



# BOREAL CARIBOU SUSTAINABLE HARVEST

## PLAIN LANGUAGE SUMMARY REPORT

SEP | 2021

# Northwest Territories Boreal Caribou Population and Harvest Models, 2019

## Overview

In 2014, boreal caribou in the NWT were listed as a Threatened species under the *NWT Species at Risk Act* and a NWT Recovery Strategy was prepared to guide boreal caribou recovery actions. One of the recovery strategy objectives is to ensure that harvest of boreal caribou is sustainable.

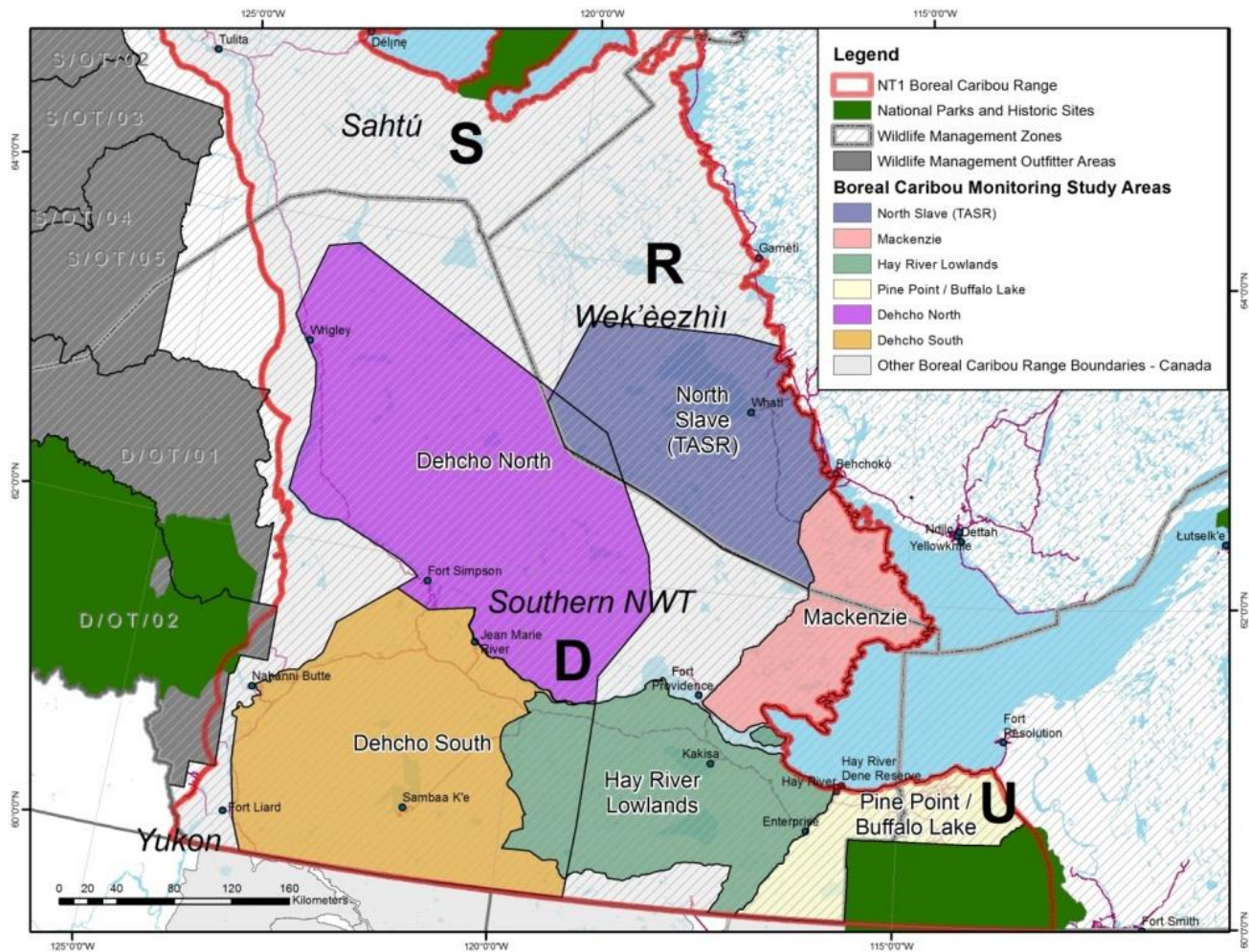
Boreal caribou are harvested for food by both Indigenous and non-Indigenous residents, but there is little information available on total harvest levels. It is also difficult to get accurate population estimates for boreal caribou. This makes it challenging to measure whether harvest levels are sustainable.

Computer population and harvest models can help explain how a boreal caribou population is changing over time and predict how it is likely to be affected by different levels of hunting. Combined with other information on boreal caribou and their management in the NWT, we can estimate what level of hunting is sustainable.

In 2019, the Government of the Northwest Territories (GNWT) hired Paragon Wildlife Research and Analysis to develop population and harvest models for boreal caribou in the NWT. This is a summary of the results.

## NWT boreal caribou population and harvest models

Population and harvest models were developed for 6 study areas in the southern NWT where boreal caribou population trends are monitored – Dehcho North, Dehcho South, North Slave (Tłı̄chǝ All-Season Road [TASR]), Mackenzie, Hay River Lowlands, and Pine Point/ Buffalo Lake. Two NWT Wildlife Management Zones (WMZs), Zone D and Zone R were also included in the study. Each area is shown in the map below.



The models used information collected in the NWT by the Government of the Northwest Territories using radio collars and field monitoring supported by co-management partners.

Information included survival rates of cows and bulls at different ages, calf to cow ratios, bull to cow ratios, and reproduction rates. These pieces of information are used to forecast the population growth rate over time, based on how many adult cows and bulls survive from one year to the next, how many calves are born each year, and how many of those calves will survive to become reproducing adults.

Because precise population estimates for boreal caribou in the NWT are difficult, population density (how many caribou are in a particular area) was used to estimate the number of caribou in each of the different study areas.

Six different population densities of caribou were used for each study area based on density estimates found across Canada. The densities were multiplied by the size of each study area to estimate a starting population size.

The average annual growth rate, without hunting included, was calculated for each population using 10 years of data and is shown in the table below.

Biologists call this number Lambda ( $\lambda$ ). If Lambda is equal to one, a population is stable. If Lambda is less than one, a population is declining. If Lambda is more than one, a population is growing.

<b>Model Population</b>	<b>Average annual population growth rate (<math>\lambda</math>)</b>	<b>Population Trend</b>
Dehcho North	1.021	Increasing
North Slave (TASR)	1.021	Increasing
Dehcho South	0.989	Decreasing
Mackenzie	1.094	Increasing
Hay River Lowlands	1.000	Stable
Pine Point/Buffalo Lake	1.000	Stable
Zone D	1.011	Increasing
Zone R	1.038	Increasing

The estimated average annual growth rate for caribou in the Hay River Lowlands and Pine Point/Buffalo Lake study areas was stable,, while in the Dehcho South study area it was slowly declining, and Dehcho North, North Slave (TASR) and Mackenzie study areas slightly increasing. Boreal caribou in Wildlife Management zones D and R were estimated to be slightly increasing overall.

Using all this information, the models were used to predict what would likely happen to each group of boreal caribou at different levels of hunting. Three scenarios were modelled for all populations: no harvesting; harvest of 10 animals a year (6 cows and 4 bulls); and harvest of 20 animals a year (13 cows and 7 bulls).

For the areas with a stable or negative annual growth rate (Dehcho South, Hay River Lowlands, and Pine Point / Buffalo Lake), two more hunting scenarios were also modelled: a cow only harvest of 20 animals a year; and a bull only harvest of 20 animals a year.

For areas with an estimated annual average growth rate greater than 1 (Dehcho North, North Slave (TASR), Mackenzie, Zone D and Zone R) the model was used to calculate how many animals could be harvested before the population begins to decline under a bull-only, cow-only, and mixed harvest.

The model was also used to see what would likely happen if that number was increased by ten animals each year (bull-only, cow-only and mixed harvest).

Each model was run 1000 times for a ten-year period to see what would happen over that length of time.

## Results

### Populations with an estimated stable or negative average annual growth rate

#### *Hay River Lowlands and Pine Point/Buffalo Lake*

Using the available information, the population and harvest models predict boreal caribou numbers in these areas would stay about the same over ten years if there is no hunting. Any hunting would cause a decline in numbers. A bull only harvest would have the least effect and a cow-only harvest would have the greatest effect.

#### *Dehcho South*

Boreal caribou in this area are slowly declining, even would continue to do so even in the absence of hunting. Any hunting in this area would increase the rate of population decline.

### Populations with an estimated average annual growth rate greater than one

The estimated number of animals that can be harvested from each of these areas before they begin to decline depends on how many animals are in the population to start with. The table in Appendix 1 shows how many animals the model predicts can be harvested from each area before it begins to decline under a bull-only, cow-only, or a mixed harvest for six different population densities.

### ***Dehcho North, North Slave (TASR), Mackenzie***

For the Dehcho North, at the lowest population density the model predicts 5 cows and 3 bulls could be harvested before the number of caribou in the area declines. At the highest population density, 27 cows and 17 bulls could be harvested before seeing a decline. Because of its relatively large size, based on the modelling, a slight overharvest would not likely put boreal caribou in the Dehcho North area at much risk over a ten-year period.

In the North Slave (TASR) area, the model predicts 2 cows and 1 bull could be harvested at the lowest population density and 13 cows and 7 bulls could be harvested at the highest population density before the number of caribou in this area begins to decline.

In the Mackenzie area, at the lowest population density, the model predicts 5 cows and 3 bulls could be harvested before the number of boreal caribou in the area begins to decline. At the highest population density, 29 cows and 17 bulls could be harvested. However, because the estimated total number of boreal caribou in this area is small, it would be more vulnerable to over-harvesting. It is also sensitive to over-harvesting of bulls. Several years of a bull only or non-selective harvest could result in not enough bulls left to breed with remaining females.

### ***Wildlife Management Zones D and R***

Wildlife Management Zone D includes the Hay River Lowlands, Pine Point/Buffalo Lake, Dehcho South, Dehcho North and part of the Mackenzie study areas. Taken together, these areas have an increasing average annual trend and could support some level of hunting without causing a decline. At the lowest population density, 8 cows and 5 bulls could be harvested before the number of boreal caribou in this area begins to decline. At the highest population density, 50 cows and 30 bulls could be harvested.

Wildlife Management Zone R includes the North Slave (TASR) area and part of the Mackenzie study area. It also has a growing number of boreal caribou that could support some level of hunting. At the lowest population density, 9 cows and 5 bulls could be harvested before the population begins to decline. At the highest population density, 50 cows and 30 bulls could be harvested. Like the Dehcho North area, Zone R has a larger total number of boreal caribou, so it is less likely to see rapid, long term decline, even if the harvest is slightly over the sustainable level.

In all areas, hunting has a greater effect when the initial population density is lower, the harvest level is higher, or the proportion of cows harvested is higher. More animals could be harvested under a bull only harvest before the population declines, and fewer animals can be harvested under a theoretical cow only harvest.

## Conclusions and Recommendations

Identifying levels of sustainable harvest would benefit from more accurate estimates of the number of boreal caribou in each study area and total hunter harvest levels. Based on the available data, the population and harvest models suggest that boreal caribou south of Great Slave Lake in the South Slave region, and south of the Mackenzie River in the Dehcho region, of the NWT are near the edge of sustainability even without hunting.

The sustainable harvest for boreal caribou in Wildlife Management Zones D and R is likely small and depends on population density. The values shown in the table in the Appendix can be used as guidelines for sustainable harvest levels.

When Wildlife Management Zones D and R are combined together, if population density is 3 caribou per 100 km<sup>2</sup> the total sustainable harvest for the southern NWT boreal caribou range would be 49 cows and 30 bulls in a mixed harvest, 55 cows in a cow-only harvest, or 190 animals in a bull only harvest. Models indicate that harvest should be from the Mackenzie, Dehcho North, and North Slave (TASR) areas to be sustainable, and not from the Hay River Lowlands, Pine Point/Buffalo Lakes or Dehcho South areas. Modelling indicated that temporary harvest limitations should be considered in the southern areas of Zone D where even small harvests may cause significant population decline.

The most important missing information for management decision-making is an accurate estimate of total boreal caribou harvest that includes both Indigenous and non-Indigenous harvest. The estimated resident harvest of boreal caribou harvest is small (21 animals a year across the NWT) and not likely to have a big impact on the entire NWT boreal caribou populations on its own. Little is known about the Indigenous harvest.

Accurate estimates of total harvest would allow for a better understanding of population growth rates and the potential effects of hunting. Harvest location information from all harvesters would allow the GNWT to assess risk to caribou in specific areas, especially those with fewer boreal caribou.

Collecting this information is a priority and assists with addressing recommendations in the NWT boreal caribou recovery strategy.

The report recommends that data on NWT boreal caribou survival and recruitment should continue to be collected and sustainable harvest models should be developed every three to five years with updated 10 year data sets.

## Appendix 1

(From W.J. Rettie, 2019. Northwest Territories boreal caribou population and harvest models. 77pp. Prepared for Government of the Northwest Territories Environment and Natural Resources. Page 36)

**Table 10:** Upper limits of annual sustainable harvests for; non-selective; cow only; and bull only hunts for each modelled study area at each potential population density<sup>1</sup>. Only managed study areas with baseline population growth rates  $\geq 1.00$  are included. Excluded study areas do not have a harvestable surplus of animals.

Management Area	Caribou / 100 km <sup>2</sup> :	1		2		3		4		5		6	
	Licensed Hunting Model Scenario	Cow	Bull	Cow	Bull	Cow	Bull	Cow	Bull	Cow	Bull	Cow	Bull
Dehcho North	Non-Selective	5	3	9	5	13	8	18	11	23	14	27	17
	Cow Only	5		10		15		20		26		31	
	Bull Only		16		33		49		67		85		102
North Slave (TASR)	Non-Selective	2	1	4	2	6	4	9	5	11	6	13	7
	Cow Only	2		5		8		10		13		15	
	Bull Only		7		16		24		32		40		49
Mackenzie	Non-Selective	5	3	9	6	14	8	19	11	24	14	29	17
	Cow Only	6		11		16		22		27		33	
	Bull Only		8		16		25		33		41		50
Zone D	Non-Selective	8	5	16	10	24	15	32	20	40	24	50	30
	Cow Only	9		19		27		36		46		57	
	Bull Only		40		81		121		163		206		248
Zone R	Non-Selective	9	5	17	10	25	15	34	20	42	25	50	30
	Cow Only	9		18		28		37		47		57	
	Bull Only		22		45		69		92		115		137