas burns during the term of the range plan, it becomes open to development. It could either be immediately replaced by other areas of undisturbed habitat, or this could be left until the

plan is reviewed, leaving the areas of undisturbed habitat that aren’t designated as critical habitat open to new disturbance until then.

Option 4 – Use habitat importance maps and regional disturbance thresholds in a tiered management framework. Under this option, all of the boreal caribou range (disturbed and undisturbed habitat) is mapped as high/medium/low importance to caribou. Transparent and defensible criteria for defining these areas would be developed based on existing data. Development decisions are made differently depending on the level of importance of an area and the condition of the range relative to regional and/or range-wide disturbance thresholds (i.e., according to tiered management classes). The specifics of how these areas are treated in decision making would need to be outlined in the Framework. The management actions/protection tools used in higher management tiers would be designed to satisfy ECCC’s criteria for effective protection.

Table D1 summarizes the relative performance of these options based on discussions within the GNWT. The “**Tiered Management Framework**” option, highlighted in grey, was the consensus option.

Table D1. Qualitative evaluation of the relative performance of the options.

	Option 1 - Do Not Delineate	Option 2 - Delineate the Most Important Habitat	Option 3 - Delineate all Critical Habitat	Option 4 - Tiered Management Framework
Compliance	••	••	••••	••
Conservation	•	••	•••	••
Development	•••	••	••	•••
Implementation Ease	•	•	•	•
Transparency	••	••	•••	••

There are three primary benefits to delineating critical habitat (Option 3, Table D1). First, it provides greater clarity about what is critical habitat and which protection measures apply. This will make it easier for ECCC to assess the effectiveness of protection, and thus supports **Compliance**. Delineation supports **Caribou Conservation** by providing greater certainty that undisturbed areas making up critical habitat include key biophysical attributes. Because delineation provides greater clarity about what critical habitat is, it provides greater **Transparency** with respect to development decisions, which would support more informed and transparent decisions by both proponents and land managers.

The primary drawback to delineating critical habitat is that it results in lower flexibility for **development** across the range, as the 65% threshold will need to be achieved within those boundaries.

There is uncertainty about which option would be better with respect to **ease of implementation**, as each has different challenges. Without delineation, there is likely to be more case-by-case decision making about development. On the other hand, with delineation, if an area designated as critical habitat burned, and if this triggered adjustment of critical habitat boundaries or thresholds prior to the scheduled range plan review, it would increase the implementation burden.

Option 4, a tiered management framework, was pursued as the best option to balance caribou and development interests. It became the basis for the proposed Framework.

D.2 Previously Considered Options for Setting Disturbance Thresholds

Several options for setting disturbance thresholds within a tiered management framework have been explored, including having no regional thresholds, several ways of developing regional long-term and short-term total disturbance thresholds, and having thresholds focused on human disturbance only. These options are described briefly below.

Initially, options for **thresholds based on total disturbance** (fire + human) were considered:

- **Option 1 - Range Threshold Only:** No regional thresholds are adopted, and only ECCC's range-wide 35% disturbance threshold is used to guide land use decisions.
- **Option 2 - Flat 35%.** Under this option, each region strives to attain or maintain a minimum of 65% undisturbed habitat (in other words, regions strive to remain below, or go below 35% disturbance). Some regions will need to increase the amount of undisturbed habitat over time; others will have room for development.
- **Option 3 - Fire History.** Under this option, each region's threshold is based on the regional fire history, so some have thresholds <35% and others >35%. It produces the maximum reasonably achievable amount of undisturbed habitat, which is 25% undisturbed habitat across the NT1 range. To allow for human disturbance, more fire suppression would be required.
- **Option 4 - Fire-adjusted.** As above but includes an allowance for human disturbance. The allowance is divided among each region in proportion to its size, and this amount is added to the threshold based on fire alone. It produces a maximum long term threshold of 35% disturbance across the NT1 range, but as above, some regions have thresholds <35%, and others >35%.
- **Option 5 - Fire-adjusted with Ranges.** Maintain total disturbance within an upper and lower limit for each region, based on fire-adjusted thresholds as per Option 4. The intent is to provide greater flexibility to each region and recognize that there is limited ability to control fire. Five different options for assigning ranges were explored.

Table D2 summarizes the relative performance of the first five options based on discussions within the GNWT.

Table D2. Qualitative evaluation of options for regional disturbance thresholds.

	Range Threshold Only	Flat 35%	Fire History	Fire-Adjusted	Fire-Adjusted + Ranges
Compliance	•••	•••	•••••	•••	••
Caribou Conservation	••	•••	•••••	•••	••
Development	•••	•••	•	•••	•••
Equity	•	•	•••	••••	••••
Achievability	•••	•	•••	••••	•••••
Credibility	•	•	•••	•••	•••
Implementation Ease	••••	••••	•••	•••	•••

• = very weak; •• = weak; ••• = moderate; •••• = strong; ••••• = very strong

Under the “**Range Threshold Only**” option, there is complete flexibility about where in the range that 35% occurs, and therefore, this approach offers the most flexibility for **development**. It also performs best with respect to **ease of implementation**, as it requires no additional effort (beyond a general GNWT-wide policy) or changes to decision making processes. However, in the absence of regional thresholds, there is a risk that regional land use decisions will not collectively achieve the NT1 threshold and that if future industrial development is concentrated in the south, the boreal caribou range could recede northwards, losing connectivity with AB and BC ranges. Additionally, the adoption of regional thresholds supports a more **equitable distribution** of conservation and development opportunities. The use of regional thresholds may also be considered more scientifically **credible**, to the extent the thresholds are established in consideration of biologically relevant region-specific factors.

“**Flat 35%**” supports **compliance** (achieves 35% range wide), and supports **caribou conservation** (reduces range recession). However, it scores poorly with respect to **credibility** (not based in biologically meaningful analyses), as well as **equity** and **achievability** (does not account for regional differences in fire disturbance).

“**Fire History**” scores well for **compliance** and **conservation** as it results in 25% disturbed habitat across the range. However, it significantly constrains the land available for **development**.

“**Fire-Adjusted**” scores reasonably well on all objectives.

“**Fire-Adjusted with Ranges**” options perform better with respect to **achievability**, as they offer a lower bound. However, there is a trade-off. If all regions manage to the lower bound, there is a greater risk of **non-compliance**, and similarly a greater risk to **caribou conservation**.

Within the options described above, **short-term targets** were proposed to help regions that are above the long-term threshold work toward moving below the threshold through a

series of shorter-term milestones that consider 1) current levels of undisturbed habitat, 2) projected habitat recovery, 3) potential new disturbance from fire, and 4) projected/potential development. Having no system for short-term targets was also considered.

Short-term targets support **compliance**, because they enhance GNWT’s ability to ensure that the range-wide target is met over the next five years. Without a short-term target, GNWT would be forced to continually assess disturbance levels across the entire range in order to ensure compliance. Short-term targets also support greater **equity** by distributing allowable development opportunities across regions and **caribou conservation** by limiting disturbance. However, short term targets incur a cost in terms of limiting flexibility of **development** in the short term.

An option for **thresholds based on human disturbance** only, as opposed to total disturbance, was eventually developed in response to feedback on earlier rounds of input within GNWT. This option was developed to address concerns about limitations to control the influence of fire, and the need to constantly adjust range plans in response to fire since it is the main driver of annual changes in the disturbance footprint in the NT1 range.

The **Human Disturbance Thresholds** option focuses on setting thresholds for the buffered human disturbance footprint while accounting for variation in the 40-year fire footprint that contributes to the total disturbance footprint.

Initially, setting **human disturbance thresholds that are the same in every region** was explored. Using the observed range-wide annual variation in 40-year old fire footprint (24-28%), an allowance for human disturbance was calculated (7-11%) that ensured that the range as a whole would stay within 5% of the 35% disturbance threshold. If human disturbance at the NT1 scale was kept within these limits, as a worst case scenario, there might be 28% fire + 11% human disturbance (39% total disturbance), and as a best case scenario there might be 24% fire + 7% human disturbance (31% total disturbance). We could therefore have high confidence that the NT1 range as a whole would be maintained between 61-69% undisturbed habitat; or within five percent of the 65% threshold.

Regions below 11% human disturbance would only use basic and enhanced management classes, and only regions above 11% would have need for an intensive management class. This option would produce the following tiered management framework in every region:

Anthropogenic Disturbance Thresholds	Relative Importance of an Area for Boreal Caribou		
	Low	Medium	High
High-risk (>11%)			
Cautionary (7-11%)			
Desired (<7%)			

This option recognizes that the primary control that we have over disturbance is for human-caused disturbance. Relative to the objectives, this option provides much more

certainty for development compared to options for thresholds based on total disturbance (fire + human). This is because spatial delineation of management classes, and therefore permitting requirements, do not change in response to fire. In addition, it is designed to be simpler and easier to understand and communicate, therefore supporting **transparency**. In addition to being technically simpler (in the derivation of thresholds and management classes), it is also designed to be more consistent with the Bathurst caribou range planning approach.

However, the human disturbance thresholds option presented concerns as well. In terms of **regional equity**, under this option the Southern NWT region currently falls into the “high-risk” threshold for human disturbance resulting in the need to delineate *Intensive* management class areas. This was not the case under the different options explored using total disturbance thresholds. It also creates a regime that is less responsive to **compliance** needs because although the range is expected to periodically drop below the 65% threshold, the management and regulatory regime does not adjust in response to fire. Lastly, this option presented issues in relation to **caribou conservation**. For those regions with high levels of fire disturbance and low levels of human disturbance, consistent thresholds for human disturbance among regions could mean that combined total disturbance could result in a regional range condition that provides caribou with a <50% likelihood of being self-sustaining. In addition, because there is no built-in response to increasing levels of fire disturbance, the condition of the range could deteriorate over time without triggering an increased management response.

These factors led to the development of the currently proposed option, detailed in the main body of the Framework document and in Appendix C. It uses human disturbance thresholds within a tiered management framework, but accounts for regional variation (with regional human disturbance thresholds rather than the same threshold for every region). It also includes mechanisms to respond to potentially increasing levels of fire disturbance in order to prevent range deterioration (fire disturbance triggers and mid-term review of plans).