



Peter Knamiller

20  
24

# Porcupine Caribou Herd Annual Monitoring Update

from the Porcupine Caribou Technical Committee  
Annual Summary Report 2022-2023





Peter Matner





## About the Porcupine Caribou herd

The Porcupine Caribou herd's home range is over 200,000 square kilometres. The herd moves through Alaska, Yukon, the Northwest Territories and the traditional territories of the Gwich'in, the Vuntut Gwitchin, the Tr'ondëk Hwëch'in, the First Nation of Na-Cho Nyak Dun and the Inuvialuit and Inupiat people. The Porcupine Caribou herd was the first international caribou herd with its own formal co-management agreements and boards. Land claim agreements solidify the Indigenous right to hunt caribou for subsistence and local participation in wildlife management.

## About the Porcupine Caribou Technical Committee

The Porcupine Caribou Technical Committee (PCTC) coordinates research and monitoring of the herd and provides technical information to co-management boards and agencies, First Nations, the Inuvialuit, and other governments. This report is for them and for people who are interested in science and monitoring related to the herd.





Peter Mather



Sophy Parker



## About this report

This report is a summary of the annual technical report prepared by the PCTC, which is intended to help the Porcupine Caribou Management Board (PCMB) make recommendations on conservation and management of the herd and its habitat, informed by scientific and technical information. The PCMB works with the Parties to the *Porcupine Caribou Management Agreement* at the Annual Harvest Meeting to ensure both science and Indigenous knowledge is used by the Board in its deliberations.

This report will help the PCMB and others who care about the caribou make decisions:

- to conserve the herd and its habitat
- to ensure opportunities for customary and traditional uses of the herd
- to assist with collaborative management for the herd across boundaries and among governments and users of the herd

## How are we gathering knowledge about the Porcupine Caribou herd?

The users of the Porcupine caribou have been following and learning about the herd and their yearly cycle for generations. Since the establishment of the PCMB and a plan for international conservation of the herd, scientists and managers have been finding ways to study and monitor the herd. This monitoring helps us learn more about the herd's health, habitat, population size and behaviours, and to watch for changes in the herd.

## INDICATORS

*Indicators are pieces of information that can be studied over time to track changes in the Porcupine Caribou Herd's numbers, health, and habitat. They are updated each year using measurements, analysis and comparison tools.*





Sonny Parker

# What does the latest monitoring tell us about the Porcupine Caribou herd?

## *INDICATOR Caribou Population*



Sonny Parker

### Photocensus

**Why do we measure this?** Knowing the overall number of caribou, or the population, and how that number changes over time is important for managing the herd, particularly when it comes to harvest.

**How often do we measure this?** To monitor population, researchers try to conduct a count of the Porcupine Caribou herd almost every year. The photocensus method has been used to count the number of caribou since 1972. The last successful count was in 2017. In 2023, although the herd did not gather in a large group, a photocensus was attempted on June 25th. The photos are being evaluated to see if they can allow us to determine a minimum size for the herd.

**How do we measure this?** Once the insects come out during the warm weather in early summer, the caribou gather into very large, tight groups sometimes consisting of tens of thousands of caribou. Satellite GPS collars help researchers locate the caribou. These large groups are photographed and caribou in the photos are counted. Caribou outside the larger groups that are photographed are also accounted for.

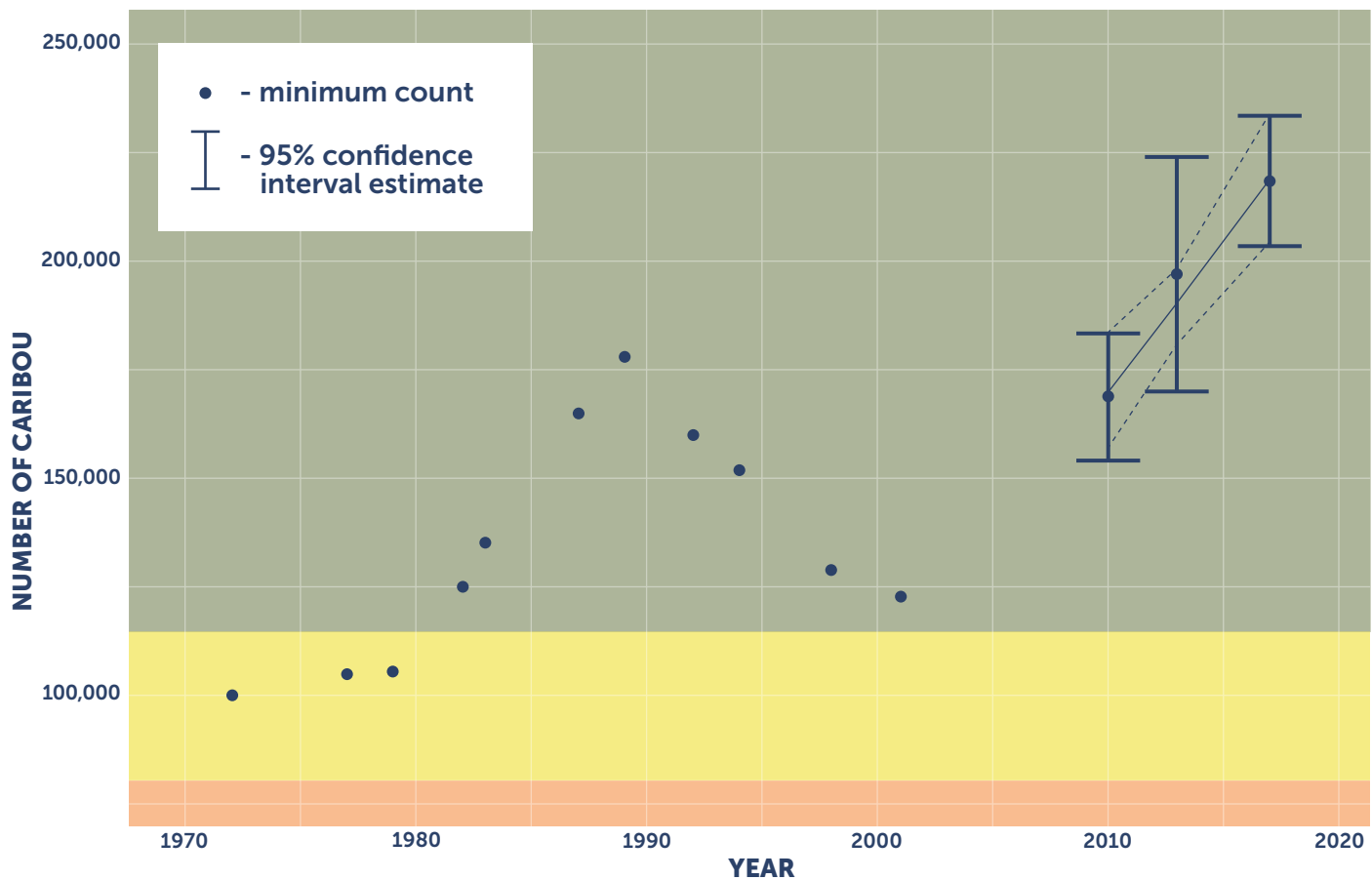
### What did we learn?

Population estimate:

<b>2013</b>	197,228	(95% CI = 168,667 – 225,789)
<b>2017</b>	218,457	(95% CI = 202,106 – 234,808)

(We are 95% confident the true population of the herd is within this range)





**FIGURE 1 | PORCUPINE CARIBOU HERD POPULATION SIZE**

*From 1972 to 2001 the photocensus established a minimum count. Since 2010, we have estimated the herd size more accurately, using minimum counts and other information to estimate herd abundance and also our certainty about the number. The background colours are the Harvest Management Colour Zones as established in the Harvest Management Plan.*

**What does this tell us about the health of the herd?** Since the first photocensus was conducted in the early 1970s, the herd has numbered from just over 100,000 to over 200,000 animals. The last successful photocensus (2017) indicated that the herd is at its highest number since surveys began in the 1970s. The herd was growing at a similar rate to its last growth phase (1972-1989). In June of 2023, the herd was monitored by pilots and most collared cows were in two large groups. The main groups of caribou were photographed on June 25th, but because biting insects hadn't emerged, the groups were spread out, and the bulls were separate. This survey might not lead to a herd size estimate, but could be useful as a minimum count.

- 0-45,000 = RED
- 45-80,000 = ORANGE
- 80-115,000 = YELLOW
- 115,000+ = GREEN

## CONFIDENCE INTERVAL

A confidence interval is a range of values that describes the uncertainty surrounding a number. It's a measure of our confidence that the number is between a given range, and our best assessment about the accuracy of the information we are presenting.





# Caribou Population

## MAKING A MODEL

*A population model incorporates many different combinations of inputs, including different numbers for calf and cow survival, to produce estimated numbers for herd size and help us understand if it is likely that the herd is increasing or declining. While we don't know the exact number of calves that survive each year, we do know the likely minimum and maximum numbers, and we can input these numbers to create scenarios. The range of possibilities produced by the computer model can show if the herd is in decline and what harvest management colour zone the herd is in.*

## Population computer model

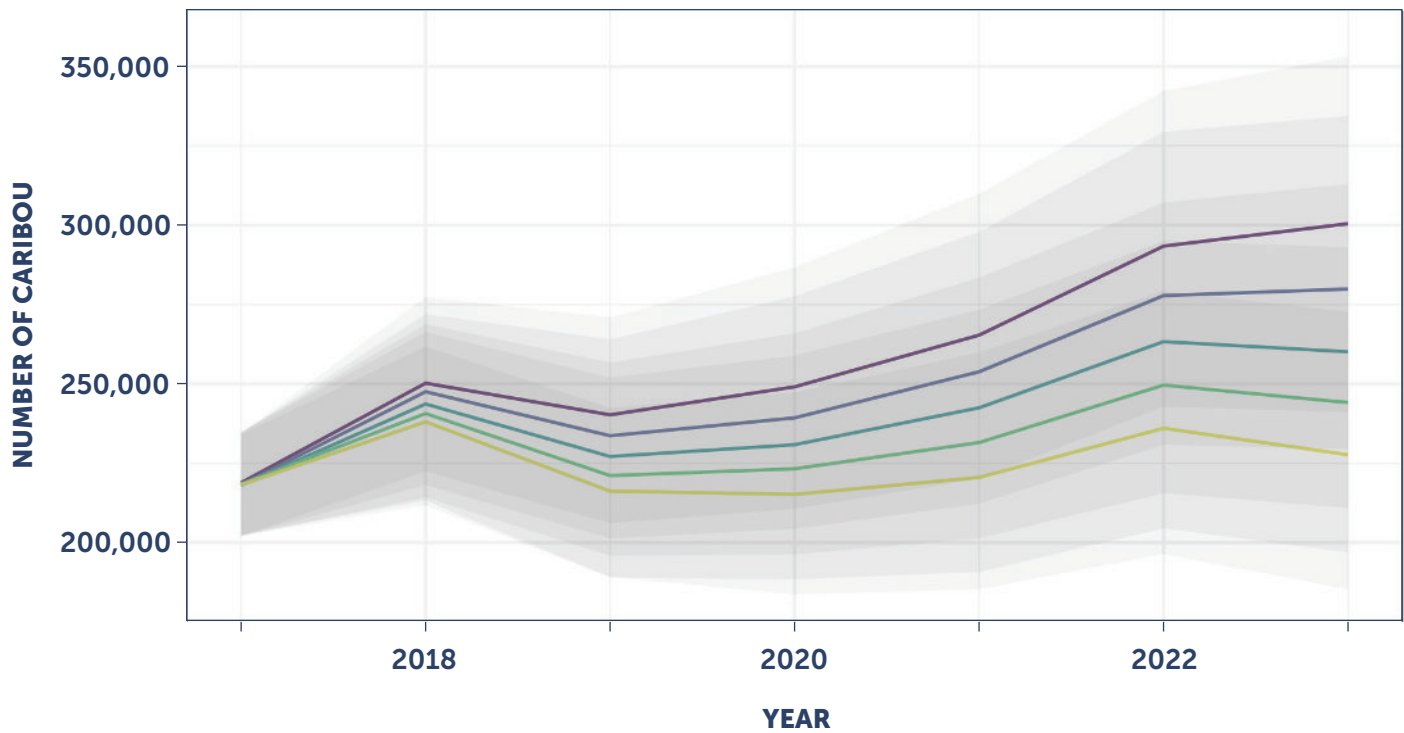
The computer model was first developed in 2012 as another way of estimating the size and population trend of the Porcupine Caribou herd. It is especially useful when a photocensus can't be completed, due to poor weather or when the caribou don't gather in large numbers.

**What does the population model tell us?** It is a way to bring together a lot of our monitoring information to get a number of caribou, with an indication of how certain we are about that number. The model is built on a computer using information from other herd indicators. Items such as photocensus numbers, estimates of the ratio of cows and bulls, harvest numbers, adult female survival and calving are used in the computer model. This tool was designed to provide the PCMB with information on the herd's size and trend. It can help us understand the amount of growth or decline that might be happening.

**How often do we measure this?** An advantage of computer modelling is that it can be done at any time, and the model can be run over and over using different combinations of the monitoring data we collect. Doing so helps us understand how certain we are about the size of the herd. The longer that it has been from the last photocensus, the less confident we will be in the actual size of the caribou herd.

**What did we learn?** The model produces many scenarios that when considered together, can show how likely it is that the caribou population is increasing, decreasing, or remaining stable. Different inputs to the model (for example, a small increase in calf survival) can show different trend lines and whether the Porcupine herd is in a particular management zone.





**FIGURE 2 | COMPUTER MODEL OF HERD SIZE SINCE 2017**

*The computer model projects the population size of the Porcupine Caribou herd using different variables. The coloured lines show the population size and trend using different calf mortality scenarios. The shaded area shows the uncertainty in the model (the area in the darker grey is the more likely outcome). Evidence from our models indicate that it is likely that the herd was stable or has increased between 2017 and 2022.*

**What does this tell us about the health of the herd?** The computer model is useful for understanding the influence of some of the different factors that affect the herd. All the scenarios produced trends that showed the herd is within the Green Zone as identified in the Harvest Management Plan. The population model is indicating that the herd population has likely increased since the 2017 population estimate. For 2022-23, there isn't a clear trend whether the herd is increasing or declining, according to the model estimates. There is a very low probability of a decline greater than 10%.



Peter Mahner



# INDICATOR *Survival estimates*



Peter Mather

## Survival Estimates

### How do we measure this?

Caribou wearing GPS collars are tracked throughout a year (from June to May) to determine an annual survival rate. When a collar stops moving, researchers know that the caribou has died. We can use that information combined with the knowledge of which caribou have survived to estimate the percentage of the herd that died in a year.

**Why do we measure this?** Even small changes in the survival of adult cows can make the difference between a herd growing or declining. We consider adult cow survival to be one of the most biologically important monitoring indicators for the herd.

### What did we learn?

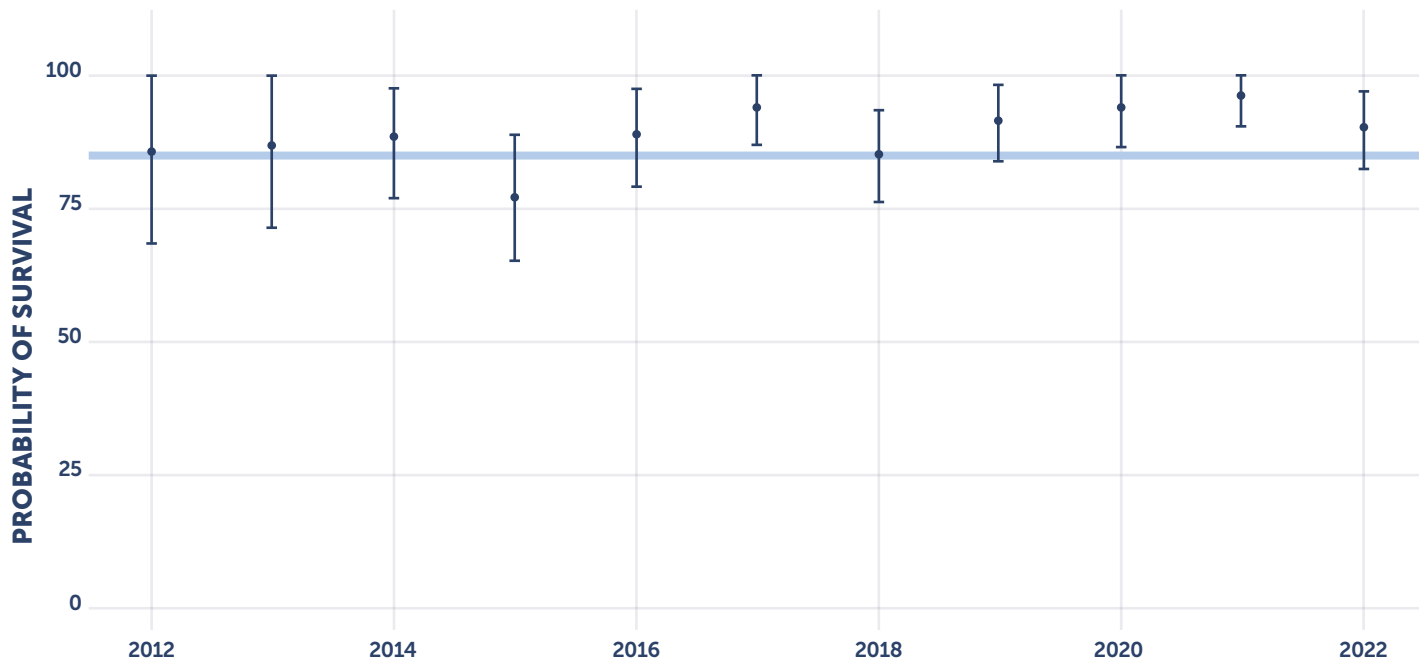
Adult females 2022-23 – 90% (5-year average is 91%)

Adult males 2022-23 – 76% (4-year average is 70%)

Yearling females 2022-23 – 83% (average is 81%)

The survival rates since 2019 remain relatively high for the herd. Survival rates for female caribou over 84-85% go along with an increasing population size. Current rates have exceeded 90% the last four years, well above the threshold for a stable herd. Adult male survival is near what we expect and is almost always lower than adult female survival.





**FIGURE 3 | SURVIVAL ESTIMATES OF ADULT FEMALE PORCUPINE CARIBOU**

*The figure shows survival estimates for female caribou with confidence intervals. At about 85% survival (shown as a blue line), we start to pay close attention to other indicators. If survival estimates dip below this line, it usually means fewer caribou. If lower levels continue for years, the herd is very likely in a major decline.*



Will Hein



## Calving

Calves are baby caribou. It is important to know how many calves are born each spring, and if they survive through their first year.

**Parturition** =  
the act of giving birth.

**Parturition rate** =  
the percentage of adult cows  
that had calves.

**How often do we measure this?** The birth rates and early survival of calves have been tracked yearly since the 1980's. In 2023, surveys were conducted in early June.

**How do we measure this?** Female caribou with satellite GPS collars are located from an airplane. The researchers then classify them as barren, pregnant or having given birth to a calf. They can tell that a cow is pregnant if they have hard antlers or bulging udders, or they may see a cow with a calf. The caribou are located again after about three weeks to see whether the calves have survived.

### What did we learn?

PARTURITION RATES 2023:

4 years or older cows: 83% (5-year average is 81%)

3-year-old cows only: 55% (5-year average is 59%)

All cows: 78% (5-year average is 78%)





## Calf survival

On average, biologists see about 82 calves born to every 100 adult cows. Of those calves, about 85% of them reach one month of age. Biologists monitor calves and cows the following March to note the relative number of calves that are about nine months old. If they can reach that age, the chance of them surviving is almost the same as an adult. Having an idea of the number of caribou that will likely reach adulthood is another way managers can estimate what will happen to a herd over the next few years.

**What does this tell us about the herd?** Fluctuation in calving numbers is normal. But if birth rates and calf survival rates remain low for several years in a row, population growth for the herd is more vulnerable.

3-week-old calf survival 2023: 77% (5-year average 3-week-old calf survival is 89%)

Late June cow/calf ratio 2023: 58 calves per 100 cows (5-year average is 60 per 100 cows)

Birth rates continue to be variable. In 2023 calf survival was one of the lowest that we've measured (77% compared to a long-term average of 87%). Despite this lower survival and lower parturition rate in 3-year-old cows, the ratio of calves to cows was at the long-term average of 58 calves per 100 cows during the late June survey, perhaps because the older cows had more calves than average this year. Researchers believe that the parturition rates of 3-year-old caribou might be a good indication of nutrition (the quality of caribou willow or lichen forage). Data from recent years may reflect cows being in poor condition going into the fall rut. The pregnancy rates of the 3-year-old cows might reflect overgrazing or bad weather conditions. We will continue to watch this indicator carefully.

## Peak of Calving and Extent of Calving Grounds

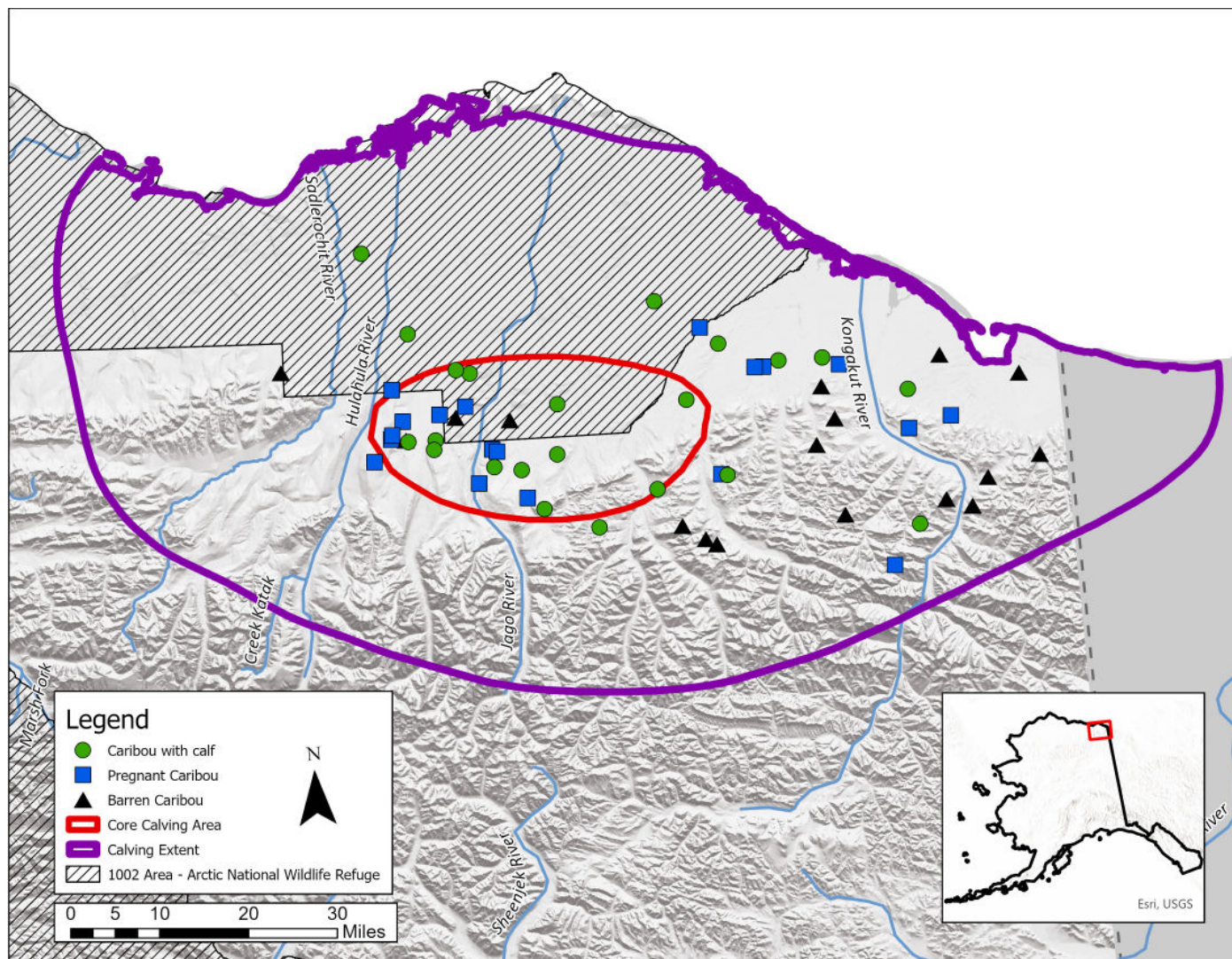
An estimate of the date when greater than half of the collared adult female caribou have given birth each spring and where the main calving grounds were.

**What did we learn?** Since 1999, the peak date of calving has varied by a few days each year, unlike some other caribou herds in central Canada that have seen a progressively earlier peak of calving. In 2023, researchers estimate the peak of calving for Porcupine Caribou was June 6th, four days later than average. In 2023, calving was widespread, happening mostly in Alaska from the border to the Canning River. Concentrated calving occurred on the flats north of the foothills, from the Egaksrat River in the east to the Okpilak River in the west.





**What does this tell us about the herd?** Porcupine Caribou generally give birth all at once, with most of the cows calving within days of each other. This is a way to reduce the risk of predation on any single calf. The similar birth date means that the cows were also bred at a similar time and can be an indication of how the rut went the previous fall. If the calving period is extended, it could mean that the rut was disrupted. This is important because calves born late in the season may be more likely to die from predators or too small to survive the migration south for the winter.



**FIGURE 4 | EXTENT OF CALVING GROUNDS 2023**

*This map shows where caribou calved this year. The red line circles the concentrated calving area, where a greater than average density of cows gave birth. The purple line identifies the area where most (99%) of the herd calved. The black-slashed area is the 1002 Lands, where oil and gas development has been proposed.*



# INDICATOR *Caribou Body Condition*

## Body Condition

This helps to understand the overall health of animals in the Porcupine Caribou herd.

**Why do we measure this?** Since 2001, a formal program has existed for hunters to submit samples and record and rate the condition of the caribou they harvest. This helps us assess the overall health of the herd by tracking the fatness of harvested caribou.

**How do we measure this?** Each year, hunters are asked to take samples from some of the caribou they harvest in the fall and measure the depth of backfat on the animals. Hunters can also rate the condition of caribou at that time of year relative to their long-term observations. Observations from hunters and other people on the land are also collected and incorporated into monitoring efforts.

**What did we learn?** While small groups of caribou were near the Dempster Highway and the coastal plain in early August, in fall of 2022, most of the Porcupine caribou were in Alaska and not available for hunters in Canada. Groups returned to the Yukon, moving east near Old Crow in November. Caribou were available for community harvest as the winter progressed. Most samples were collected near Aklavik, NWT. Hunters collected and assessed 157 caribou samples. Scores for body condition were average or below average and back-fat depth measurements were lower than average.

Body condition scores have been variable since hunters began rating them in 2001. This may be because most caribou were collected during the post-rut period (after mid-November), and the body condition and fat of caribou is highest in September. Hunters are also selective in their harvest, so results of sampled caribou may not indicate overall herd health.



Peter Mather



Peter Mather



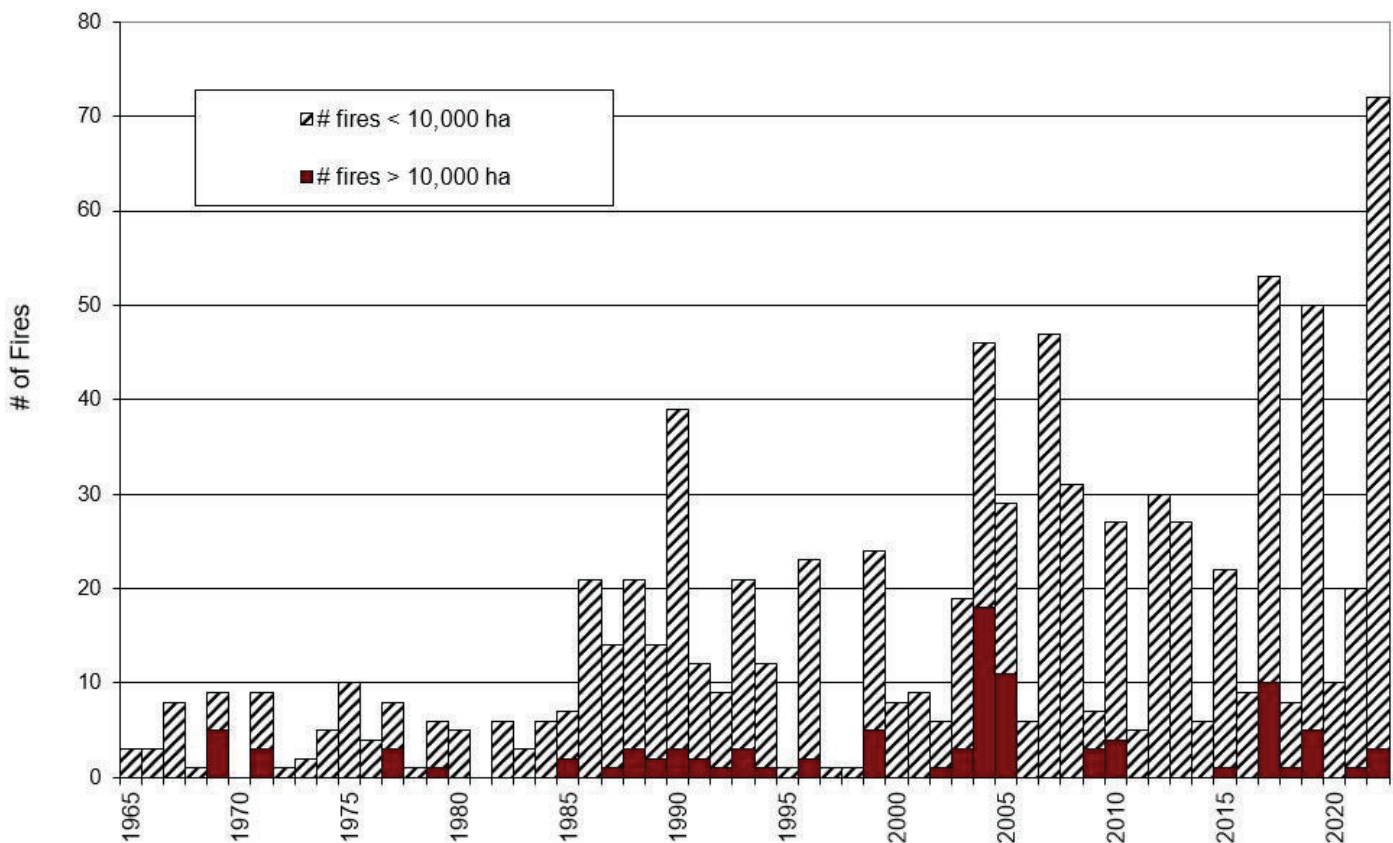
# INDICATOR *Habitat*

## Wildland Fires

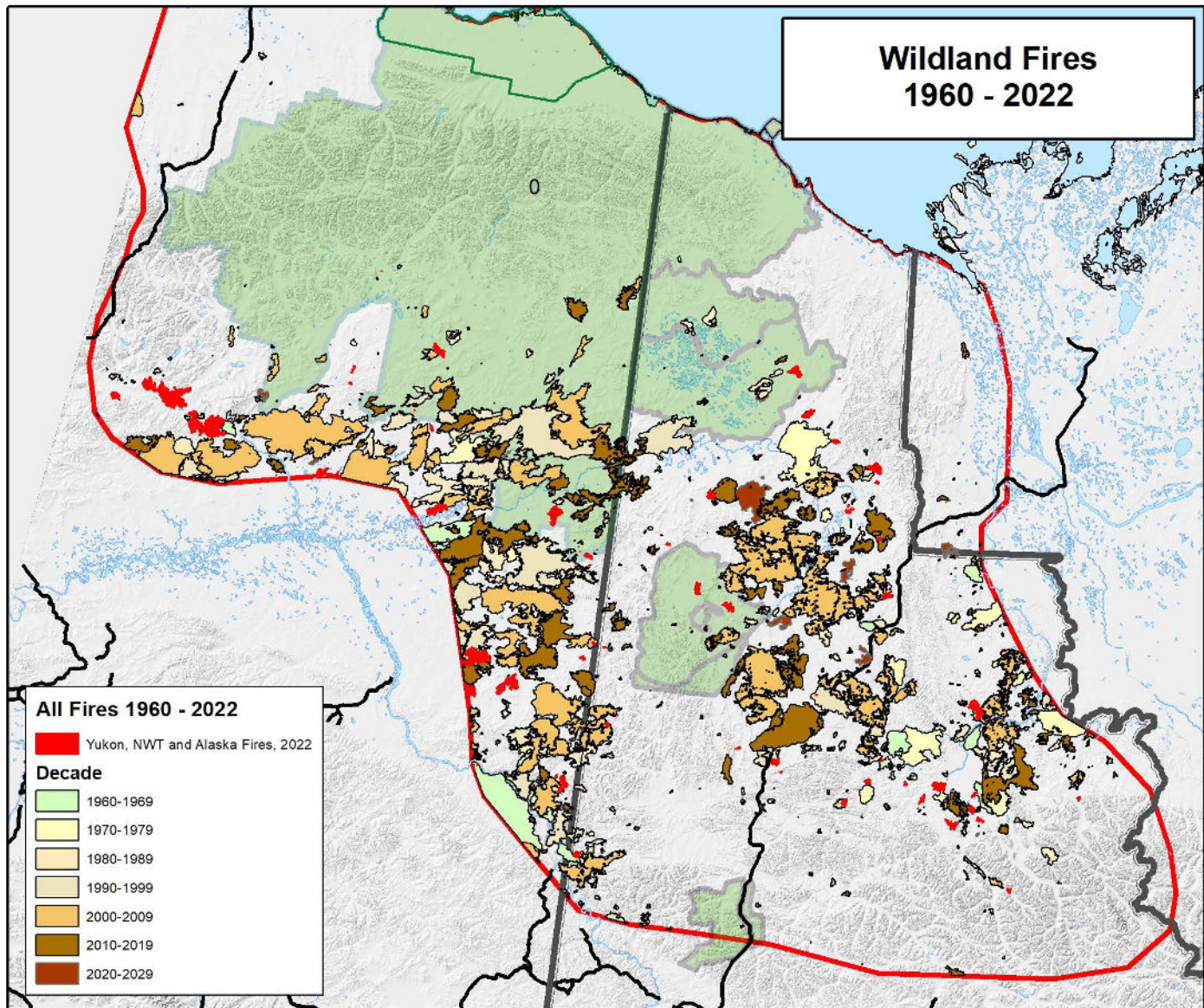
**Why do we measure this?** Fires affect the habitat of caribou and the regrowth of lichen can take anywhere from around 40 years to over a century to recover after a forest fire. Caribou tend to avoid large burned areas, especially during winter. We track wildland fires to see how each year's fires affect the condition of the Porcupine Caribou herd's range.

**How do we measure this?** We try to measure the total area burned by fires and the perimeter of new fires each year. Fire data has been tracked across the herd's range since the 1960s.

**What did we learn?** As of 2022, the total area burned by fires since 1960 is about 49,000 km<sup>2</sup>, or 19% of the herd's total range. Some of these areas have burned more than once. In 2022, about 1400 km<sup>2</sup> was burned by fires, which is above average. There were 35 fires in the caribou's range in Alaska in 2022, 37 fires in the Yukon and none in the NWT. Only three fires were considered large, burning parts of the western edge of the herd's winter range. Fire map data for 2023 is not yet available, but large fires burned on both the winter and summer range, particularly in the Yukon.







^ FIGURE 6 | 1960-2022 MAP OF WILDLAND FIRES

< FIGURE 5 | TOTAL NUMBER OF FIRES AND NUMBER OF LARGE FIRES (GREATER THAN 10,000 HECTARES) IN PORCUPINE CARIBOU HERD RANGE, BY YEAR



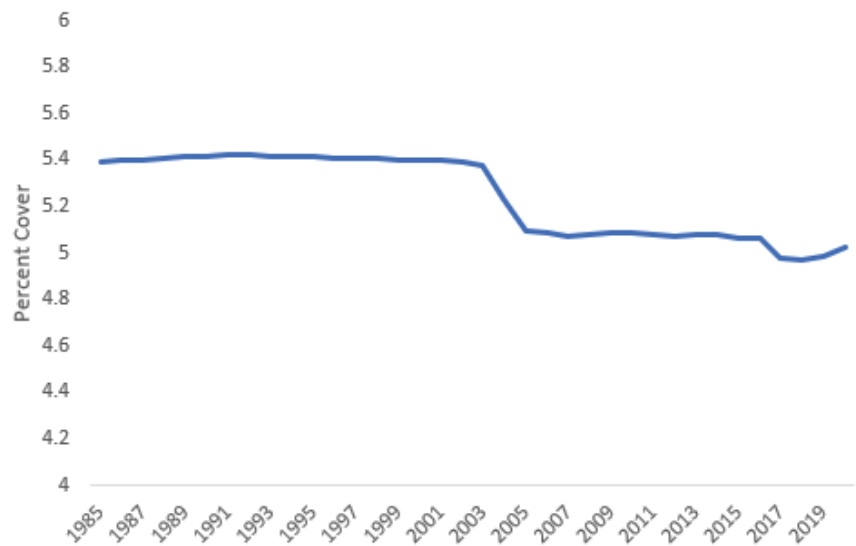


## Lichen Monitoring

**Why do we measure this?** Lichens are the primary food for caribou in winter. Climate changes to vegetation and wildfires may affect the availability and growth of lichen across the Porcupine Caribou herd's range.

**How do we measure this?** Researchers map lichen cover and total biomass (amount of lichen) across the landscape using satellite imagery. Because the satellite imagery used starts in 1985, data is available describing changes in lichen since that time. Going forward we can track changes in the amount of lichen, as well as its distribution and availability to caribou in parts of their range.

**What did we learn?** Research has shown small decreases to the lichen cover and biomass across the herd's core range, and larger declines across the Yukon and Alaska more generally. Declines within the herd's core range have mostly been associated with a few significant fire years. As wildfires increase, we will continue to monitor lichen cover and mass as an indicator of the state of the caribou range.



**FIGURE 7 | CHANGES IN LIGHT MACROLICHEN COVER ACROSS THE PORCUPINE CARIBOU CORE RANGE SINCE 1985**



# Linear disturbance and human development footprint

**Why do we measure this?** Large patches of intact habitat are critical to caribou herds. Increased access to the caribou's range can add to hunting pressures. Linear developments like cut lines and roads can help predators. These things can increase predation and stress levels for caribou. Human activities in caribou habitat, particularly development activities, can impact the way caribou use their habitat and their seasonal movements at critical times, such as calving.

## LINEAR DISTURBANCE:

includes cut lines and trails, roads, and seismic lines that are cut across the landscape.

**How do we measure this?** Disturbance and development data is collected in NWT, Yukon and Alaska. Historical disturbance has been tracked through cumulative effects studies and land use planners evaluated historical disturbances and vegetation recovery.

**What did we learn?** No major human development footprint changes across the Porcupine herd's range have occurred in recent years. Most development in the range of the Porcupine Caribou herd occurred prior to the 1980s, though 3D seismic work in 2013-14 in the winter range cut around 2,000km of seismic line. In late winter 2023, the Old Crow winter road (from Eagle Plains) operated. Oil and gas leases that were sold in 2021 in Alaska's Arctic National Wildlife Refuge have since been cancelled. However, a coastal plains oil and gas leasing program is being prepared, which is expected to include oil and gas development activities that overlap with areas of the herd's calving and summer ranges. An application to do oil and gas work near Eagle Plains has also been received in Yukon.



Peter Mather



Peter Mather





## Snow Condition

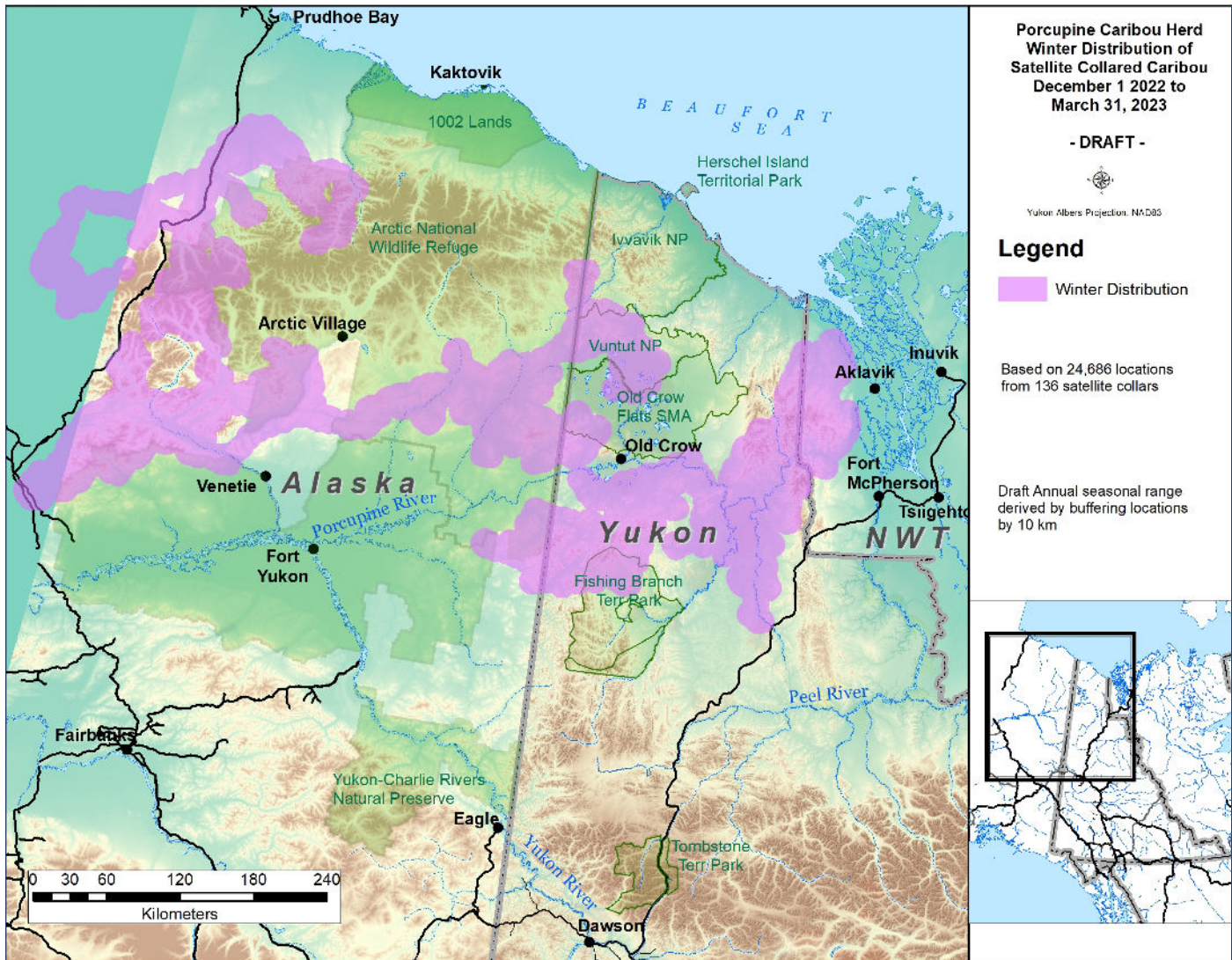
### **Why do we measure this?**

We study snow depth and hardness because when snow is deep or hardened by wind, caribou expend more energy digging through it. These winter conditions affect the energy the caribou use to dig for lichen and move around their habitat. Using a lot of energy can affect the caribou's body condition and reproductive capability.

**How do we measure this?** The depth of the snow and its condition is measured at a number of specified permanent locations throughout the herd's range. Samples are taken to measure the density of the snow or snow/water equivalent. We are working on new remotely sensed measures of snow conditions to help us understand more about how these conditions affect the habitat selected by the caribou and to better understand snow conditions across the herd's range.

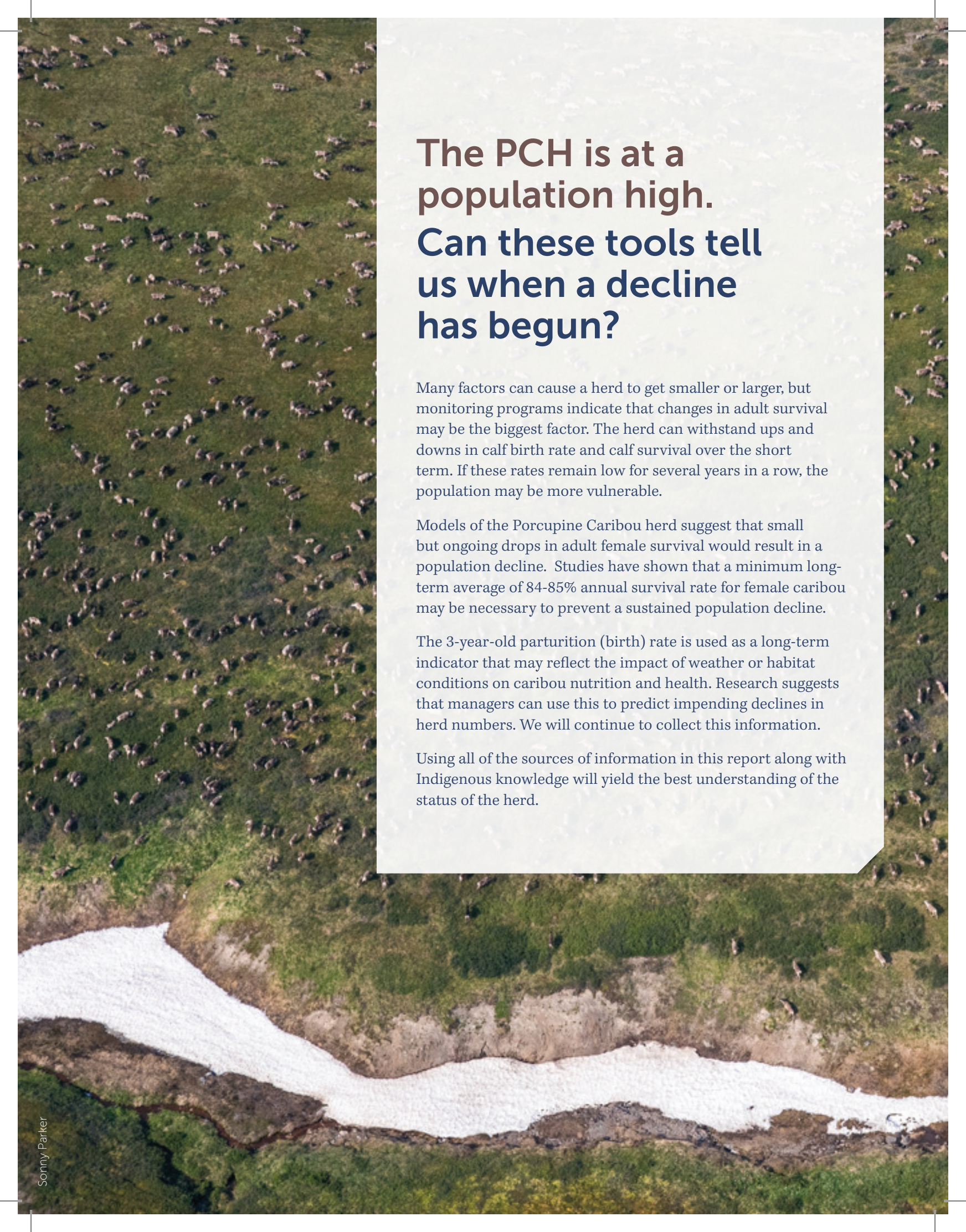
**What did we learn?** Snow condition measures have been taken from 17 locations in the Yukon since the 1970s. In the winter of 2022-23, snow depth was well above average in the Eagle, Ogilvie and Old Crow regions. The North Slope region was slightly above the long-term average snow depth. Snow density appears to be increasing over time in most Yukon regions. Field work observations confirmed above average snow depth in the Yukon and Alaskan parts of the winter range, where most caribou wintered. The exception was the Richardson Mountains, where ridges were bare or low in snow where most of the caribou were.





**FIGURE 8 | WINTER DISTRIBUTION OF CARIBOU**





## The PCH is at a population high. Can these tools tell us when a decline has begun?

Many factors can cause a herd to get smaller or larger, but monitoring programs indicate that changes in adult survival may be the biggest factor. The herd can withstand ups and downs in calf birth rate and calf survival over the short term. If these rates remain low for several years in a row, the population may be more vulnerable.

Models of the Porcupine Caribou herd suggest that small but ongoing drops in adult female survival would result in a population decline. Studies have shown that a minimum long-term average of 84-85% annual survival rate for female caribou may be necessary to prevent a sustained population decline.

The 3-year-old parturition (birth) rate is used as a long-term indicator that may reflect the impact of weather or habitat conditions on caribou nutrition and health. Research suggests that managers can use this to predict impending declines in herd numbers. We will continue to collect this information.

Using all of the sources of information in this report along with Indigenous knowledge will yield the best understanding of the status of the herd.









FOR FURTHER INFORMATION:

Porcupine Caribou Management Board | [dlemke@pcmb.ca](mailto:dlemke@pcmb.ca) | [pcmb.ca](http://pcmb.ca)