The Porcupine Caribou Herd Annual Summary Report

Submitted to the Porcupine Caribou Management Board
by the Porcupine Caribou Technical Committee

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 Inupiaq 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, Inuvialuit, and other governments. This report is for them and for people who are interested in science and monitoring related to the herd.

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 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:
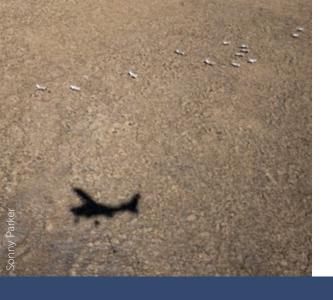
- to conserve the herd and its habitat
- to ensure opportunities for customary and traditional uses of the Porcupine Caribou Herd
- to help with cooperation for the herd across boundaries and between governments and users of the herd.

How are we using research to learn 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. Over time, this monitoring helps us learn more about the caribou herd's health, habitat and behaviours, and to watch for changes in the herd.

INDICATORS

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

What does the latest monitoring tell us about the health of the Porcupine Caribou Herd?

INDICATOR *Caribou Population*

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 census of the Porcupine Caribou herd almost every year. The photocensus method has been used to estimate the size of the herd since 1972. The last successful one was in 2017. In 2022, wildfire smoke from Alaska and a lack of sufficient gathering of the herd prevented a photocensus. The next photocensus is planned for 2023.

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. Radio collars help researchers locate the caribou. These large groups are photographed and caribou in the photos are counted. Caribou that are outside the large group are added to the count and the total is rounded to the nearest thousand.

What did we learn?
Population estimate:

2013	197,228	(95% CI = 168,667 – 225,789)
2017	218,457	(95% CI = 202,206 – 234,808)

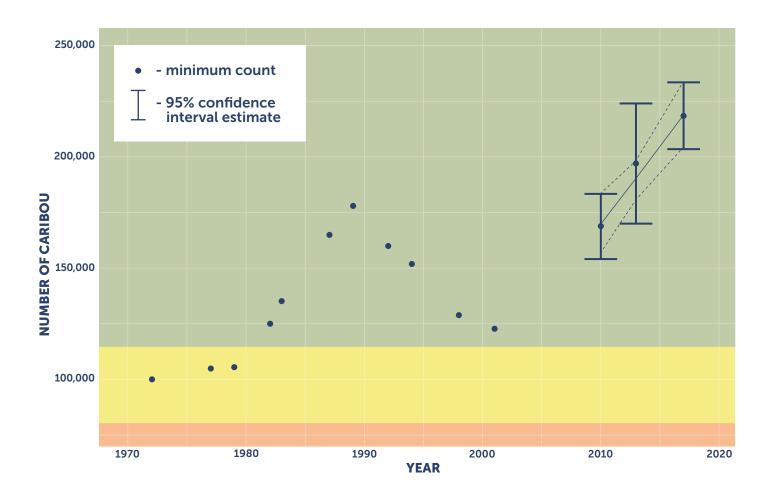(We are 95% confident the true population of the herd is within this range)

FIGURE 1 | PORCUPINE CARIBOU HERD POPULATION SIZE

From 1972 – 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 colour is the Harvest Management colour zones established in the Harvest Management Plan.

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

What does this tell us about the health of the herd?

Since the first census was conducted in the early 1970s, the herd has shifted between 100,000 and 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).

CONFIDENCE INTERVAL

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

Population computer model

The computer model was 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 done, due to poor weather or when the caribou don't gather in large numbers.

What does the population model tell us? It estimates the number of caribou and also measures the uncertainty surrounding that estimate. The model is done on a computer using information from other herd monitoring initiatives. Variables such as photocensus numbers, estimates of the ratio of cows and bulls, harvest numbers, adult female survival and calving are used. The population model tool was designed to provide the PCMB with information on the herd's size and trend. It can help us understand the trajectory and the amount of growth or decline that might be happening.

How often do we measure this? An advantage of computer modeling is that it can be done at any time, and the model can be run over and over using different combinations of variables. Doing so helps us understand how certain we are in our projections. The uncertainty in the model about the actual size of the caribou herd gets bigger as the model projects further into the future from the last photocensus.

What did we learn? The model produces a trend line that can show whether the caribou population is increasing, decreasing, or remaining stable, and also give us an idea of how confident we are. Different inputs to the model (changing some of the variables) can show different trend lines and whether the Porcupine herd is in a particular management zone.
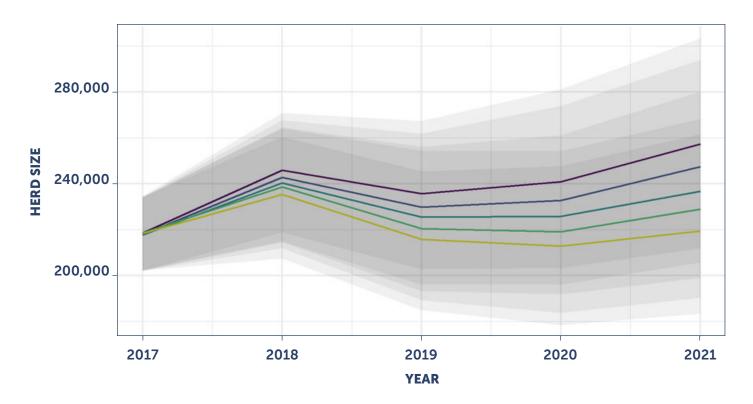
FIGURE 2 | COMPUTER MODEL OF HERD SIZE SINCE 2017

The computer model projects the population size of the PCH 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 was most likely that the herd was stable or increased between 2017 and 2021

What does this tell us about the health of the herd?

The computer model is useful for looking at the influence of some of the different herd indicators. All of the scenarios produced trends that showed the herd is within the 'Green Zone' as identified in the Harvest Management Plan. It shows that the herd population is generally stable.

Peter Mather

INDICATOR *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 the collars stop moving, researchers know caribou have died. We can use that information combined with the knowledge of who has survived to estimate the percentage of the herd that died in a year.

Why do we measure this? The number of adult cows that survive in a population can make the difference between a herd growing or declining.

What did we learn?

Adult females 2020 – 94% (average is 88%)
Adult males 2020 – 68% (average is 70%)
Yearling females 2020 – 80% (average is 85%)

From June 1, 2020 to May 31, 2021, the survival rate for cow caribou was almost 6% above average, while bull and yearling survival were slightly below average.
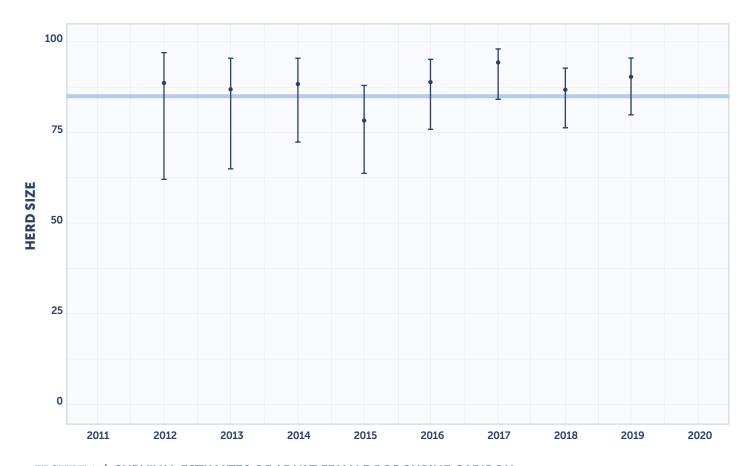

FIGURE 3 | SURVIVAL ESTIMATES OF ADULT FEMALE PORCUPINE CARIBOU

Calf survival

On average, biologists see about 82 calves born to every 100 cows. Of those calves, about 85% of them reach one month of age. Biologists then monitor calves and cows the following March to see 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 health of 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 calf survival 2022: 93%

Late June cow/calf ratio: 68 calves per 100 cows

While calving rates were lower than average in 2022, early calf survival was high, and the ratio of calves to cows was above the long-term average. Researchers believe that the birthing rates of 3-year-old caribou might be a good indication of nutrition (caribou forage like willow or lichen). These pregnancy rates might reflect overgrazing or bad weather conditions.

< *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 less caribou. If lower levels continue for years, the herd is very likely in a major decline.*

Peter Mather

Peter Mather

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

Peter Mather

How often do we measure this? The birth rates and early survival of calves have been tracked yearly since 2018. In 2022, surveys were conducted in early June.

How do we measure this? Female caribou with radio 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.

Parturition = the act of giving birth.

Parturition rate = the percent of cows that had calves.

What did we learn?

Parturition rates 2022:
4 year or older cows: 76%
Over 3-year-old cows: 70%
3-year-old cows: 50%

Peak of Calving and Extent of Calving Grounds

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

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 2022, researchers estimate the peak of calving for Porcupine Caribou was June 4th, slightly later than average.

What does this tell us about the health of the herd?

Porcupine caribou generally give birth all at once, with most of the cows birthing calves within days of each other. Doing 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.

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.
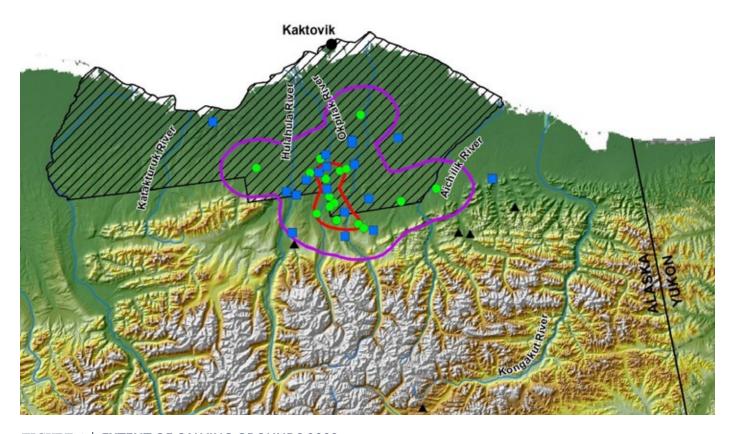

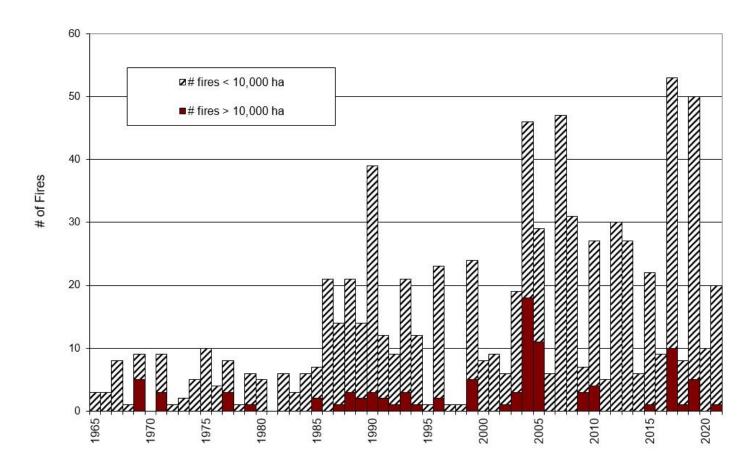**FIGURE 4 | EXTENT OF CALVING GROUNDS 2022**

Wildland Fires

Why do we measure this? Large patches of intact habitat are critical to caribou herds. Caribou have been shown to avoid large burned areas, especially during winter. Fires affect the range of caribou and the regrowth of lichen can take anywhere from around 40 years to over a century to recover after a forest fire. 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 2021, the total area burned by fires since 1960 is about 47,000 km², or 18% of the herd's total range. In 2021, nearly 600 km² was burned by fires in Yukon – this is lower than average. There were seven fires in Alaska in 2021, six in the Yukon and seven in the NWT. Only one fire, which burned southeast of Old Crow, was considered large. 2022 fire map data is not yet available, but several moderate-sized fires burned in winter range in the Yukon.
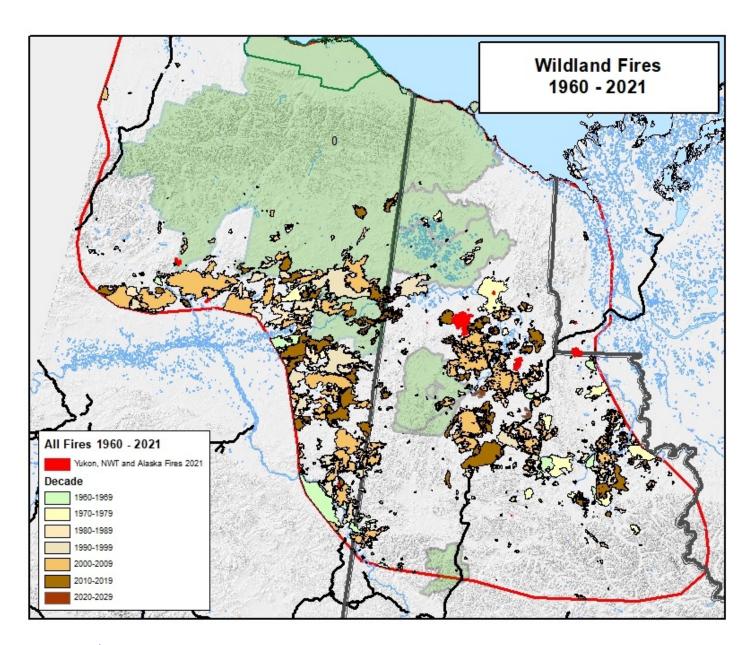
Wildland Fires 1960 - 2021

All Fires 1960 - 2021

Yukon, NWT and Alaska Fires 2021

Decade
- 1960-1969
- 1970-1979
- 1980-1989
- 1990-1999
- 2000-2009
- 2010-2019
- 2020-2029

FIGURE 6 | 1960-2021 WILDLAND FIRES

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

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 and 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? Most development in the range of the Porcupine Caribou herd occurred prior to the 1980's, though 3D seismic work in 2013/14 in the winter range cut around 2000km of seismic line, and in 2021, oil and gas leases were sold in Alaska's Arctic National Wildlife Refuge in areas used by Porcupine Caribou for calving and summer range. The leases were later suspended and a review of environmental impact is underway. In late winter 2022, the Old Crow winter road (from Eagle Plains) was opened to wheeled vehicles for the first time since 2014. In 2020 and 2021 freight was hauled with snowcats and trailers. This road bisects the Yukon portion of the caribou herd's range and is 280 km long. It is expected to be constructed and re-opened in winter 2023. No major human development footprint changes have occurred in recent years. A review of disturbance data is planned for 2023.

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. Snow-water equivalent can be converted to density by dividing the SWE by the depth of snow.

What did we learn? Snow condition measures have been taken from 17 locations in the Yukon since 2013. In the winter of 2021/22 snow depth was well above average in Eagle and Ogilvie regions, and slightly above in the Old Crow region. The North Slope region was slightly below 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 range, but relatively shallower in the Alaskan range, where most caribou wintered.
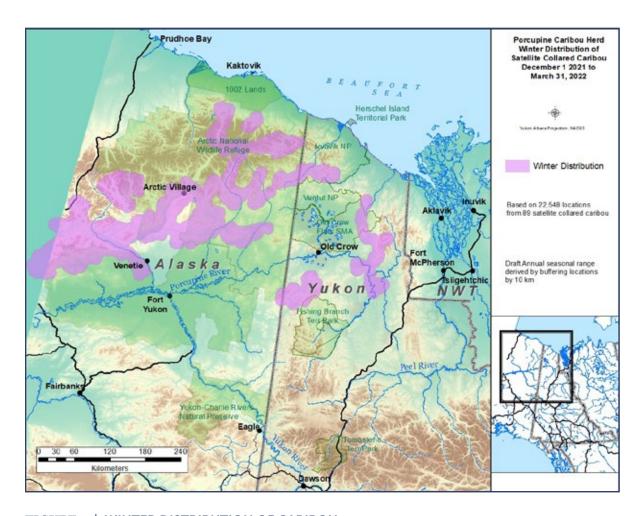

FIGURE 7 | WINTER DISTRIBUTION OF CARIBOU

Caribou 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? In fall of 2021, most of the Porcupine caribou had moved into Alaska. Small groups returned to the Yukon near Old Crow in early November and then moved away and towards Whitefish Lakes where they were harvested by hunters from Old Crow and Fort McPherson in late winter 2022. Yukon hunters submitted samples from caribou harvested between October and March. 19 caribou samples were collected and 11 were assessed by hunters. Scores for body condition and back fat depth were lower than average, but this may be due to the fact that samples were collected post-rut. Late winter caribou captures in Alaska showed slightly higher body condition scores.

Body condition scores have been variable since hunters began rating them in 2001. This may be because caribou are collected at varying times of the year, 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

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 84% annual survival rate for female caribou may be necessary to prevent a sustained population decline.

Three-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.