

THE EXCHANGE:

Sharing Knowledge, Inspiring Solutions



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SPECIAL ISSUE



ARCKP

Alberta Regional Caribou Knowledge Partnership

Connecting Alberta's forest sector and policy makers to accessible and relevant scientific information is key to advancing woodland caribou conservation efforts across the province. To facilitate this, the Alberta Regional Caribou Knowledge Partnership (ARCKP) provides regular knowledge exchange, keeping our partners and stakeholders up to date on the research and information they need to make important forest management and policy decisions.

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Special issue

An overview of provincial caribou monitoring in Alberta

The Government of Alberta monitors caribou using a variety of complementary methods across all caribou ranges in the province. This long-term monitoring program is vital to provincial and national species recovery efforts, informs provincial and regional decision-making, and enables the province to evaluate the effectiveness of management actions (e.g., population or habitat management).

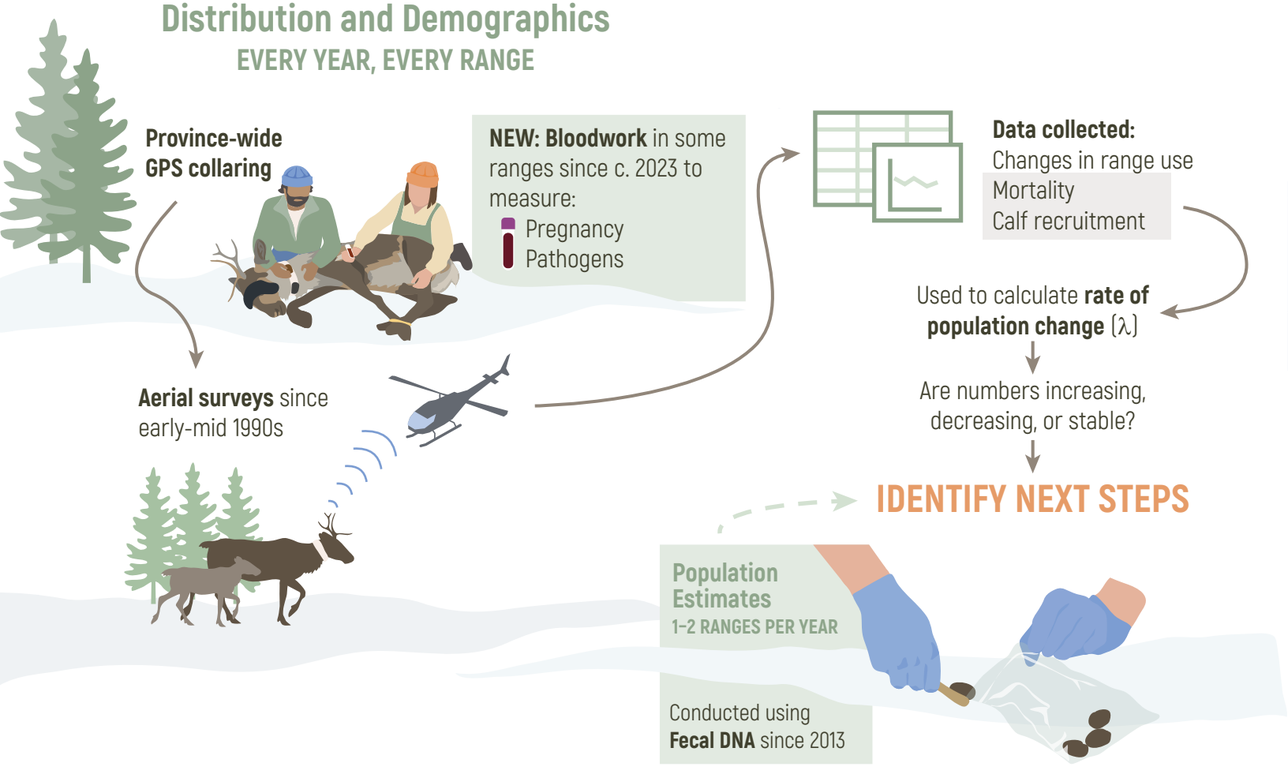
Integrated methods to gather comprehensive data

The primary objective of Alberta's caribou monitoring program is to monitor population status over time. This includes the early adoption of fecal DNA to evaluate population size. Alberta was also one of the first jurisdictions to begin deployment of radio collars on caribou in the late 1970s. Alberta began calculating range-specific demographic vital rates in the mid 1990s.

This special issue of *The Exchange* provides an overview of Alberta's caribou population monitoring efforts, including a deep dive into its **distribution and demographic** monitoring (page 4) and **population size monitoring** (page 6). The ARCKP thanks the Government of Alberta for sharing information about their program to make this special issue possible.

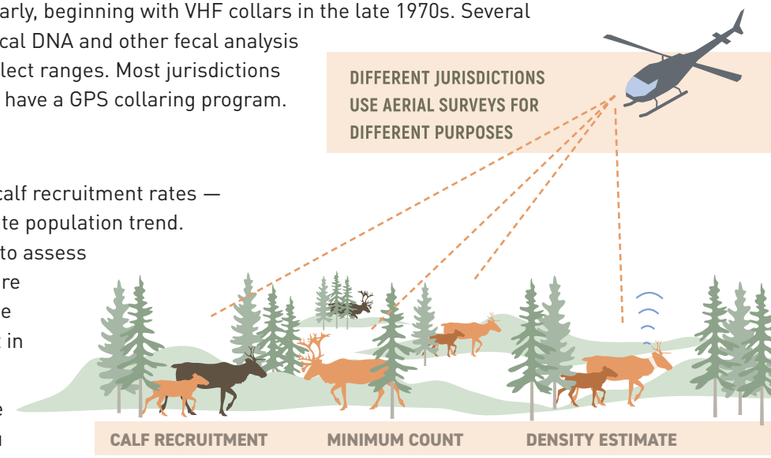
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Caribou monitoring across jurisdictions

Each jurisdiction in Canada has a unique monitoring approach, both in terms of the methods they use and the types of data they collect. Alberta's provincial caribou monitoring program was an early adopter of fecal DNA analysis and initiated caribou collaring early, beginning with VHF collars in the late 1970s. Several other jurisdictions are beginning to employ fecal DNA and other fecal analysis (e.g., to detect parasites), in some cases in select ranges. Most jurisdictions employ some form of aerial survey, and many have a GPS collaring program.



Not all surveys collect the same data

In Alberta, aerial surveys are used to assess calf recruitment rates — a key demographic parameter used to calculate population trend. However, Alberta does not use aerial surveys to assess population size. Aerial population estimates are difficult to obtain as caribou are cryptic, can be spread out, and otherwise challenging to spot in boreal forests.

In other jurisdictions, aerial surveys may have a different objective, such as counting caribou to generate a coarse population assessment in the form of a minimum count. In some cases, these aerial counts are combined with collar data to generate an estimate of caribou density, which is then extrapolated across the range to generate an estimate of population size. However, such estimates typically have a wide margin of error and are not always possible to calculate due to small sample sizes. Fecal DNA analysis, while more resource- and time-intensive, provides an alternative method for population estimates (see page 6 of this issue for more information on fecal DNA analysis).



Emerging knowledge of diseases and parasites

Recently, the Alberta provincial monitoring program began collecting blood samples from caribou when they are collared in select ranges. In addition to pregnancy status, these samples are used to monitor diseases, parasites and overall health.

Provincial monitoring informs management at many scales

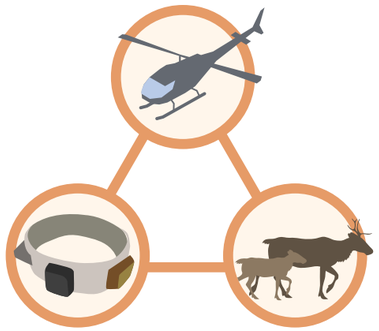
Monitoring data is critical for establishing population, distribution and demographic baselines and evaluating the success of recovery initiatives. In ranges where monitoring indicates high mortality and low calf recruitment, focused data collection and management actions can be deployed to identify and address the threats putting them at risk. Annual surveys and collaring activities give provincial staff visibility on the health and wellbeing of caribou populations and the condition of caribou habitat and ranges. The provincial program has has advanced over time to address supplementary management questions and research requirements.

Alberta is one of the few jurisdictions in Canada that has completed population estimates for many of its caribou ranges. By leveraging the strengths of different data collection methods, it has accumulated a rigorous dataset to help inform decision-making and evaluate progress.

Special issue

Monitoring caribou space use and demographics in Alberta

Every year, biologists with the Government of Alberta collect data on caribou space use and demographics through a variety of methods, including GPS collaring and aerial surveys. The scope of this monitoring effort is exceptional, covering every caribou range in the province year after year. Analyzed together, the information collected allows for robust monitoring of caribou population trends and habitat use across the province.



GPS collars

DATA COLLECTED: DISTRIBUTION AND SURVIVAL
FREQUENCY: EVERY YEAR, EVERY RANGE



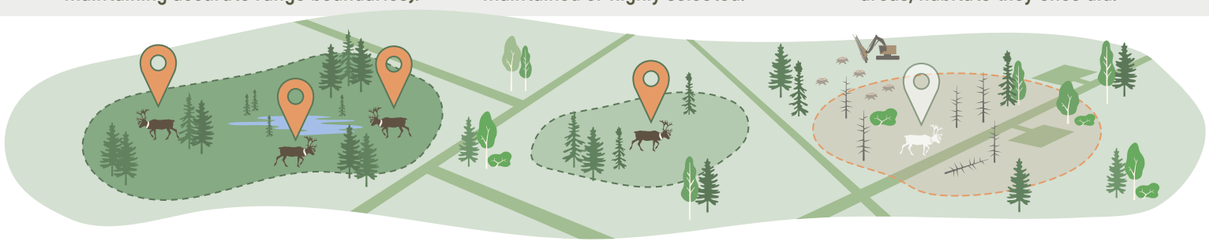
GPS collar data provides information on both distribution and survival. Across the province, approximately 100–125 caribou are collared each year, maintaining a representative sample size within each population dependant on size.

Collaring occurs in January or February, depending on snow conditions. The collars have a built-in GPS that shares spatial coordinates via satellite, which allows biologists to remotely track the caribou's movements. This location data is used to determine:

The extent of caribou ranges (used for maintaining accurate range boundaries).

Areas where caribou occupancy is maintained or highly selected.

Whether caribou are no longer using areas/habitats they once did.



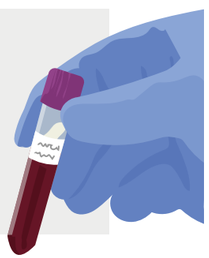
Biologists can also use GPS collar data to determine whether a caribou has died. If a collar remains motionless for a set period, it will broadcast a special signal to indicate a likely mortality. Biologists will respond to the collar location and perform a mortality investigation. This provides several key pieces of information:

- Adult female survival rate – a key parameter for calculating population trend
- Cause of mortality. Knowing what caused a caribou to die helps identify drivers of population decline as well as emerging threats.

Health assessments

DATA COLLECTED: BLOOD SAMPLES
FREQUENCY: SELECT POPULATIONS (FOCUSED ON NORTHEAST RANGES) FOR PAST FEW YEARS

A recent addition to the province's caribou monitoring is the collection of blood samples from caribou in select northeast ranges. During collaring operations, blood samples are collected from immobilized caribou for later analysis. Bloodwork provides information on pregnancy rates and other health indicators.



Aerial surveys

DATA COLLECTED: CALF RECRUITMENT
FREQUENCY: EVERY YEAR, EVERY RANGE

In Alberta, aerial surveys are used to calculate calf recruitment – a key parameter for calculating population trend. Surveys are conducted every year for every range.

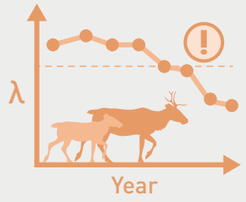
Aerial surveys occur in late February to early March, with crews using GPS collar signals to track down groups of caribou. Once a group of caribou is spotted, crews classify caribou by age and sex and determine the calf:cow ratio (i.e., calf recruitment).

In other jurisdictions, aerial surveys may be used for different purposes, such as obtaining a simple minimum count of caribou in a given area.



Calculating population trend

By annually estimating adult female survival and calf recruitment, biologists can calculate the annual change in population size (often referred to as lambda (λ)). Tracking annual change in population size indicates if the population is declining, increasing or stable compared to the previous year.

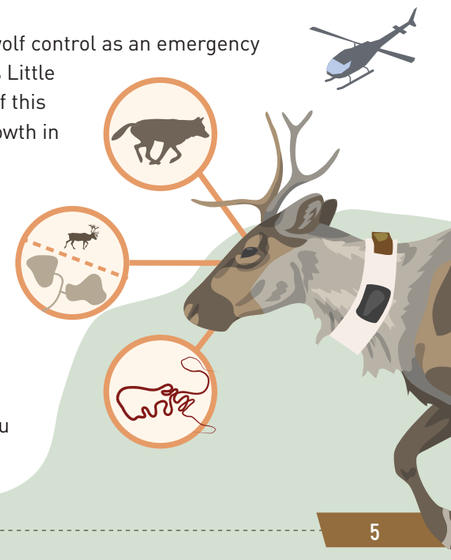


Population trend is critical information for managers. Knowing which caribou populations are facing the steepest declines, and whether management actions are working to slow or reverse declines, is essential for effective adaptive management. Population trend can also be calculated more readily and more frequently than estimates of population size. (For more information on how the province estimates caribou population size via fecal DNA, see page 6.)

How the information is used

Thanks to these monitoring efforts, the province has accumulated a rich dataset with 40+ years of caribou space use, adult female survival and calf recruitment data across Alberta's caribou ranges. Since its inception, provincial caribou monitoring has provided critical insights for caribou management:

- Robust data on population trend was a critical driver for the initiation of wolf control as an emergency management action to prevent extirpation of several populations (such as Little Smoky). Continued monitoring has also demonstrated the effectiveness of this action preventing further declines and enabling stability or population growth in some ranges.
- Information on caribou space use (via collar data) informs how potential developments may impact caribou and plays an important role in environmental assessment and land use planning. For instance, by guiding development of spatial harvest sequencing in northeast ranges.
- Mortality monitoring recently revealed an emerging parasite threat: meningeal worm.
- Provincial data informs science of caribou ecology, recovery and adaptive management in response to natural and anthropogenic impacts to caribou and their habitats.



Special issue

Monitoring caribou population size in Alberta with fecal DNA

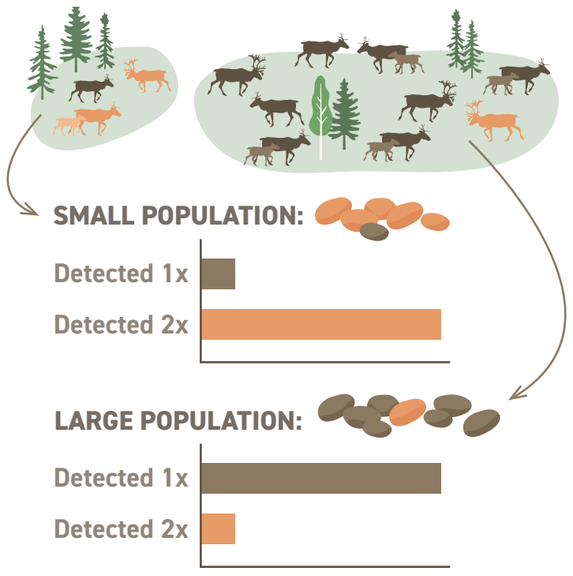
Woodland caribou often spread out across large swaths of mature conifer forests and treed peatlands to avoid predators. A result of this strategy is that caribou are very difficult to spot from the air — a single caribou among trees is much less obvious than a herd in open terrain. In 2013, the Government of Alberta initiated efforts in partnership with Trent University to estimate caribou population size using fecal DNA. This approach has provided more rigorous and reliable population estimates for caribou herds in the province, and Alberta has played an important role in refining and spreading the adoption of this technique.



True population estimates vs minimum counts

When surveyors simply tally up the total number of animals they see, the result is a minimum count (also referred to as "minimum number alive"). This metric is ***not*** an estimate of the actual population size, as not all individuals in the population will be seen during the survey.

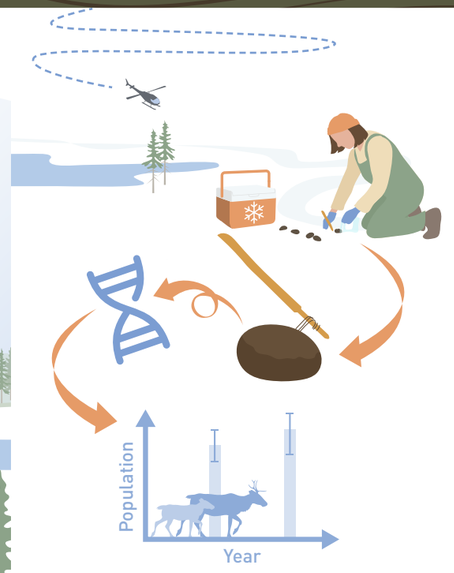
In contrast, capture-recapture enables an estimate of the proportion of the population that is not detected across sampling periods. While some jurisdictions use minimum counts as a metric of caribou population size due to logistical or other constraints, Alberta has assessed population size for most herds using estimates derived from DNA-based capture-recapture. See page 4 for more on the demographic data Alberta does collect via aerial surveys.



From poop to population size

The techniques used to estimate population size from DNA build upon long-standing capture-recapture methods. Such techniques involve sampling the population multiple times and comparing how often the same individuals reappear across samples. Intuitively, you may conclude that if many of the same individuals are recaptured in each sampling period, the overall population must not be very large. If instead you capture new individuals every time, that may indicate a larger population. The math underlying capture-recapture methods works on this principle.

DNA-based capture-recapture applies these techniques to DNA samples collected across space and time, such as those found on fecal pellets. If separately collected pellets frequently contain DNA from the same individuals, the overall population size is likely small. This non-invasive method allows for robust population estimates without subjecting caribou to unnecessary handling.



How fecal DNA is collected in Alberta

Fecal pellets must freeze quickly and remain frozen to prevent the DNA from degrading. For this reason, crews collect fecal pellets in winter. Crews fly transects across the entire caribou range to locate caribou feeding sites, where they are dropped off to collect fecal samples. The sampling process is repeated three times between December and March.

At Trent University's lab, fecal samples are thawed and DNA is extracted. The number of individuals "captured" (i.e., detected via their DNA) and recaptured across sampling locations is identified and used to calculate a total population estimate.

Fecal DNA collection is costly and logistically complex, therefore Alberta collects fecal DNA from only select ranges each year. Ranges are prioritized for sampling based on how the information will support adaptive decision making — for instance, to determine whether a new management action is affecting the population.

Why are population size estimates not produced annually for all ranges?

While population estimates are highly valuable, they are not precise enough to track population trends year over year. Population trends can be assessed more effectively and affordably using demographic data (i.e., adult female survival and calf recruitment), which is collected every year across every range. The clearest picture emerges when both kinds of data are viewed together: A declining trend in a population of 25 caribou may trigger a different management response than the same trend in a population of 500. See page 4 for further discussion of caribou demographic monitoring in Alberta.

Key learnings from Alberta's fecal DNA program

As early adopters of fecal DNA-based population monitoring, Alberta caribou biologists have refined the method over time to produce more robust estimates for lower cost. Government of Alberta biologists have shared information and adaptations on these techniques to other jurisdictions, helping foster adoption of DNA-based capture-recapture across other caribou programs. Key learnings include:



Collection methods

Identified best practices for labelling and handling fecal pellet samples to preserve DNA quality.



Logistics

Through simulations, demonstrated that halving the number of transects flown (a significant cost driver) could still produce robust population estimates.



Statistical approaches

Explored different analytical approaches for calculating the population estimate, including incorporating the spatial locations of "captured" individuals, known as spatially explicit capture-recapture.

WHAT IS THE ARCKP?

Who we are, and what we do

Woodland caribou are a cultural and ecological icon of Alberta's Boreal forests. However, they are also a threatened species, and represent a significant conservation challenge. In response to this challenge, and to the additional challenge of managing woodland caribou across different ecosystems, the Government of Alberta and the province's forest sector formed the Alberta Regional Caribou Knowledge Partnership (ARCKP). Together, we are committed to finding on-the-ground solutions that balance forestry activities with woodland caribou conservation.

Initiated in 2020, the ARCKP is an association of fRI Research and funded by the Forest Resource Improvement Association of Alberta (FRIAA) through the support of forestry companies in Alberta. Together, these partners have contributed over $1 million per year to address region-specific knowledge gaps in woodland caribou ecology.

fRI Research
Informing Land & Resource Management

ARCKP
Alberta Regional Caribou Knowledge Partnership

$1M / YEAR

Forest Resource Improvement Association of Alberta (FRIAA)

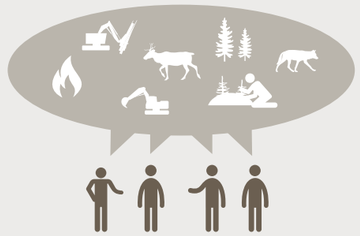
Twelve Forestry Companies

Alberta Government



OUR VISION

A collaboration promoting self-sustaining caribou populations and a viable forest sector.



OUR MISSION

We support the development and sharing of innovative tools, techniques, strategies and understandable scientific knowledge to enhance sustainable forest management and caribou recovery efforts.

Have questions about the ARCKP?
Contact our network coordinator at ARCKP@fuseconsulting.ca or visit arckp.ca.





The ARCKP is funded by the Forest Resource Improvement Association of Alberta

Forest Resource Improvement Association of Alberta (FRIAA)

Current ARCKP Partners

ANC Timber Ltd. · Tolko · Weyerhaeuser · Northland Forest Products Ltd. · Alberta Pacific Forest Industries Inc. · Mercer Peace River · Canfor · West Fraser · Vanderwell Contractors (1971) Ltd.

ARCKP
Alberta Regional Caribou Knowledge Partnership

For more information or to contact the ARCKP, visit arckp.ca

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