# Ontario Boreal Caribou Monitoring Program

# 2025 Results

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# EXECUTIVE SUMMARY

Through the Boreal Caribou Monitoring Program, Ontario is working to improve understanding of the current and projected status of Boreal Caribou in Ontario at a range-scale. The monitoring program includes the fourteen Boreal Caribou ranges in Ontario.

This document provides information on the methodology and results of the 2025 aerial surveys, fecal pellet collection and genetic analysis, and collaring of adult female caribou across several ranges, and research conducted on the Missisa and Ozhiski ranges from 2018 to 2024. It was prepared by the Ministry of the Environment, Conservation and Parks (MECP) and the Ministry of Natural Resources (MNR) and is an addendum to the reports on the aerial surveys conducted under the Boreal Caribou Monitoring Program in 2023 and 2024.

In 2025, monitoring efforts occurred in seven Boreal Caribou ranges (Berens, Churchill, Kinloch, Nipigon, Spirit, Swan, and Sydney). Apart from the Sydney Range, at least 100 caribou were identified in each range. This represents the minimum number of caribou occupying each range, recognizing that not all caribou in a range are detected during an aerial survey or fecal DNA study. As per Environment Canada (2011) modelling, population sizes over 100 caribou indicate a large enough population that has a minimum 70% probability of not reaching a quasi-extinction threshold of less than ten reproductively active females under stable conditions over 50 years.

Research conducted in the Missisa and Ozhiski ranges from 2018 to 2024 indicates stable or increasing populations in these ranges. The minimum animal counts for both ranges are higher than 300, the number reported as needed for self-sustaining local populations (Environment Canada 2011).

Specifically, as part of the Boreal Caribou Monitoring Program:

- MECP conducted a two-stage aerial survey with fecal pellet collection in February 2025 in the Nipigon Range and a two-stage aerial survey with fecal pellet collection and demographic classifications was conducted from late January to mid-March 2025 in the Spirit and Swan ranges. For all three ranges, Stage One was completed with a fixed-wing aircraft, along transects covering the whole of each range, and Stage Two was completed with a rotary-wing aircraft focusing on areas where caribou and their sign were identified in Stage One.
- A two-stage aerial survey with demographic classifications was conducted by MNR in early 2018 in the Ozhiski Range. Stage One was completed with a fixed-wing aircraft, along transects covering the whole of the range and Stage Two was completed with a rotary-wing aircraft focusing on areas where caribou and their sign were identified in Stage One.
- Global Positioning System (GPS) collars were applied by MECP to 105 adult female caribou from mid-February to mid-March 2025 in the Berens, Churchill, Kinloch and Sydney ranges.

- GPS collars were applied by MNR to more than 150 adult female caribou during the period of 2019 to 2024 in the Missisa and Ozhiski ranges.
- The collars are programmed to provide caribou GPS locations every 2.5 hours to five hours over three years. The placement of GPS collars on adult female caribou is being used to monitor survival and recruitment in these ranges. Fecal pellet and hair samples were collected for genetic analysis from the caribou that were collared. All caribou groups encountered during collaring efforts were counted and classified by age and sex.

The following are highlights of the 2025 monitoring efforts. Caution is advised when interpreting these results, as they represent a single point in time. Robust assessments of caribou populations typically require several years of data to account for natural variability and long-term trends.

Nipigon Range

- 133 individual caribou were identified through genetic analysis of fecal pellets.
- 17 caribou were observed and tracks were recorded at 80 sites during fixed-wing flights and 24 caribou were observed during rotary-wing flights. Some caribou individuals may have been observed during both flight types.

Spirit Range

- 116 caribou were observed during rotary-wing flights. 90 caribou were observed and tracks were recorded at 543 sites during fixed-wing flights. Some caribou individuals may have been observed during both flight types.
- 113 individual caribou were identified through genetic analysis of fecal pellets.

Swan Range

- 390 caribou were observed and tracks were recorded at 803 sites during fixed-wing flights. 311 caribou were observed during rotary-wing flights. Some caribou individuals may have been observed during both flight types.
- 148 individual caribou were identified through genetic analysis of fecal pellets.

Berens Range

- 301 caribou were observed in 34 groups during GPS collaring flights.
- 38 adult female caribou were collared in Berens Range.

Churchill Range

- 181 caribou were observed in 31 groups during GPS collaring flights.
- 26 adult female caribou were collared in the Churchill Range.

Kinloch Range

- 176 caribou were observed in 27 groups during GPS collaring flights.
- 33 adult female caribou were collared in the Kinloch Range.

Sydney Range

- 31 caribou were observed in eight (8) groups during GPS collaring flights.
- Eight adult female caribou were collared in the Sydney Range.
- The Sydney Range is part of a larger geographic area supporting the caribou population that includes the Owl-Flintstone Management Unit in Manitoba. The spatial extent of the Sydney Range is likely too small to support an independent and sustainable population of caribou and therefore is ecologically inter-dependent on the Owl-Flintstone Management Unit in Manitoba.

# 1 INTRODUCTION

## 1.1 Purpose

The purpose of this document is to describe the methodology and results of Boreal Caribou aerial surveys (with fecal pellet collection) and adult female collaring undertaken in 2025 across several ranges, and research undertaken from 2018 to 2024 in the Missisa and Ozhiski ranges, as part of Ontario's Boreal Caribou Monitoring Program.

A two-stage aerial survey with fecal pellet collection was conducted in February 2025 in the Nipigon Range and a two-stage aerial survey with fecal pellet collection and demographic classification was conducted from late January to mid-March 2025 in the Spirit and Swan ranges. All observations and signs of Boreal Caribou were documented during the aerial surveys.

Additionally, from mid-February to mid-March 2025, 105 adult female caribou were captured by net-gun from a helicopter and fitted with GPS collars in four ranges: 38 in Berens, 26 in Churchill, 33 in Kinloch and eight in Sydney. Fecal pellet and hair samples were collected from these caribou for use in genetic analysis. All locations and the age and sex of observed caribou were documented during the flights to locate caribou for collaring.

Between 2019 and 2024, more than 150 adult female caribou were collared and monitored in the Missisa and Ozhiski ranges combined. Minimum animal counts were obtained using a systematic two-stage (fixed-wing and rotary-wing) aerial survey in the Ozhiski Range in 2018 and from counts of caribou observed during collaring efforts in the Ozhiski and Missisa ranges from 2019 to 2024.

The Ontario Boreal Caribou Monitoring Program webpage includes information on the single-stage rotary-wing distance sampling aerial surveys of the Brightsand, Churchill, Kesagami and Kinloch ranges that were conducted in early 2023, and of the Berens and Sydney ranges conducted in early 2024. This report is an addendum to those reports and additional background and context related to the monitoring program can be found in the 2023 report.

Additional work is underway or planned under the monitoring program to generate information on the status of Boreal Caribou in Ontario.

# 2 METHODOLOGY

This section outlines the methodology that was used for:

- The 2025 aerial surveys (with fecal pellet collection) conducted in the Nipigon, Spirit, and Swan ranges.
- The 2025 GPS collaring conducted in the Berens, Churchill, Kinloch and Sydney ranges.

- The aerial surveys and GPS collaring conducted in the Missisa and Ozhiski ranges from 2018 to 2024.

The 2025 aerial surveys and GPS collaring, both with fecal pellet collection, provide information to support two lines of evidence related to population state: population size and population trend (MNRF 2014a). The research undertaken on the Missisa and Ozhiski ranges from 2018 to 2024 provides information on population size and population trend.

Table 1 indicates how the 2025 aerial surveys, fecal DNA studies, GPS collaring and cumulative disturbance estimation, as well as the research on Missisa and Ozhiski ranges, contribute to the collection of information to support updated Integrated Range Assessments (MNRF 2014a).

*Table 1. The 2025 aerial surveys, fecal DNA studies, GPS collaring and cumulative disturbance estimation, and the research on the Missisa and Ozhiski ranges, as they relate to the four lines of evidence used to complete an Integrated Range Assessment (MNRF 2014a).*

| | **Line of Evidence** | **Measure** | **Information provided in this report** |
|---|---|---|---|
| Population state | Population size | Minimum Animal Count (the number of individual caribou observed). | A count of visually observed caribou is available for Nipigon, Spirit, Swan, Berens, Churchill, Kinloch, Missisa, Ozhiski and Sydney ranges.<br><br>A count of individual caribou based on genetic analysis of fecal pellet samples is available for Nipigon, Spirit and Swan ranges. |
| | | Population density (the number of caribou per square kilometre). | Not estimated. |
| | | Population size (based on population density which is used to determine range-level population size estimates). | Not estimated. |
| | Population trend | Recruitment rate (the number of calves per 100 adult females). | Estimated for the Swan, Missisa and Ozhiski ranges (sample size was too low in Spirit and Nipigon ranges). |
| | | Survival (the proportion of adult females that survive one year). | Estimated for Missisa and Ozhiski ranges. |
| | | Demographic structure (the number of adult females, adult males, adults of unknown sex, and calves). | This information is reported for Nipigon, Spirit, Swan, Berens, Churchill, Kinloch and Sydney ranges. |
| | | Group size (the average number of caribou per group observed). | This information is reported for Nipigon, Spirit, Swan, Berens, Churchill, Kinloch and Sydney ranges. |
| Habitat state | Disturbance Assessment | Cumulative disturbance (estimate of the amount of natural and anthropogenic disturbance in a range). | Estimated for Nipigon, Spirit, Swan, Missisa, Ozhiski, James Bay, Berens, Churchill, Kinloch and Sydney ranges. |
| | Habitat assessment (amount and arrangement) | Habitat amount and arrangement for each range. | Not applicable. |

## 2.1 2025 Aerial Surveys with Fecal Pellet Collection and Demographic Classification

The 2025 aerial surveys in Nipigon, Spirit and Swan ranges were two-stage aerial surveys with fecal pellet collection. In addition, efforts in the Spirit and Swan ranges also included caribou group demographic classification as one of the primary objectives. Demographic classification also occurred as a result of two-stage aerial surveys of the Nipigon Range but was incidental rather than a primary objective. Detailed survey methods are provided in Appendix 1. The aerial survey of the Nipigon Range was completed by Natural Resource Solutions Inc., and the aerial surveys of the Spirit and Swan ranges were completed by AtkinsRéalis Canada Inc., all on behalf of MECP.

Stage One of the aerial surveys consisted of fixed-wing aircraft flying transects (parallel northeast-southwest flightlines) spaced 4.6 km apart in the Nipigon Range and 9.2 km apart in the Spirit and Swan ranges. This spacing allowed for transects to intersect the centroids of hexagons used for probability of occupancy aerial surveys during Integrated Range Assessments from 2009 to 2011 (MNRF 2014a, 2014b, 2014c, 2014d, 2014e, 2014f). For safety reasons (e.g., concerns about flying over open water or ice), some portions of transects that overlapped with Lake Nipigon, in the Nipigon Range, were removed. Survey efforts consisted of flying the transects and searching for caribou and their tracks in the snow. The details and location of caribou observations were recorded along with information on other species including wolves, moose and wolverine. When possible, high-resolution photographs were taken of observed caribou, and other wildlife, to assist with assessing group demographics.

Stage Two of the aerial surveys involved using rotary-wing aircraft to visit selected locations to collect fecal pellet samples at sites where caribou activity had been identified during Stage One. The objective was to achieve an even spatial distribution of samples across the survey area while collecting samples from as many areas of caribou use as possible.

Sampling locations were prioritized based on a review of Stage One survey results. Each observation was assessed according to the presence of caribou, confidence in track identification, freshness of tracks (new or old), and the type of activity observed (e.g., few tracks, numerous tracks, or feeding craters). Sites with fresh, high-confidence cratering were given the highest priority, as these conditions increased the likelihood of efficiently locating fecal pellets. Older observations and low-confidence tracks were assigned lower priority. Where potential sampling sites were located within one kilometre of each other and connected by visible trails, the site with the freshest tracks was selected.

Logistical considerations also informed site selection, including maximizing the number of locations that could be visited in a day while balancing aircraft efficiency and fuel requirements.

At each Stage Two site, the number of caribou using the area was estimated based on the number of distinct fecal pellet groups and tracks observed. To maximize the likelihood of obtaining a sample from each individual caribou, approximately 1.5 fecal samples were

collected per estimated number of caribou at each site. A sample was defined as a bag of pellets from a single, distinct pellet group, containing a minimum of 20 pellets. For example, if 10 caribou were estimated to have used a site, approximately 15 fecal samples (15 bags) were collected. Each fecal sample was stored individually, labelled with a unique identifier, and kept frozen until DNA extraction.

For the Stage Two rotary-wing demographic classification survey flights in the Spirit and Swan ranges, surveyors used the caribou activity sites identified during the Stage One aerial survey to locate caribou groups, photograph the group and record the demographic composition of observed caribou groups. Any caribou groups detected incidentally while travelling to and between targeted activity sites were also photographed and recorded. In contrast, for the Nipigon Range, demographic classification was incidental rather than the primary objective of the aerial surveys; photographs of caribou were taken if detected during flights.

## 2.2 2025 GPS Collaring

The 2025 GPS collaring was conducted by Fireweed Helicopters Ltd. and sub-contractor DueNorth Helicopters Inc., on behalf of the MECP, in the Berens, Churchill, Kinloch and Sydney ranges following the methods outlined in Appendix 2. The work involved using a rotary-wing aircraft to locate, net-gun capture, and collar 105 adult female caribou. Fecal pellet and hair samples were collected from all collared adult female caribou to support future genetic analysis. Other biological data was also collected from the collared caribou including neck circumference, chest girth, hind foot length, total length, body condition, presence of antlers, and presence of a calf at heel. Age or age class was estimated based on dentition wear, body size and physical appearance (Cattet 2011). Additionally, all caribou groups encountered during flights were demographically classified. Observations of caribou sign (e.g., tracks and cratering) were not recorded.

Periodically, a second rotary-wing aircraft (scouting crew) was used to assist in locating caribou, and during these flights, observations of caribou were recorded.

The main purposes of collaring adult female caribou are to estimate:

- Annual adult survival rate by range, based on individual fates of collared caribou recorded over the course of a year (e.g., mortalities, collar failures, survival).
- Annual calf recruitment rate by range based on subsequent collar-targeted caribou group demographic classification aerial surveys, conducted from early February to mid-March, when calves born the previous spring are approximately 10 months old.

The number of collars that were targeted to be deployed in each range was determined based on the number of adult female caribou already collared within the range and the estimated population size of the range. For reliable survival estimates, a minimum of 35 collared adult females for a minimum of three years is recommended in medium-to-large sized populations (i.e., populations of more than 100 individuals) or 20 to 30 collared adult females in small populations (i.e., populations of less than 100 individuals) (MNR, unpublished data). However,

it is not always possible to achieve target collar numbers due to a variety of factors, including weather conditions and the number of adult female caribou observed. The targeted number of collars for deployment in winter 2025 based on these factors is shown in Table 2 as is the number of collars deployed.

*Table 2. The estimated population size, number of existing deployed collars, number of collars targeted to be deployed, and number of collars deployed for the Berens, Churchill, Kinloch and Sydney ranges in 2025.*

| Range | Estimated Population Size | Number of Existing Collars Deployed as of January 2025 | Targeted Number of Collars to be Deployed | Number of New Collars Deployed in 2025 | Total Number of Collars Deployed at End of Winter 2025 |
|---|---|---|---|---|---|
| Berens | More than 100 | 12 | 35 | 38 | 50 |
| Churchill | More than 100 | 15 | 25 | 26 | 41 |
| Kinloch | More than 100 | 13 | 30 | 33 | 46 |
| Sydney | Less than 100 | 0 | 20 | 8 | 8 |

## 2.3 2025 Fecal DNA Analysis

Collection of fecal pellet samples during aerial surveys (Nipigon, Spirit and Swan ranges) and fecal pellet and hair samples during GPS collaring (Berens, Churchill, Kinloch and Sydney ranges) occurred for genetic profiling.

Fecal pellet samples collected during aerial surveys underwent genotyping in 2025 at Trent University using established conservation genomics protocols detailed by Liu et al. (2024).

The analysis of each fecal sample yielded:

- Identification of unique individual caribou through genotype assignment.
- Determination of sex based on sex-linked genetic markers.
- Comparison of caribou genotypes to those in Trent University's data repository to determine if individual caribou have been sampled previously.
- Complete microsatellite genotype profiles to be archived in a data repository by Trent University.

Fecal pellets containing low amounts of degraded host DNA, high levels of substances that interfere with laboratory methods, and large amounts of non-target DNA were considered unsuitable and not included in the analysis.

## 2.4 2025 Analytical Approach

### 2.4.1 Population Distribution and Size

Winter caribou distribution for each of the seven ranges studied in 2025 was derived by recording locations of observed caribou and their tracks in the snow during aerial surveys and observed caribou during GPS collaring. This single point-in-time data confirms caribou presence at observed locations during winter. However, due to the challenges in detecting

caribou, the brief duration of the surveys, and incomplete range coverage during flights, the absence of observations in portions of ranges cannot be interpreted as definitive evidence that caribou are not present in those areas. In the same vein, there may be more caribou than the number observed. Comparable surveys within a relatively short timeframe (e.g., five years) can further support determination of winter caribou distribution, as can location information gained through GPS collaring. In addition, winter observations in the Spirit and Swan ranges likely include Eastern Migratory Caribou as well as Boreal Caribou. Both are known to be in the area during winter and are not visually distinguishable.

Minimum Animal Counts (MACs) are provided in this report based on:

- The visual observation of caribou during the 2025 aerial surveys (Nipigon, Spirit, Swan) and GPS collaring flights (Berens, Churchill, Kinloch, Sydney).
- The number of unique individual caribou identified through genetic analysis of fecal pellet samples for the Nipigon, Spirit and Swan ranges.

### 2.4.2 Population Trend

#### 2.4.2.1 Survival Rate

The 2025 aerial surveys were not designed to update survival rate estimates. Where the sample size was sufficient (i.e., Swan Range), population trend was assessed based on combining a spectrum of potential adult female survival rates, (i.e., ‘low’ (0.80), ‘medium’ (0.85) and ‘high’ (0.88)) derived from Environment Canada (2008, 2011) with 2025 survey-based estimates of calf recruitment to estimate the range of potential population growth rates.

GPS collaring completed in 2025 for four ranges (Berens, Churchill, Kinloch and Sydney) provides a basis for estimating survival in subsequent years based on annual adult female mortality.

#### 2.4.2.2 Recruitment Rate

For the 2025 surveys, sample size was sufficient in the Swan Range to derive a preliminary recruitment rate estimate and too small in the Nipigon and Spirit ranges.

GPS collaring completed in 2025 for four ranges (Berens, Churchill, Kinloch and Sydney) provides a basis for estimating recruitment in subsequent years based on calf survival.

#### 2.4.2.3 Demographic Structure

During aerial surveys in the Nipigon, Spirit and Swan ranges and GPS collaring in the Berens, Churchill, Kinloch and Sydney ranges, information was collected to determine sex (male, female) and general age class (adult, calf) based on criteria including body size, presence of a vulva patch or penis sheath, and snout proportions. Demographic structure was also assessed via fecal pellet genotyping in the Nipigon, Spirit and Swan ranges.

*Adult Sex Ratios*

In general, adult sex ratios derived from aerial surveys and fecal pellet genotyping are broadly similar, although pellet genotyping typically includes calves and may bias estimates toward males because calf sex ratios are generally closer to parity than the female-biased sex ratios observed among adults in caribou populations.

Female-biased adult sex ratios are expected in caribou populations due to lower survival and longevity of adult males and where the rate of female and male calves in a population is expected to be equivalent (Bergerud 2000; COSEWIC 2014; MNRF 2014a). Very female-heavy sex ratios are interpreted carefully, as they can reflect differences in survival or limits in how data are collected, rather than indicating a healthier caribou population (COSEWIC 2014; Environment Canada 2011).

- Bergerud (1978, 2000) demonstrates that adult sex ratios in caribou are highly variable and typically female-biased, often ranging from approximately 30 to 60 males per 100 females, reflecting differences in harvest pressure, predation, and population dynamics.
- Rudolph et al. (2017) reported an average baseline condition of 156 adult females to 100 adult males (or 64 adult males per 100 adult females) based on reporting of average baseline conditions for multiple Boreal Caribou populations.

Following MNRF (2014a), observed sex ratios were used to estimate the number of adult females within the uncategorized adult caribou group, to derive an adjusted estimate of the adult female population for recruitment calculations (calves:100 adjusted adult females). Adult female-to-male ratios were calculated by range using observed adults only.

*Proportion of Calves*

Proportion of calves in the total population was calculated by dividing the number of observed calves in a range by the total number of animals classified by age. After calculating the percentage of calves in the total population, Wilson confidence intervals were used to express the uncertainty around the estimate, recognizing that it is based on survey counts rather than a complete census. Wilson confidence intervals were used instead of the standard 95% confidence interval because percentage of calves comes from counting animals in surveys (yes/no outcomes), not from continuous data. Wilson intervals are better suited to this type of data and give more reliable results, especially with the smaller sample sizes that are typical of caribou calf surveys (Brown et al. 2001; Ellington et al. 2020; Wilson 1927).

*Group Size*

Average group size was estimated from direct observations of caribou groups and the counted number of caribou present. A *t*-test–based 95% confidence interval was used to describe uncertainty around group size estimates, accounting for sample size and variability among observed groups (Zar, 2010). All caribou groups were considered in the estimation of group

size, regardless of whether 50% or more of a group was successfully classified to age class and sex.

Group sizes were compared to reported group sizes in Boreal Caribou groups across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5). These reported group sizes are typically small and variable, with many groups consisting of five or fewer individuals. Smaller, more dispersed groups are generally associated with low-density populations and predator avoidance, whereas larger groups may occur where densities are higher or risk is reduced (Bergerud 2000; Rettie and Messier 1998).

## 2.5 Research on Missisa and Ozhiski Ranges (2018-2024)

From 2018 to 2024, MNR completed a research program in the Missisa and Ozhiski ranges to determine population size, population trend (based on estimates of survival and recruitment), habitat use and movements of caribou. This report provides highlights of the methodology and results. Publication of more detailed information is planned.

The following activities were completed in the Ozhiski Range from 2018 to 2024:

- A two-stage aerial survey with demographic classifications was conducted in early 2018. Stage One was completed with a fixed-wing aircraft, along transects covering the whole of the range and Stage Two was completed with a rotary-wing aircraft focusing on areas where caribou and their sign were identified in Stage One. Caribou encountered during Stage Two flights were counted and classified by age and sex for determination of a MAC and estimation of demographic measures including recruitment rate.
- 51 GPS collars were placed on adult female caribou from March 18 to 21, 2019; 20 replacement collars were placed on adult female caribou from February 21 to 24, 2021; and 30 replacement collars were placed on adult female caribou from March 6 to 8, 2022. Data from the collars was used to estimate annual survival, habitat use and movement of caribou, and the count of caribou observed in 2019 was used to determine the MAC for the range. During collaring deployment efforts, caribou group demographic information was collected and was used to estimate recruitment rates.

The following activities were completed in the Missisa Range from 2019 to 2024:

- 51 GPS collars were placed on adult female caribou from February 25 to March 6, 2020 and seven replacements placed on adult female caribou from February 21 to 24, 2021. Data from the collars was used to estimate annual survival, habitat use and movement of caribou, and the count of caribou observed in 2020 was used to determine the MAC for the range. During collaring deployment efforts, caribou group demographic information was collected and was used to estimate recruitment rates.

# 3 RESULTS OF 2025 AERIAL SURVEYS WITH FECAL PELLET COLLECTION AND DEMOGRAPHIC CLASSIFICATION

## 3.1 Nipigon Range

### 3.1.1 Context

The Nipigon Range is approximately 38,600 km² and is located centrally in northern Ontario. It neighbours the Brightsand, Kinloch, Missisa, Ozhiski and Pagwachuan ranges, as well as the Discontinuous Distribution. The Nipigon Range includes all of Lake Nipigon (4,500 $km^2$), a portion of Wabakimi Provincial Park, four ecodistricts, and calving and nursery areas important to caribou including Lake Nipigon, as well as Onaman, Esnagami, Mojikit, Ogoki, and Caribou lakes. The range shows significant human disturbance in the south, with increasing road and forestry activity in the north.

#### 3.1.1.1 Integrated Range Assessment Report

This section provides a summary of the approach for the Integrated Range Assessment undertaken from 2010 to 2013 for the Nipigon Range, the results of which were published in 2014 (MNRF 2014e). The report is available at: Integrated Range Assessment for Woodland Caribou and their Habitat - Nipigon Range 2010.

A two-stage aerial survey was conducted during February and March 2010. Observations of caribou and their sign were recorded first during the fixed-wing hexagon-based survey. During the rotary-wing flights, caribou were identified as adults, males or females, calves, or unknown age and/or sex. Data collected during the survey was used to estimate population state metrics including a MAC of 172. However, the total number of caribou within the Nipigon Range was likely considerably more.

Targeted recruitment surveys were completed in late winter of 2011, 2012, and 2013. The annual recruitment rate estimates (number of calves per 100 adult females) were 36.6 (2011), 39.2 (2012) and 22.9 (2013). Apart from 2013, estimated annual recruitment rates were above expected values thought to support a stable to increasing population trend (i.e., 28.9 calves per 100 adult females, assuming an adult female survival rate of 85%, Environment Canada 2008, 2011). Variability around the calculated recruitment estimates was high based on 95% confidence intervals.

Adult female caribou were fitted with GPS collars in February 2010 (six caribou), March 2011 (47 caribou), and February 2012 (nine caribou). Annual survival estimates varied from 80% to 88% based on three biological years of data and when modelled with the calf recruitment levels resulted in a geometric mean of $\lambda = 0.98$. This estimate suggested the population may

be declining, but the metric was close to the point where the population may be considered stable.

A geospatial analysis, as part of the 2014 IRAR, estimated that 38.4% of the range was characterized as naturally (4.6%) or anthropogenically disturbed (33.4%) (MNRF 2014e). The resulting likelihood of stable or increasing population growth was estimated to be 55% and at that level it was uncertain whether the Nipigon Range could sustain the caribou population. However, analysis of the amount and arrangement of caribou habitat, through the calculated Simulated Ranges of Natural Variation indicated alignment with that expected in a natural landscape (MNRF 2014e).

The Integrated Range Assessment concluded that risk to caribou was uncertain within the Nipigon Range and it was uncertain whether range condition was sufficient to sustain caribou (MNRF 2014e).

#### 3.1.1.2 Monitoring Activities since the 2014 IRAR

Ongoing caribou surveys have been conducted within Forest Management Units overlapping Nipigon Range through activities related to Forest Management Planning. While results from these surveys do not provide estimates of recruitment, survival, or population size or trend, they do provide additional sub-range context of caribou distribution during the summer and winter survey periods.

Cumulative disturbance analysis was completed by MNR to estimate range-level disturbance for 2017 through 2023 (Table 3). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 3. Cumulative disturbance estimates for 2017 to 2023 in the Nipigon Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|
| Anthropogenic (%) | 13.1 | 13.1 | 13.0 | 13.0 | 12.9 | 12.8 | 12.8 |
| Zone of Influence (%) | 20.8 | 21.0 | 21.1 | 21.3 | 21.4 | 21.6 | 21.9 |
| Natural (%) | 6.0 | 6.0 | 6.0 | 6.1 | 6.1 | 6.1 | 7.3 |
| **Total (%)** | **39.9** | **40.1** | **40.1** | **40.3** | **40.4** | **40.4** | **42.0** |

Between 2020 and 2024, MNR Research Scientists and colleagues published several studies examining factors influencing caribou survival based on collaring efforts throughout a portion of the range. While not meant to infer the status of caribou within the entire Nipigon Range, the results of this research provide information about caribou reproduction and landscape features important for caribou survival in the local area (e.g., Walker et al. 2020, Walker et al. 2024).

A two-stage caribou aerial survey with fecal pellet collection was conducted between February 22 and March 11, 2024 in the Nipigon Range by Environment and Climate Change Canada (ECCC). Stage One was completed with a fixed-wing aircraft, along transects spaced 10 km apart covering the whole of the range. Stage Two was completed with a rotary-wing aircraft to

collect fecal pellet samples. No caribou were observed during either stage of the survey, and caribou tracks were recorded at five sites (ECCC 2026).

### 3.1.2 Results and Discussion

Two-stage aerial surveys with fecal pellet collection of the Nipigon Range were completed from February 4 to 17, 2025. During that time 197 transects totalling 8,824 km were flown by fixed-wing aircraft in the Nipigon Range along a northeast-southwest axis (Stage One survey). Figure 1 shows the stratified fixed-wing flightlines within the Nipigon Range. Transects near and over Lake Nipigon were adjusted due to sharp turns and concerns about flying over open water/ice. The study area was divided into five bands of transects (North, North-Central, Central, South-Central, and South). These bands were used for planning purposes, flight paths, and integrated into fecal sample labelling. Subsequent rotary-wing flights were made to areas of caribou activity to collect fecal pellet samples (Stage Two survey).

Snow station data available within the southeastern portion of the range, from the MNR Geraldton snow station indicated that there was an average of 52 cm of snow on the ground on February 3, 2025, and an average of 56 cm of snow on the ground on February 18, 2025. Based on available Environment Canada historical weather data at the ECCC Geraldton Airport weather station, the average daily temperature between February 4 and 17, 2025 was -18.9°C with the warmest days (February 6) being -8.9°C and the coldest day being -25.1°C (February 11).

Snow station data available within the central-western portion of the range, from the MNR Armstrong snow station indicated that there was an average of 44.5 cm of snow on the ground on January 31, 2025, and an average of 54.1 cm of snow on the ground on February 15, 2025. Based on available Environment Canada historical weather data at the MNR Armstrong climate station, the average daily temperature between February 4 and 17, 2025 was -19.9°C with the warmest days (February 6) being -11.2°C and the coldest day being -27.1°C (February 13). Note, seven of the thirteen survey days had over 75% cloud cover, which can reduce visibility of signs such as tracks and cratering and lower the likelihood of observing caribou.

During the two-stage aerial survey, caribou sign (i.e., tracks, cratering and/or slushing) was observed at 80 locations with 41 caribou observed at nine additional locations throughout the range (Figure 2).

A total of 235 fecal pellet samples were collected from 31 sites (Figure 2). Of the fecal pellet samples collected, seven were unsuitable for analysis. From the remaining 228 samples, genetic analysis identified 133 individual caribou (the MAC). As per Environment Canada (2011) modelling, population sizes over 100 indicate a large enough population that has a minimum 70% probability of not reaching a quasi-extinction threshold of less than ten reproductively active females under stable conditions over 50 years.

A MAC of 133 caribou represents the minimum number of caribou present in the Nipigon Range at the time and for the portion of the range sampled. It is assumed that additional caribou were not sampled through these efforts and that the actual population size is more than 133.

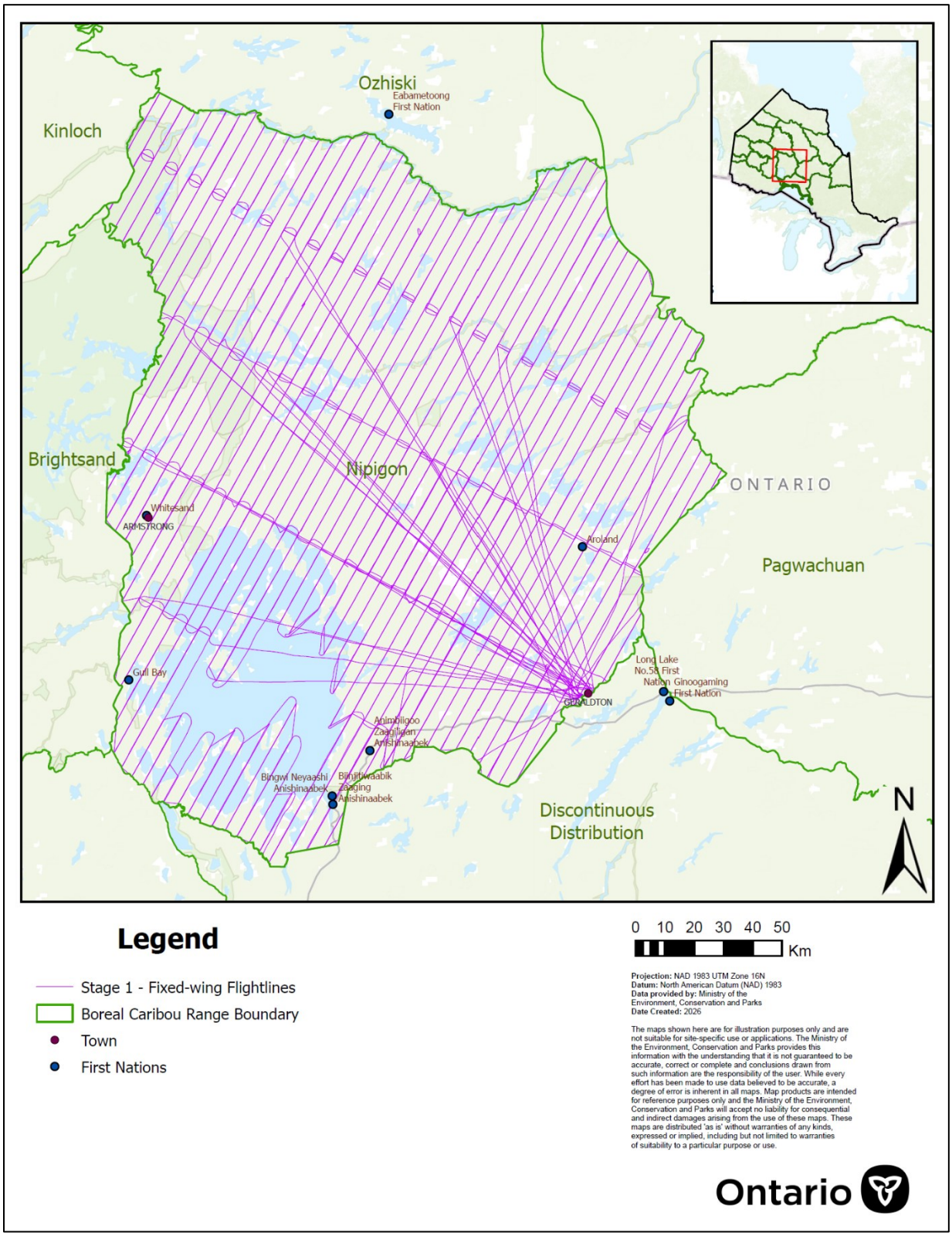


*Figure 1. Fixed-wing flightlines for the 2025 Stage One aerial survey in the Nipigon Range.*

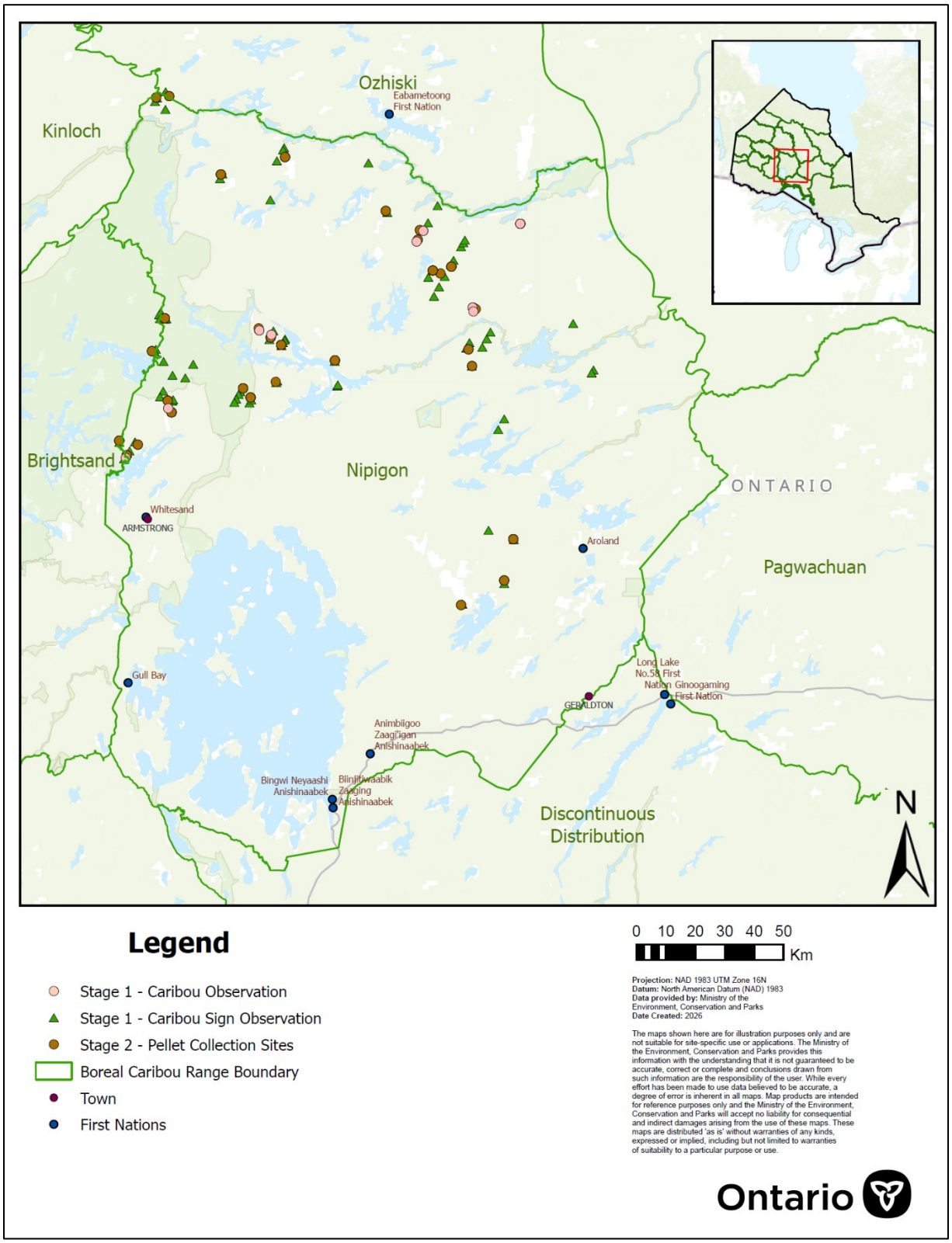


*Figure 2. Observed caribou and caribou sign from the Stage One and Stage Two pellet collection flights with fecal pellet collection sites in the Nipigon Range.*

#### 3.1.2.1 Population Distribution

Distribution mapping for observations of Boreal Caribou and their signs (i.e., tracks, slushing, cratering) during the Nipigon Range survey (including intentional on-transect and incidental off-transect observations from both Stage One and Stage Two fecal pellet collection flights) is shown in Figure 2. The map may not reflect the full winter distribution of caribou in the range due to the difficulty of detecting caribou (e.g., dense forest) and the spacing of flight transects which did not allow for a complete visual survey of the entire range (i.e., there were areas between transects where caribou and sign would not have been seen).

The observed distribution of caribou in the Nipigon Range during the 2025 survey was clustered in the northern portion of the range with some sign observations occurring within the eastern half of the range as well. The areas where caribou were observed during the 2025 survey are generally consistent with caribou observations included in the 2014 IRAR for Nipigon Range with all observations documented in the northern portion of the range (MNRF 2014e). Similarly, both the surveys conducted as part of the 2014 IRAR and those undertaken in 2025 recorded instances of caribou sign in the southern portion of the range. However, unlike the 2014 surveys, the 2025 effort documented no confirmed caribou sign within 35 km of Lake Nipigon.

The 2025 aerial survey is limited in its ability to provide comprehensive understanding of distribution patterns because it includes information from only a single year.

#### 3.1.2.2 Population Trend

*Recruitment and Survival*

The recruitment rate and survival rate were not estimated for the Nipigon Range based on the 2025 aerial surveys as the minimum sample size of 50 calves and adjusted adult females combined for estimating calf recruitment with a reasonable level of certainty was not met.

There were observations of nine groups totaling 41 individual caribou. Moreover, there were only five groups for which demographic classification occurred for more than 50% of the group resulting in a sample size of 19 animals (seven adjusted males, 10 adjusted females, two calves).

*Demographic Structure*

The estimated proportion of calves is below the range required for a stable population (13-15% calves in the population; Bergerud 1992; Bergerud 1996), recognizing the high degree of uncertainty associated with the estimate due to the small sample size. As the demographic classification occurred incidentally in the Nipigon Range and the sample size was small, any interpretation based on the calculated calf ratios should occur cautiously.

The proportion of calves in the Nipigon Range was estimated at 10.5%, with a corresponding 95% confidence intervals of 2.9% (lower confidence interval) to 31.4% (upper

confidence interval). The sample size was two calves in a total of 19 caribou classified by age (17 adults in five groups).

The ratio of 150 adult females to 100 adult males (i.e., 60% adult females and 40% adult males) is roughly approximate to that average baseline condition reported by Rudolph et al. (2017) of 156 adult females to 100 adult males. The sample size of adult caribou that were classified by sex was six males and nine females. Based on the calculated sex ratio of 60% adult females to 40% adult males from the observed animals, applied to the two observed adults of unknown sex, the adjusted number of adult females is 10 and the adjusted number of adult males is seven.

Consideration of unique animal genotypes through fecal pellet collection indicated that 61% of the 133 genotypes were female (82) and 39% male (51). Fecal pellet genotyping does not exclude calves in the assignment of sex. This results in a ratio of 156 adult females to 100 adult males; identical to that average baseline condition reported by Rudolph et al. (2017).

The demographic breakdown of observed caribou in the Nipigon Range is provided in Table 4.

*Table 4. Observed caribou demographics in the Nipigon Range during the 2025 aerial survey.*

| Sample/Groups | Groups | Adults, Sex Unknown | Adult Males | Adult Females | Calves | Unknown Age and Sex | Total | Adjusted Adult Males | Adjusted Adult Females |
|---|---|---|---|---|---|---|---|---|---|
| All | 9 | 14 | 6 | 13 | 2 | 6 | 41 | - | - |
| Groups with less than 50% classified by age and sex removed | 5 | 2 | 6 | 9 | 2 | 0 | 19 | 7 | 10 |

*Group Size*

The average group size estimate is comparable to other reported group sizes in Boreal Caribou groups across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported average group sizes ranging from 4.8 to 5.5).

- The average group size based on all caribou observations (including incidental observations and groups with individuals not identified to age or sex), was 4.6 ± 2.9 (95% confidence intervals of 1.7 (lower confidence interval) and 7.4 (upper confidence interval)).

Some caution should be recognized in comparing group sizes derived from the 2025 aerial surveys as only 41 caribou were observed.

## 3.2 Spirit Range

### 3.2.1 Context

The Spirit Range is approximately 47,000 km$^2$ and is located in northwestern Ontario. It neighbours the Berens, Kinloch, Ozhiski and Swan ranges, as well as the Manitoba border where it shares a common boundary with the Molson Management Unit (one of the designated areas in Manitoba for the monitoring and recovery of Boreal Caribou). It is believed that caribou on both sides of the provincial border utilize similar habitat types and share some level of connectivity across it (MNRF 2014b). The range encompasses the western portion of the Big Trout Lake Ecoregion (2W), and it is comprised of ecodistricts 2W-1, 2W-3 and a small portion of 3S-1. This range has an aggressive fire regime, high frequency of natural disturbance events (e.g., blowdown), and high moose and wolf densities as compared to ranges further east.

#### 3.2.1.1 Integrated Range Assessment Report

This section provides a summary of the approach for the Integrated Range Assessment undertaken from 2009 to 2012 for the Spirit Range, the results of which were published in 2014. The report is available at: Integrated Range Assessment for Woodland Caribou and their Habitat - The Far North of Ontario 2013 (MNRF 2014b).

Two-stage winter distribution surveys were completed in February and March of 2009 and 2010. During the fixed-wing survey, all observations of caribou and signs of their presence were recorded. During subsequent rotary-wing flights, caribou were identified as adults, males or females, calves, or unknown age and sex. Data collected during the survey work was used to estimate population state. Twenty-one GPS collars were deployed between February and March of 2009 and 2010.

Based on winter distribution survey results from 2009 and 2010 the MAC was 373. In addition to the surveys in 2009 and 2010, targeted recruitment surveys were completed 2010 to 2012. The calculated recruitment rates (calves per 100 adult females) were 20.7 (2010), 20.1 (2011) and 12.5 (2012). These estimated recruitment rates are below expected values thought to support a stable to increasing population trend (28.9 calves per 100 adult females, assuming an adult female survival rate of 85%, Environment Canada 2008, 2011). Variability around the calculated recruitment estimates was high based on calculated 95% confidence intervals.

Mean annual adult survival estimate was relatively high (88%), based on three biological years of data, but when combined with the calf recruitment levels, resulted in a declining population trend with a geometric mean of $\lambda = 0.95$. This estimate suggested that the population was declining during the three-year period when vital rate data was collected.

A geospatial analysis, as part of the 2014 IRAR, estimated that 28.6% of the range was characterized as naturally (25.1%) or anthropogenically disturbed (3.5%) (MNRF 2014b). The resulting likelihood of stable or increasing population growth was estimated to be 0.7 and at

this level it is likely the Spirit Range could sustain the caribou population. The Integrated Range Assessment concluded that risk to caribou was intermediate in the Spirit Range. At that time, it was uncertain whether the range was sufficient to sustain caribou.

#### 3.2.1.2 Monitoring activities since 2014 IRAR

Cumulative disturbance analysis was completed by MECP to estimate range-level disturbance for 2017 through 2022 (Table 5). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 5. Cumulative disturbance estimates for 2017 to 2022 in the Spirit Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Anthropogenic (%) | 1.7 | 1.7 | 1.7 | 1.6 | 1.7 | 1.7 |
| Zone of Influence (%) | 3.0 | 3.0 | 3.0 | 3.1 | 3.1 | 3.7 |
| Natural (%) | 18.7 | 19.3 | 20.1 | 19.4 | 19.8 | 19.2 |
| **Total (%)** | **23.4** | **24.0** | **23.8** | **24.0** | **24.6** | **24.6** |

### 3.2.2 Results and Discussion

Two-stage aerial surveys with fecal pellet collection and caribou group demographic classifications of the Spirit Range were completed from January 27 to March 13, 2025. This includes an extended break in surveying between February 15 and March 8, 2025, apart from dedicated demographic survey flights on February 17 and 19, 2025. During survey efforts, 35 transects totalling 5,589 km were flown by fixed-wing aircraft in the Spirit Range along a northeast-southwest axis (Stage One). Figure 3 shows the stratified flightlines along transects within the Spirit Range. Subsequent rotary-wing flights were made to areas of caribou activity to collect fecal pellet samples (Stage Two) and to demographically classify caribou groups. Figure 4 shows the flightlines flown during dedicated demographic survey days on February 17 and 19, and March 13, 2025.

Snow station data available within the central-eastern portion of the range, from the ECCC Weagamow Lake climate station indicated that there was an average of 42 cm of snow on the ground on January 27, 2025, and an average of 62 cm of snow on the ground on March 13, 2025. Based on available ECCC historical weather data at the Weagamow Lake climate station, the average daily temperature between these days was -17.6°C with the warmest days (March 3) being -5°C and the coldest day being -28.9°C (February 13).

During the Stage One fixed-wing aerial survey, 13 groups of caribou were observed totaling 90 individual caribou, and caribou signs (i.e., tracks, cratering and/or slushing) were observed at 543 locations.

During the Stage Two rotary-wing fecal pellet collection flights, 207 fecal samples were collected from 19 sites (Figure 5). Of these samples, 19 were unsuitable for analysis. From the remaining 188 samples, genetic analysis identified 113 individual caribou (the MAC).

During the Stage Two rotary-wing demographic classification flights, 116 caribou (the MAC), belonging to 11 groups, were observed (Figure 4).

As per Environment Canada (2011) modelling, population sizes over 100 indicate a large enough population that has a minimum 70% probability of not reaching a quasi-extinction threshold of less than ten reproductively active females under stable conditions over 50 years.

A MAC of 116 caribou represents the minimum number of caribou known to occur in the Spirit Range at the time and over the portion of the range that was sampled. It is assumed that additional caribou were not sampled through these efforts and that the actual population size is more than 116.

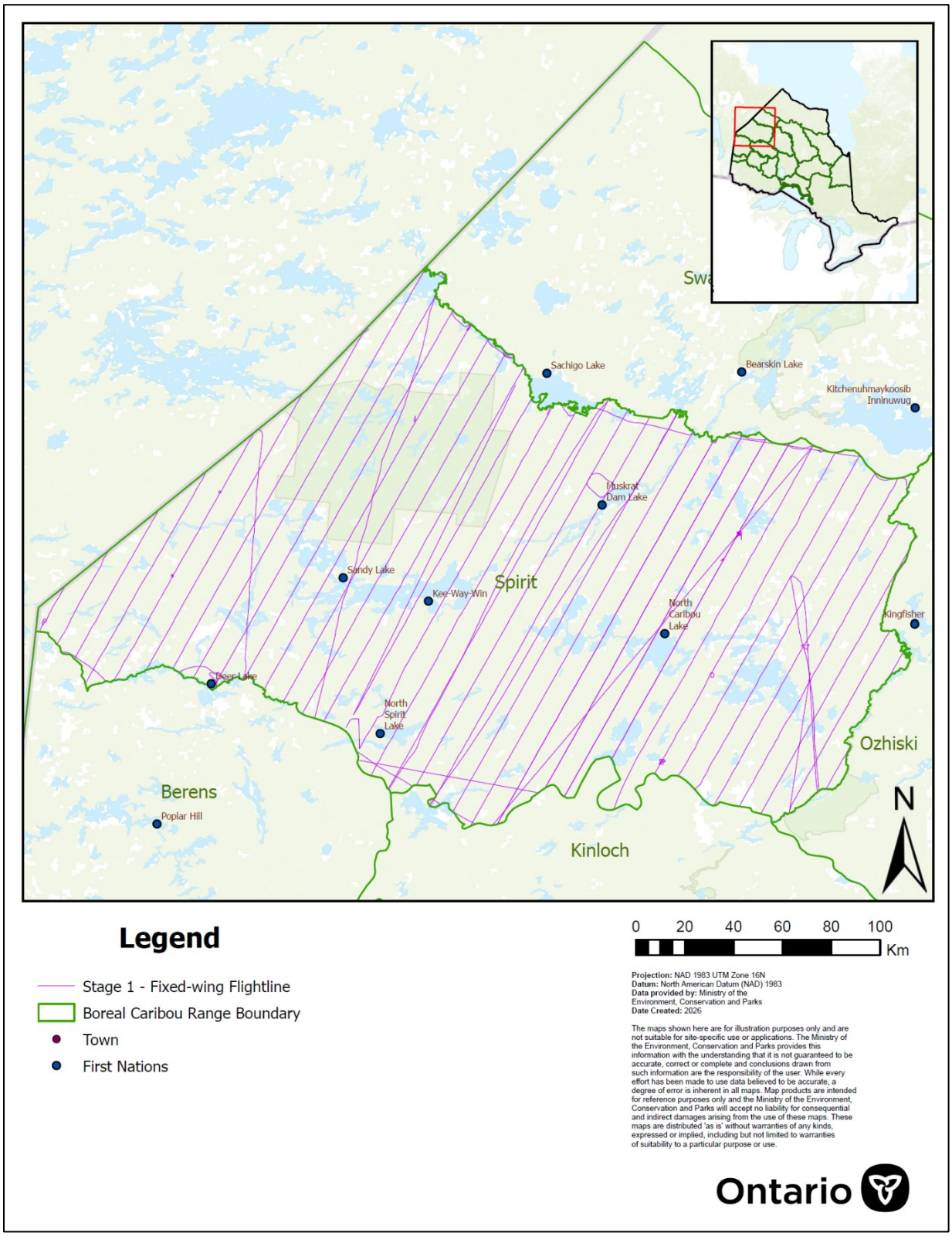


*Figure 3. Fixed-wing flightlines for the 2025 Stage One aerial survey in the Spirit Range.*

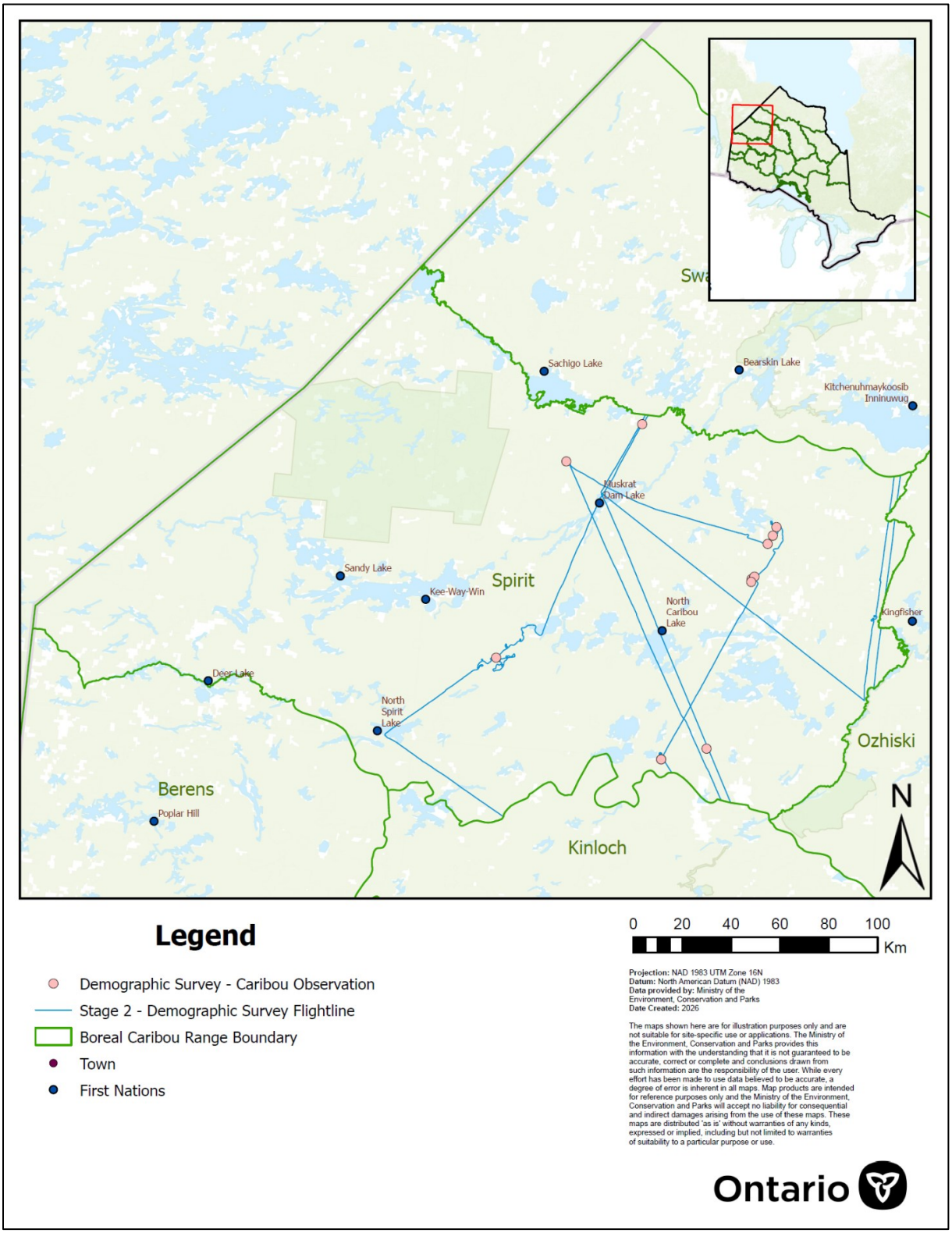


*Figure 4. Observed caribou with flightlines from the Stage Two rotary-wing demographic classification survey in the Spirit Range.*

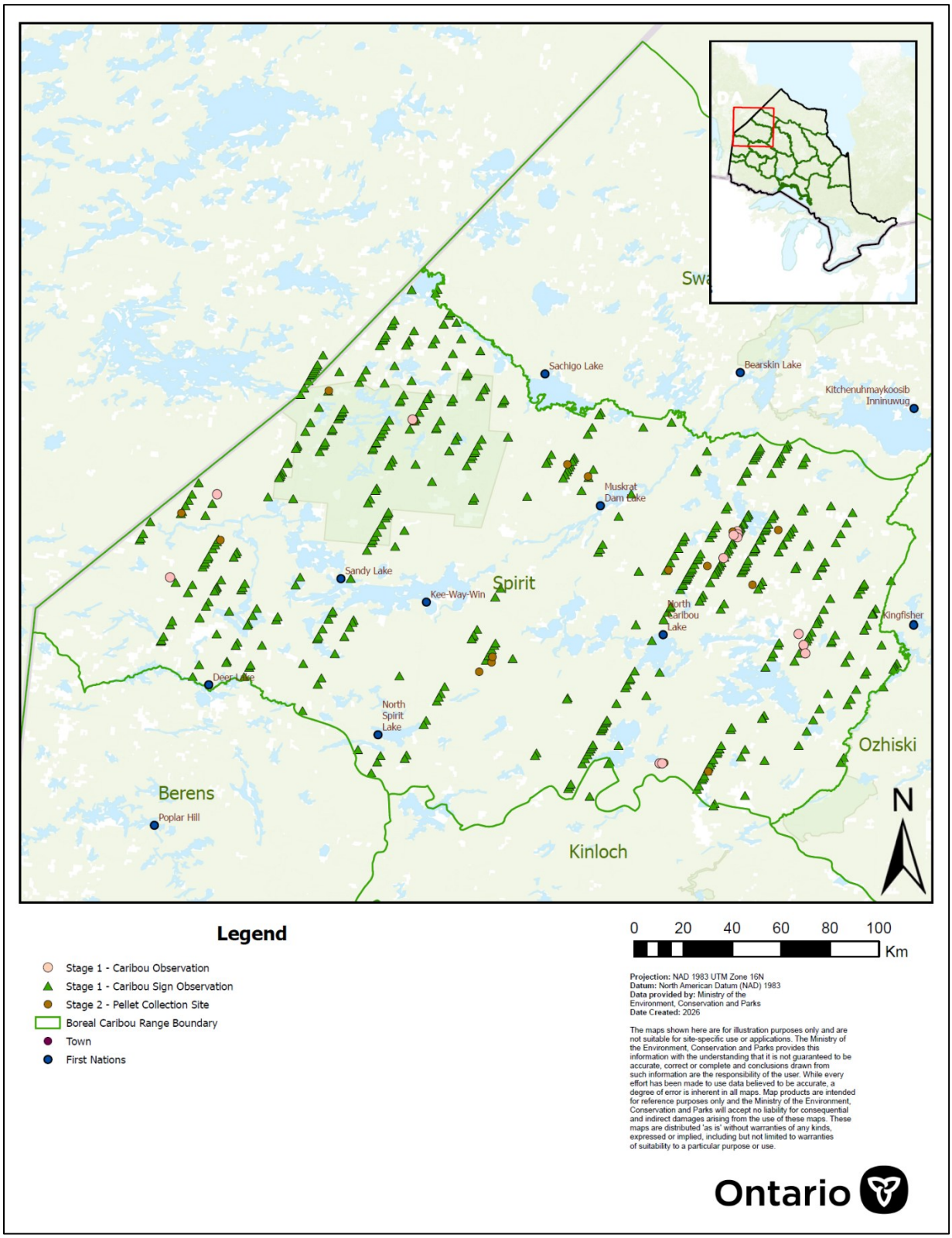


*Figure 5. Observed caribou and caribou sign from the Stage One survey with fecal pellet collection sites from the Stage Two pellet collection flights in the Spirit Range.*

#### 3.2.2.1 Population Distribution

Distribution mapping for observations of caribou and their signs (i.e., tracks, slushing, cratering) during the Spirit Range survey (including Stage One intentional on-transect and incidental off-transect observations and dedicated demographic flight observations) is shown in Figure 5. The map may not reflect the full winter distribution of caribou in the range due to the difficulty of detecting caribou (e.g., dense forest) and the spacing of flight transects which did not allow for a complete visual survey of the entire range (i.e., there were areas between transects where caribou and sign would not have been seen).

The observed distribution of caribou in the Spirit Range during the 2025 survey was throughout the range with fewer observations in the centre of the range than the western and eastern sides. The areas where caribou were observed during the 2025 survey differed from the caribou sign observations included in the 2014 IRAR for Spirit Range where most observations were documented in the central and eastern portions of the range and where the western portion of the range showed little caribou activity.

The 2025 aerial survey is limited in its ability to provide comprehensive understanding of distribution patterns because it includes information from only a single year.

#### 3.2.2.2 Population Trend

Two samples of data were collected and analyzed separately for the Spirit Range to avoid double counting, as individuals could be re-observed across survey windows:

- Sample A: 90 caribou photographed during Stage One fixed-wing flights.
- Sample B: 116 caribou photographed during Stage Two rotary-wing flights.

*Recruitment and Survival*

A recruitment rate and survival rate were not estimated for the Spirit Range based on the 2025 aerial surveys as the minimum sample size of 50 calves and adjusted adult females combined for estimating calf recruitment with a reasonable level of certainty was not met.

- For Sample A, there were observations of 13 groups totaling 90 individual caribou. However, there were only five groups for which demographic classification occurred for more than 50% of the group resulting in a sample size of 20 caribou (eight adjusted males, 10 adjusted females, two calves).
- For Sample B, there were observations of 11 groups totaling 116 individual caribou. However, there were only nine groups for which demographic classification occurred for more than 50% of the group resulting in a sample size of 54 animals (16 adjusted males, 37 adjusted females, one calf).

*Demographic Structure*

The proportion of calves is below the range required for a stable population (13-15% calves in the population; Bergerud 1992; Bergerud 1996), recognizing the high degree of uncertainty associated with the estimate due to small sample sizes.

- For Sample A, the estimated proportion of calves in the Spirit Range is 10.0% (95% confidence intervals of 2.8% (lower confidence interval) and 30.1% (upper confidence interval). The sample size is two calves in a total of 20 caribou classified by age (18 adults in five groups).
- For Sample B, the estimated proportion of calves in the Spirit Range is 1.9% (95% confidence intervals of 0.3% (lower confidence interval) and 9.8% (upper confidence interval). The sample size is one calf in a total of 54 caribou (53 adults in nine groups).

For Sample A, the ratio of 113 adult females to 100 adult males (i.e., 53% adult females and 47% adult males) is lower than that average baseline condition reported by Rudolph et al. (2017) of 156 adult females to 100 adult males. The sample size of adult caribou that were classified by sex was nine females and eight males. Based on the sex ratio of 53% adult females to 47% adult males, from the observed animals, applied to the one adult of unknown sex, the adjusted number of adult females increases to 10 and the number of adult males remains at eight.

For Sample B, the ratio of 225 adult females to 100 adult males (i.e., 69% adult females to 31% adult males) is higher than that average baseline condition reported by Rudolph et al. (2017) of 156 adult females to 100 adult males. The sample size of adult caribou that were classified by age was 36 females and 16 males. Based on the sex ratio of 69% adult females to 31% adult males from the observed animals, applied to the one adult of unknown sex, the adjusted number of adult females increases to 37 and the number of adult males remains at 16. The larger sample size for Sample B (52 animals) provides a more informed basis for evaluating adult sex ratios compared to Sample A (17 animals).

The collection of fecal pellets for the identification of unique individuals in the Spirit Range indicated the presence of 113 unique animals. Fecal pellet genotyping does not exclude calves in the assignment of sex. Of these 113 unique animals, 69 (61%) were identified as females with the remaining 44 animals (39%) considered to be males. This ratio is what is expected from an adult boreal caribou sex ratio, as reported by Rudolph et al. (2017).

Differences in observed sex ratios based on Sample A, Sample B and the fecal pellet genotype information is likely attributable to visual confirmation of primary sexual characteristics (vulva patch and penis sheath) frequently constrained by animal orientation, distance, lighting, and image resolution (when using photographic information), resulting in a proportion of animals of unknown sex (Alo 2021). In contrast, genetic sexing is not affected by visual constraints (Ahlering et al. 2011). Adult sex ratios derived from aerial surveys and fecal pellet genotyping are broadly similar, although fecal pellet genotyping typically includes calves

and may bias estimates towards males because calf sex ratios are generally closer to parity than the female-biased sex ratios observed among adults.

The demographic breakdown of the observed caribou, for the Spirit Range, is provided in Table 6.

*Table 6. Observed caribou demographics in the Spirit Range during the 2025 aerial survey.*

| Sample/ Groups | Groups | Adults, Sex Unknown | Adult Males | Adult Females | Calves | Unknown Age / Sex | Total | Adjusted Adult Males | Adjusted Adult Females |
|---|---|---|---|---|---|---|---|---|---|
| Sample A (all groups) | 13 | 1 | 17 | 14 | 2 | 56 | 90 | - | - |
| Sample B (all groups) | 11 | 1 | 19 | 47 | 2 | 47 | 116 | - | - |
| Sample A (groups with more than 50% classified by age and sex) | 5 | 1 | 8 | 9 | 2 | 1 | 21 | 8 | 10 |
| Sample B (groups with more than 50% classified by age and sex) | 9 | 1 | 16 | 36 | 1 | 16 | 70 | 16 | 37 |

*Group Size*

The average group sizes in the Spirit Range are larger than reported Boreal Caribou group sizes across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5).

- For Sample A, the average group size was 6.9 ± 3.2 (95% confidence intervals of 3.7 (lower confidence interval) and 10.1 (upper confidence interval)).
- For Sample B, the average group size was 10.6 ± 5.3 (95% confidence intervals of 5.3 (lower confidence interval) and 15.8 (upper confidence interval)).

For Sample B, the higher average group size is likely partly due to the inclusion of one group of 30 animals which could be attributed to an Eastern Migratory Caribou group which have average group sizes larger than that of Boreal Caribou (COSEWIC 2017). The remaining groups ranged between two and 16 animals.

Above-average caribou group sizes can be associated with environmental and demographic factors, including aggregation during winters with above average snowfall and, in some cases, changing population conditions (COSEWIC 2014; Jung et al. 2019). During the winter of 2025 there were below average snowfall conditions in northern Ontario, including that area overlapping the Spirit Range. Further observations of caribou groups would improve the

precision of average group-size estimates by reducing sampling variability, allowing changes in group size over time to be interpreted more confidently as potential indicators of changing population conditions rather than chance variation (Jung et al. 2019; Kasozi and Montgomery 2020).

## 3.3 Swan Range

### 3.3.1 Context

The Swan Range is approximately 25,000 $km^2$ and is located in northwestern Ontario. It neighbours the Missisa, Ozhiski and Spirit ranges, and the Manitoba border. The degree of caribou immigration and emigration across the Swan Range boundaries is unknown, although collaring data reported in the 2014 Integrated Range Assessment demonstrated significant movement northward into the Hudson Bay Lowland, as well as east into the Missisa Range, and west into Manitoba (MNRF 2014b). The range encompasses the western portion of the Big Trout Lake Ecoregion (2W) and is comprised of ecodistricts 2W-1, 2W-3 and a small portion of 2W-2. The Swan Range captures the northwestern end of the Shield-Lowland interface. The northern boundary is defined by the Northern Taiga Ecoregion, which approximates the shift from predominantly Boreal Caribou to Eastern Migratory Caribou, particularly during the summer when Eastern Migratory Caribou reside closer to Hudson Bay (Berglund et al. 2014). Large numbers of Eastern Migratory Caribou have been observed moving into this range each winter suggesting an area of overlap between Boreal Caribou and Eastern Migratory Caribou distribution within the Swan Range.

#### 3.3.1.1 Integrated Range Assessment Report

This section provides a summary of the approach for the Integrated Range Assessment undertaken from 2009 to 2011 for the Swan Range, the results of which were published in 2014. The report is available at: Integrated Range Assessment for Woodland Caribou and their Habitat - The Far North of Ontario 2013 (MNRF 2014b).

Two-stage winter distribution surveys were completed in February and March of 2009 and 2011. During the fixed-wing survey, all observations of caribou and signs of their presence were recorded. During subsequent rotary-wing flights, caribou were identified as adults, males or females, calves, or unknown age and sex. Six GPS collars were deployed between February and March of 2009 and 2010.

Based on winter distribution survey results from 2009 and 2011 the MAC was 491. In addition to the surveys in 2009 and 2011, targeted recruitment surveys were completed in 2011 and 2012. The estimated recruitment rates (calves per 100 adult females) were 11.4 in 2009, 17.4 in 2011 and 21.0 in 2012. These recruitment estimates are below expected values thought to support a stable to increasing population trend (28.9 calves per 100 adult females, assuming an adult female survival rate of 85%, Environment Canada 2008, 2011). Variability around calculated recruitment estimates was high.

Annual survival rate and population trend were not estimated for the Swan Range as not enough collared caribou were present within the range.

A geospatial analysis, as part of the 2014 IRAR, estimated that 23.5% of the range was characterized as naturally (20.3%) or anthropogenically (3.2%) disturbed (MNRF 2014b). The resulting likelihood of stable or increasing population growth was estimated to be 78% and at this level it was likely the Swan Range could sustain the caribou population. The Integrated Range Assessment concluded that risk to caribou was low in the Swan Range.

#### 3.3.1.2 Monitoring activities since 2014 IRAR

Ontario has been tracking collared adult female caribou in the neighbouring Missisa and Ozhiski ranges since 2019. Adult female caribou have also been collared and tracked in the Missisa and Ozhiski ranges between 2021 to 2026 by proponents for projects undergoing environmental assessment. Collared caribou from these monitoring projects have moved across caribou range boundaries into the Swan Range. Please see the section on Missisa, Ozhiski and James Bay Ranges (Section 5) for additional information. While results from this work may not provide updated information to assess population state in the Swan Range, they do provide additional sub-range information on caribou distribution and habitat selection during the calving, rearing, and winter periods.

Cumulative disturbance analysis was completed by MECP to estimate range-level disturbance for 2017 through 2022 (Table 7). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 7. Cumulative disturbance estimates for 2017 to 2022 in the Swan Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Anthropogenic (%) | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 |
| Zone of Influence (%) | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| Natural (%) | 17.6 | 17.8 | 16.9 | 16.5 | 15.4 | 13.7 |
| **Total (%)** | **20.6** | **20.7** | **19.8** | **19.6** | **18.3** | **16.8** |

### 3.3.2 Results and Discussion

Two-stage aerial surveys with fecal pellet collection and caribou group demographic classifications of the Swan Range were completed from January 23 to March 12, 2025 with an extended break in surveying between January 24 and 28, and February 9 and March 12, 2025 with the exception of dedicated demographic survey flights that took place on February 17 to 19, 2025. During that time 25 transects totalling 3,034 km were flown by fixed-wing aircraft in the Swan Range along a northeast-southwest axis. Figure 6 shows the stratified flightlines along transects within the Swan Range.

Subsequent rotary-wing flights were made to areas of caribou activity to collect fecal pellet samples and separate rotary-wing flights were made to demographically classify caribou

groups. Figure 7 shows the rotary-wing flightlines flown during dedicated demographic survey days on February 17, 18, and 19, 2025.

Snow station data available within the southeast portion of the range, from ECCC Big Trout Lake Airport climate station indicated that there was an average of 40 cm of snow on the ground on January 23, 2025, and an average of 56 cm of snow on the ground on March 12, 2025. Based on available Environment Canada historical weather data at the Big Trout Lake Airport climate station, the average daily temperature between these days was -18.9 with the warmest day (March 3) being -10.8°C and the coldest day being -30.2°C (February 13).

During the Stage One fixed-wing aerial survey, 49 groups of caribou were observed totaling 370 individual caribou. Caribou signs (i.e., tracks, cratering and/or slushing) were observed at an additional 795 locations. Additionally, two groups of caribou totaling 20 individual caribou were observed off-transect during Stage One flights, considered incidental observations, for a total of 390 individuals observed altogether in Stage One.

During the Stage Two rotary-wing fecal pellet collection (which did not involve recording caribou demographics), 245 fecal samples were collected from 17 sites (Figure 8). Of these samples, 22 were unsuitable for analysis. From the remaining 223 samples, genetic analysis identified 148 individual caribou (the MAC).

During the Stage Two rotary-wing demographic classification flights, 30 groups of caribou were observed totaling 311 caribou (Figure 7) (the MAC).

In both Stage One and Stage Two, the number of caribou observed is higher than 300, the number reported as needed for self-sustaining local populations (Environment Canada 2011). There is a high likelihood some of the observed caribou were Eastern Migratory Caribou.

A MAC of 390 caribou represents the minimum number of caribou present in the Swan Range at the time and within the portion of the range that was sampled. It is assumed that additional caribou were not sampled through these efforts and that the actual population size is more than 390.

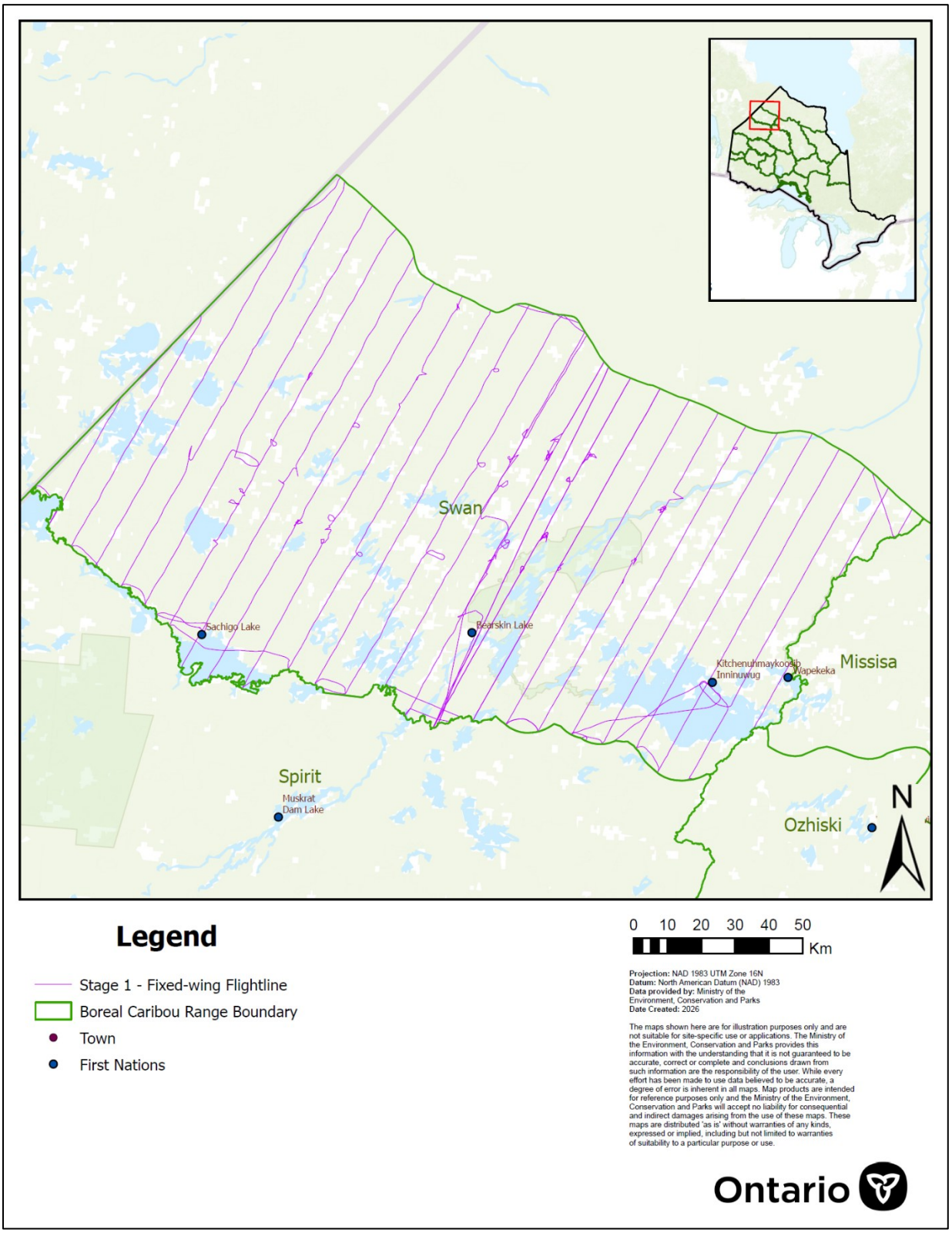


*Figure 6. Fixed-wing flightlines for the 2025 Stage One aerial survey in the Swan Range.*

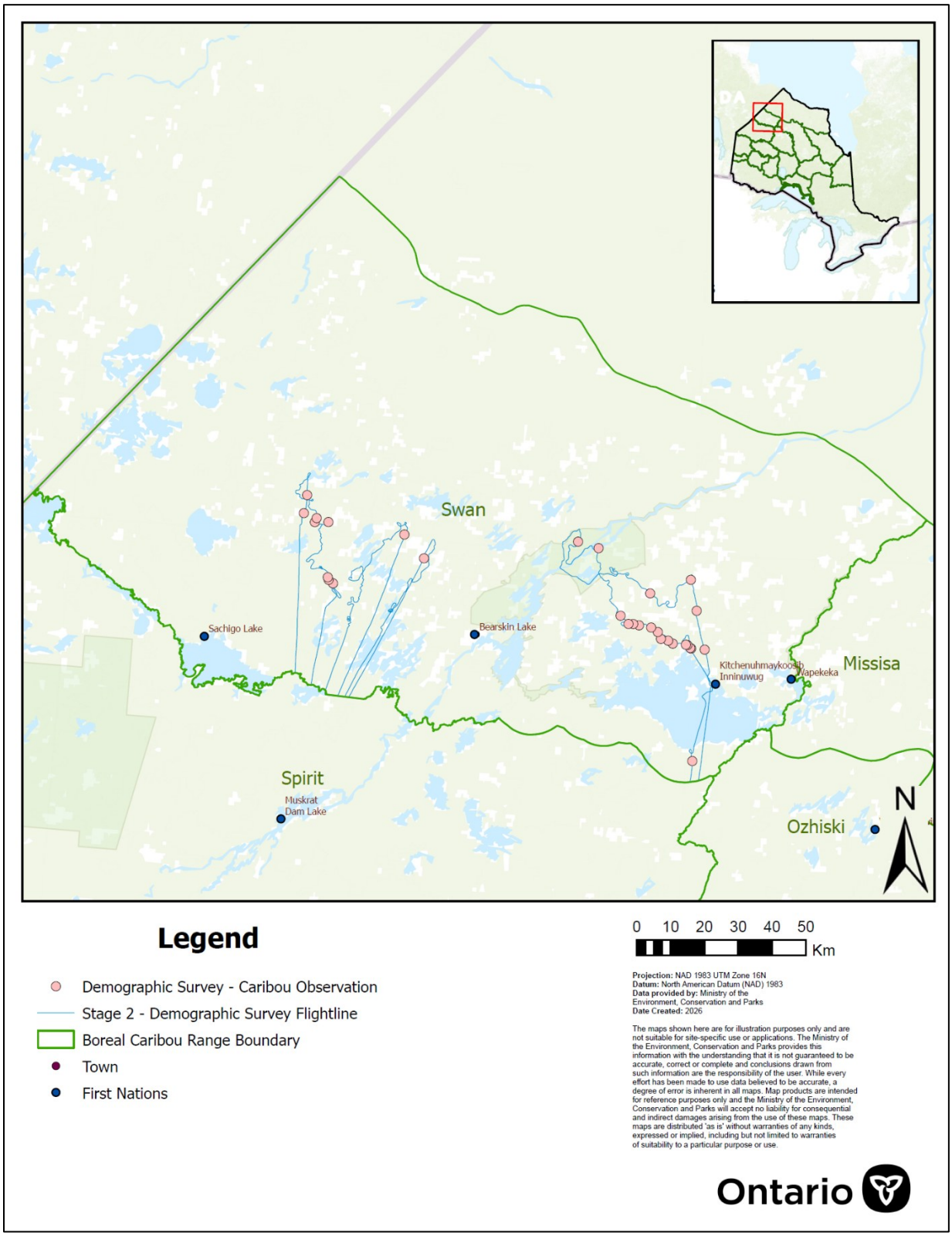


*Figure 7. Observed caribou with flightlines from the Stage Two rotary-wing demographic classification survey in the Swan Range.*

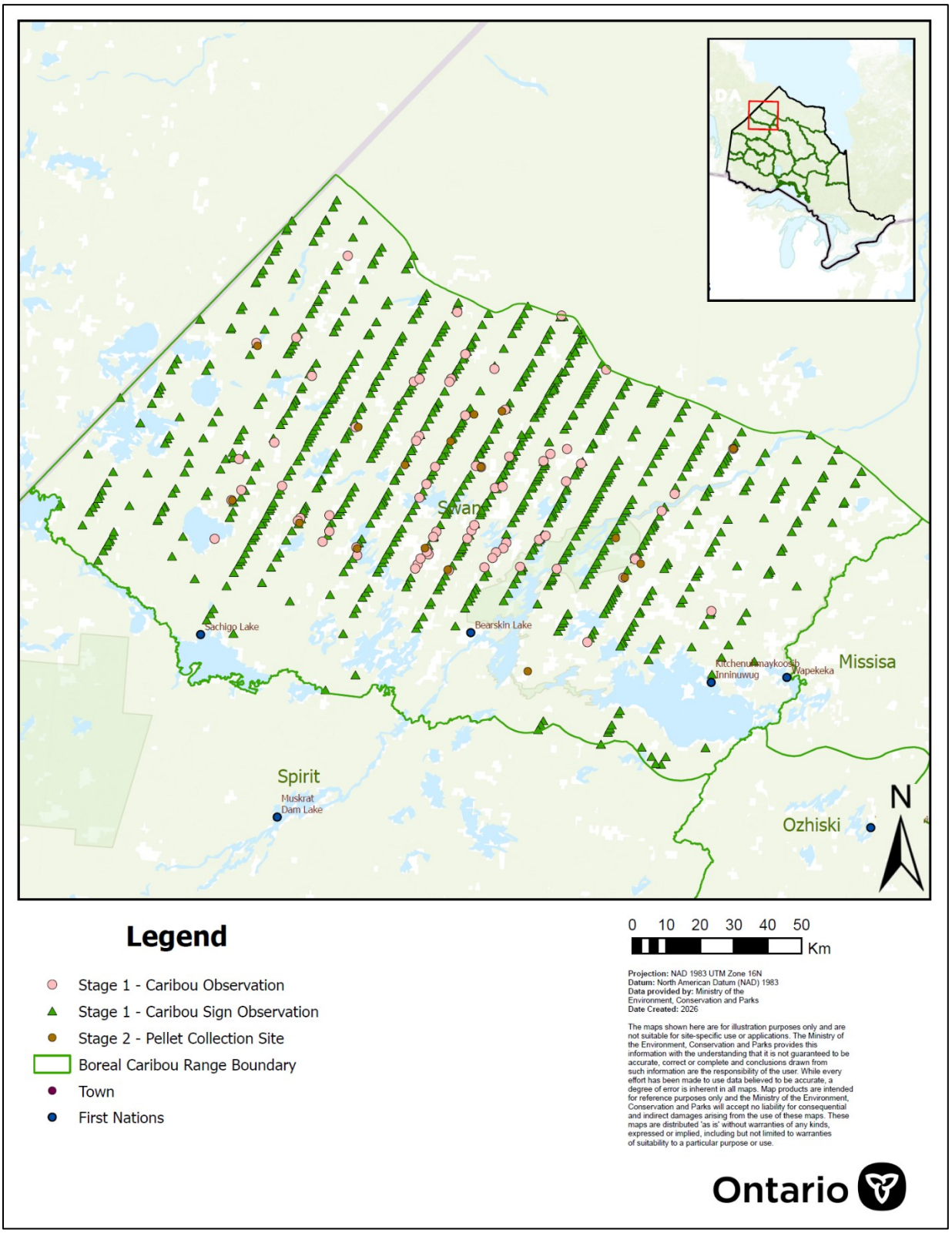


*Figure 8. Observed caribou and caribou sign from the Stage One survey with fecal pellet collection sites from the Stage Two pellet collection flights in the Swan Range.*

#### 3.3.2.1 Population Distribution

Distribution mapping for observations of caribou and their signs (i.e., tracks, slushing, cratering) during the Swan Range surveys (including Stage One intentional on-transect and incidental off-transect observations and dedicated demographic flight observations) is shown in Figure 8. The map may not reflect the full winter distribution of caribou in the range due to the difficulty of detecting caribou (e.g., dense forest) and the spacing of flight transects which did not allow for a complete visual survey of the entire range (i.e., there were areas between transects where caribou and sign would not have been seen).

The observed distribution of caribou in the Swan Range during the 2025 survey was evenly distributed across the range. The areas where caribou were observed during the 2025 survey differ from caribou sign observations included in the 2014 IRAR for Swan Range where most observations were documented in the northern and eastern portions of the range and where the southwestern portion of the range showed little caribou activity. As they are visually similar, it is likely that some of the observed caribou in 2025 were Eastern Migratory Caribou as well as Boreal Caribou.

The 2025 aerial survey is limited in its ability to provide comprehensive understanding of distribution patterns because it includes information from only a single year.

#### 3.3.2.2 Population Trend

Two samples of data were collected and analyzed separately for the Swan Range to avoid double counting as individuals could be re-observed across survey windows:

- Sample A: 390 caribou photographed during Stage One fixed-wing flights.
- Sample B: 311 caribou photographed during Stage Two rotary-wing flights.

*Recruitment and Survival*

The estimated recruitment rate for both Sample A and Sample B is below the threshold for maintaining a stable population (28.9 calves per 100 adult females, assuming an adult female survival rate of 85% (Environment Canada 2008, 2011)).

- The estimated recruitment rate from Sample A was 19.4 calves per 100 adjusted adult females. 95% bootstrapped confidence intervals were 9.8 (lower 95% confidence interval) and 29.8 (upper 95% confidence interval) (sample size of 55 caribou including nine calves and 46 adjusted adult females).
    - For Sample A, there were observations of 51 groups totaling 390 individual caribou. There were 21 groups for which demographic classification occurred for more than 50% of the group resulting in a sample size of 115 animals (60 adjusted males, 46 adjusted females, nine calves).
- The estimated recruitment rate from Sample B was 14.0 calves per 100 adjusted adult females. 95% bootstrapped confidence intervals were 4.4 (lower 95% confidence

interval) and 29.6 (upper 95% confidence interval) (sample size of 57 caribou including seven calves and 50 adjusted adult females).

- For Sample B, there were observations of 30 groups totalling 311 individual caribou. There were 22 groups for which demographic classification occurred for more than 50% of the group resulting in a sample size of 142 animals (85 adjusted males, 50 adjusted females, seven calves).

A current survival rate for adult females in the Swan Range is not available. However, population trend can be estimated based on three survival rate scenarios (low, medium, high) and the estimated recruitment rate from either of the 2025 surveys, including the Stage One (Sample A) surveys (Table 8) and the Stage Two (Sample B) surveys (Table 9).

*Table 8. Population trend estimates in the Swan Range based on completed Stage One surveys.*

| Survival Scenario | S | R | $R_{LL}$ | λ | $λ_{LL}$ | n |
|---|---|---|---|---|---|---|
| **Low** | (0.80) | 19.37 | 9.85 | **0.89** | **0.84** | 55 |
| **Med** | (0.85) | 19.37 | 9.85 | **0.94** | **0.89** | 55 |
| **High** | (0.88) | 19.37 | 9.85 | **0.97** | **0.93** | 55 |

S = assumed survival rate of adult females (Environment Canada, 2008, 2011); R = recruitment rate (calves: 100 adjusted adult females) from the 2025 survey; $R_{LL}$ = lower confidence interval of the recruitment rate from the 2025 survey; λ = estimated population growth rate; $λ_{LL}$ = estimate of population growth calculated using lower confidence interval of the recruitment rate; n = sample size.

*Table 9. Population trend estimates in the Swan Range based on completed Stage Two surveys.*

| Survival Scenario | S | R | $R_{LL}$ | λ | $λ_{LL}$ | n |
|---|---|---|---|---|---|---|
| **Low** | (0.80) | 14.00 | 4.44 | **0.86** | **0.82** | 50 |
| **Med** | (0.85) | 14.00 | 4.44 | **0.91** | **0.87** | 50 |
| **High** | (0.88) | 14.00 | 4.44 | **0.95** | **0.90** | 50 |

S = assumed survival rate of adult females (Environment Canada, 2008, 2011); R = recruitment rate (calves: 100 adjusted adult females) from the 2025 survey; $R_{LL}$ = lower confidence interval of the recruitment rate from the 2025 survey; λ = estimated population growth rate; $λ_{LL}$ = estimate of population growth calculated using lower confidence interval of the recruitment rate; n = sample size.

Using the recruitment rate (19.4) from Sample A indicates that population growth is declining in all survival scenarios (λ = 0.89 (low), 0.94 (medium) and 0.97 (high)) (see Table 8). Similarly, using the recruitment rate (14.0) from Sample B, population growth is declining in all survival scenarios (λ = 0.86 (low), 0.91 (medium) and 0.95 (high)) (see Table 9).

*Demographic Structure*

The proportion of calves is below the range required for a stable population (13-15% calves in the population; Bergerud 1992; Bergerud 1996).

- For Sample A, the estimated proportion of calves in the Swan Range is 7.8% (95% confidence intervals of 4.2% (lower confidence interval) and 14.2% (upper confidence interval)). The sample size was nine calves and a total of 115 caribou classified by age (106 adults in 21 groups).

- For Sample B, the estimated proportion of calves in the Swan Range is 4.9% (95% confidence intervals of 2.4% (lower confidence interval) and 9.8% (upper confidence interval). The sample size was seven calves and a total of 142 caribou classified by age (135 adults in 22 groups).

For both samples, the ratio of adult females to adult males is lower than the average baseline condition reported by Rudolph et al. (2017) of 156 adult females to 100 adult males.

- For Sample A, the ratio is 78 adult females to 100 adult males (i.e., 44% adult females and 56% adult males). The sample size of adult caribou that were classified by sex was 39 females and 50 males. Based on the calculated sex ratio of 44% adult females to 56% adult males, from the observed animals, applied to the 17 adults of unknown sex observed during Stage One, the adjusted number of adult females is 46 and the number of adult males is 60.
- For Sample B, the ratio is 59 adult females to 100 adult males (i.e., 37% adult females and 63% adult males). The sample size of adult caribou that were classified by sex was 50 females and 85 males. There were no adults observed that were not classified as adult males or females.

The collection of fecal pellets for the identification of unique genotypes in the Swan Range indicated the presence of 148 unique animals. Of these 148 unique animals, 103 (70%) were identified as females with the remaining 45 animals (30%) considered to be males. Fecal pellet genotyping does not exclude calves in the assignment of sex. This ratio is higher than that average baseline condition reported by Rudolph et al. (2017) of 156 adult females to 100 adult males but where the collection of fecal pellets for genotype analysis did not exclude calves (unlike the identification of animals associated with Sample A and Sample B data).

Differences in observed sex ratios based on Sample A, Sample B and the genotype information from fecal pellet collections is likely attributable to visual confirmation of primary sexual characteristics (vulva patch and penis sheath) frequently constrained by animal orientation, distance, lighting, and image resolution (when using photographic information), resulting in a proportion of animals of unknown sex (Alo 2021). In contrast, genetic sexing assigns sex independently of morphology and is not affected by these visual constraints (Ahlering et al. 2011).

The demographic breakdown of the observed animals, for the Swan Range, is provided in Table 10.

*Table 10. Observed caribou demographics in the Swan Range during the 2025 aerial survey.*

| Sample/Groups | Groups | Adults, Sex Unknown | Adult Males | Adult Females | Calves | Unknown Age / Sex | Total | Adjusted Adult Males | Adjusted Adult Females |
|---|---|---|---|---|---|---|---|---|---|
| Sample A (all groups) | 51 | 18 | 59 | 46 | 10 | 257 | 390 | - | - |
| Sample B (all groups) | 30 | 0 | 87 | 71 | 7 | 146 | 311 | - | - |
| Sample A (groups with more than 50% classified by age and sex) | 21 | 17 | 50 | 39 | 9 | 13 | 128 | 60 | 46 |
| Sample B (groups with more than 50% classified by age and sex) | 22 | 0 | 85 | 50 | 7 | 45 | 187 | 85 | 50 |

*Group Size*

The average group size in the Swan Range is larger than that reported for Boreal Caribou group sizes across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5).

- For Sample A, the average group size was 7.7 ± 2.0 (95% confidence intervals of 5.7 (lower confidence interval) and 9.6 (upper confidence interval)).
- For Sample B, the average group size was 10.4 ± 3.7 (95% confidence intervals of 6.7 (lower confidence interval) and 14.0 (upper confidence interval)).

This can partially be attributed to the presence of Eastern Migratory Caribou in observed groups or groups consisting entirely of Eastern Migratory Caribou that have larger group sizes (Jung et al. 2019).

Otherwise, above-average caribou group sizes can be associated with factors including declining population trends and/or to mitigate for above-average snowfall conditions. However, during the winter of 2025 there were below average snowfall conditions in northern Ontario, including that area overlapping the Swan Range. Further observations of caribou groups would improve the precision of average group-size estimates by reducing sampling variability, allowing changes in group size over time to be interpreted more confidently as potential indicators of changing population conditions rather than chance variation (Jung et al. 2019; Kasozi and Montgomery 2020).

# 4 GPS COLLARING RESULTS

## 4.1 Berens Range

### 4.1.1 Context

For context about the Berens Range, previous IRARs and monitoring activities in the Berens Range please see the Ontario Boreal Caribou Monitoring Program 2024 Aerial Survey Results published on Ontario.ca.

In 2023, a caribou collaring study (50 collars), including aerial surveys with demographic classifications was initiated by a proponent to inform development of their environmental assessment in parts of the Berens, Churchill and Kinloch ranges.

#### 4.1.1.1 Monitoring Activities since the Ontario Boreal Caribou Monitoring Program 2024 Aerial Survey Results

Cumulative disturbance analysis was completed by MNR to estimate range-level disturbance for 2017 through 2023 (Table 11). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 11. Cumulative disturbance estimates for 2017 to 2023 in the Berens Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|
| Anthropogenic (%) | 3.9 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.9 |
| Zone of Influence (%) | 6.8 | 6.9 | 6.9 | 6.9 | 7.0 | 7.5 | 7.6 |
| Natural (%) | 22.8 | 23.9 | 23.6 | 22.1 | 30.1 | 28.4 | 28.4 |
| **Total (%)** | **33.4** | **34.6** | **34.3** | **32.9** | **40.8** | **39.8** | **39.9** |

### 4.1.2 Results and Discussion

GPS collaring of adult female caribou within the Berens Range by MECP was completed from February 11 to 21, 2025. Collaring may not have been conducted on all dates due to weather conditions and other factors. Figure 9 shows the rotary-wing flightlines within the Berens Range from both scouting and collaring flights. It also shows the locations of observed and collared caribou.

To optimize collaring effort, rotary-wing flights were targeted towards areas with a higher probability of winter occupancy by caribou (e.g., some areas where caribou and their sign were not detected during aerial surveys conducted by MECP in winter 2023 (MECP 2024) were not targeted in 2025). Additionally, areas were avoided where previously collared caribou were located, including through those collaring efforts which occurred to inform development of an environmental assessment. During the scouting flights, collared caribou were encountered. Efforts were made to avoid collaring additional individuals within these groups to maintain an even distribution of collars across all groups in the range.

Snow station data available from the MNR Red Lake snow station indicated that there was an average of 56.1 cm of snow on the ground on February 10, 2025, and an average of 52.4 cm of snow on the ground on February 24, 2025. Based on available Environment Canada historical weather data at the Red Lake A station, the average daily temperature over these days was -23.3°C with the warmest days (February 21) being -13.7°C and the coldest day being -29.2°C (February 13).

There were 38 adult female caribou collared, 15 of which were observed to have a calf with them. The average estimated age of the adult female caribou that were collared was five to six years, the youngest estimated age was three and the oldest 9 or 10 years.

During the 2025 GPS collaring effort, 34 groups of caribou were observed totalling 301 individuals (the MAC). The number of caribou observed is close to 300, the number reported as needed for self-sustaining local populations (Environment Canada 2011).

A MAC of 301 caribou represents the minimum number of caribou occurring in the Berens Range at the time of the survey and within the portion of the range that was sampled. It is assumed that additional caribou were also in the range but were not detected through these survey efforts. Therefore, the actual population size is expected to be greater than 301.

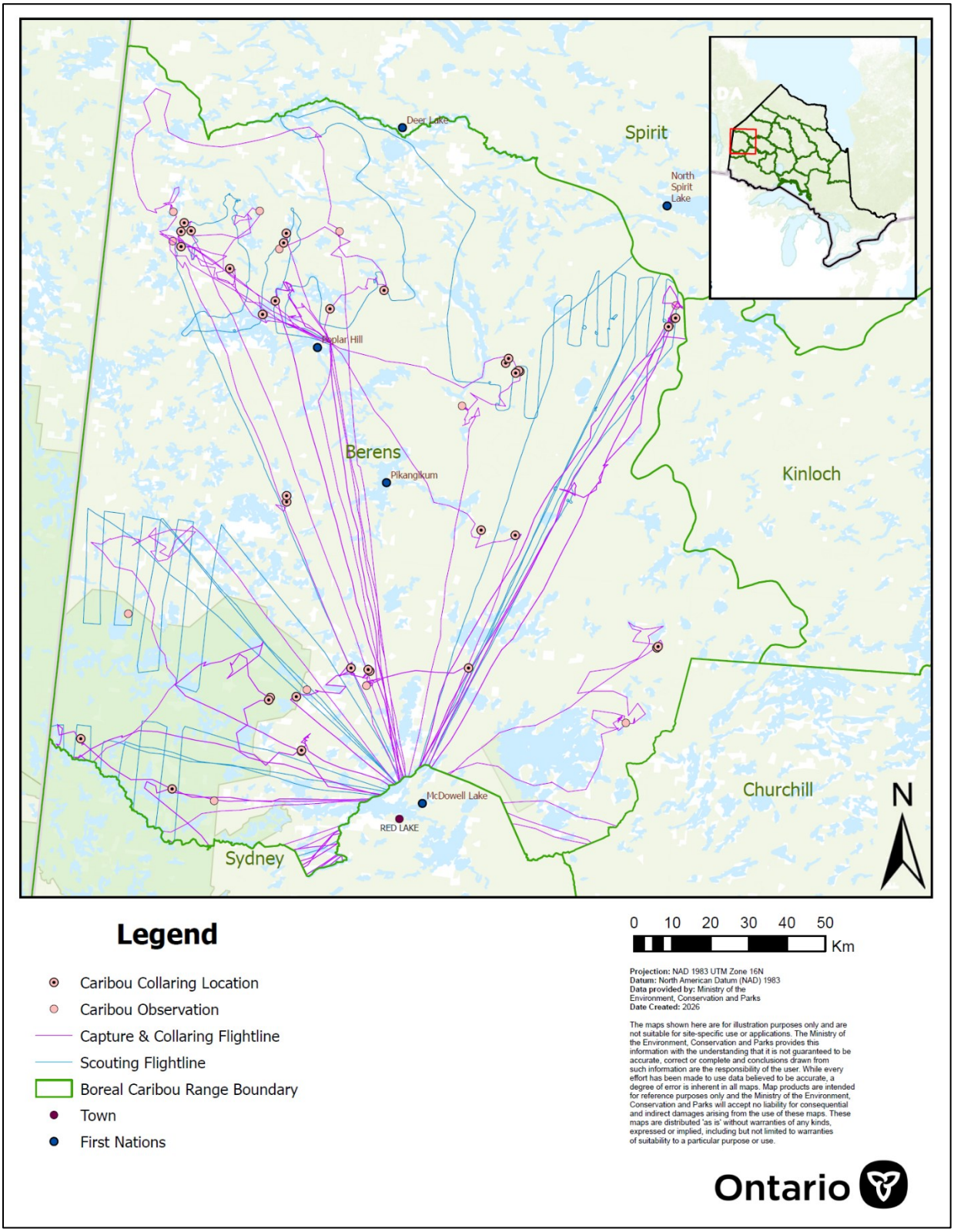


*Figure 9. Flightlines for the 2025 GPS collaring and scouting with observed caribou and GPS collar deployment locations in the Berens Range.*

#### 4.1.2.1 Population Distribution

The spatial distribution of caribou observations and collar deployment locations during the 2025 GPS collaring effort in the Berens Range is shown in Figure 9. It shows caribou observations that are evenly distributed across the range. Conversely, both the 2023 MECP single-stage aerial surveys and the 2012 observations included in the 2014 IRAR for the Berens Range, recorded caribou primarily in the western portion of the range (MECP 2024; MNRF 2014c).

The 2025 GPS collaring effort has limitations in its ability to provide a comprehensive understanding of distribution patterns, as it reflects a single point in time and was based on incomplete survey coverage aligned with the specific objectives of the work. Distribution will be better understood through telemetry data from collars in future years.

#### 4.1.2.2 Population Trend

*Recruitment and Survival*

The 2025 GPS collaring effort in Berens Range provides the foundation to support estimates of recruitment and survival rates in future years.

*Demographic Structure*

Due to the methodology used in the 2025 GPS collaring effort (i.e., data gathered during collaring rather than a more comprehensive approach), caution should be applied in drawing conclusions about the following information.

- The estimated proportion of calves observed in the Berens Range during flights related to GPS collaring in 2025 is 21.2% (95% confidence intervals of 14.8% (lower confidence interval) and 29.4% (upper confidence interval)). The sample size was 25 calves in a total of 118 animals classified by age and/or sex.
    - This contrasts with the results of the 2024 survey of the Berens Range (MECP 2025) where the proportion of calves was estimated at 6.8% (95% confidence intervals of 1.9% (lower confidence interval) and 11.7% (upper confidence interval)). The 2025 results are likely higher as the methodology focused on identifying adult females for collaring and calves are likely to accompany adult females.
- The sex ratio is 102 adult females to 100 adult males (i.e., 51% adult females to 49% adult males). The sample size of adult caribou that were classified by sex is 46 males and 47 females.
    - This contrasts with the results of the 2024 survey of the Berens Range (MECP 2025) of 71 adult females to 100 adult males based on the observation of 62 males and 44 females during the survey. The 2025 results show a higher ratio of females to males likely because the methodology focused on identifying adult females for collaring.

The demographic breakdown of the observed animals, for the Berens Range, is provided in Table 12.

*Table 12. Observed caribou demographics in the Berens Range during the 2025 aerial survey.*

| Adult Males | Adult Females | Calves | Unknown Age and Sex | Total |
|---|---|---|---|---|
| 46 | 47 | 25 | 183 | 301 |

*Group size*

From observations recorded during the 2025 GPS collaring effort (i.e., which covered only a portion of the range), the average group size was 8.9 ± 3.3 (95% confidence intervals of 5.6 (lower confidence interval) and 12.1 (upper confidence interval)). This average group size is larger than that reported for Boreal Caribou group sizes across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5).

- The average group size in the Berens Range during the 2024 MECP single-stage aerial survey was 6.3 ± 1.5 (95% confidence intervals of 4.8 (lower confidence interval) and 7.8 (upper confidence interval)) (MECP 2025).

Above-average caribou group sizes can be associated with environmental and demographic factors, including aggregation during winters with above average snowfall and, in some cases, changing population conditions (COSEWIC 2014; Jung et al. 2019). During the winter of 2025 there were below average snowfall conditions in northern Ontario, including that area overlapping the Berens Range.

Further observations of caribou groups would improve the precision of average group-size estimates by reducing sampling variability, allowing changes in group size over time to be interpreted more confidently as potential indicators of changing population conditions rather than chance variation (Jung et al. 2019; Kasozi and Montgomery 2020).

## 4.2 Churchill Range

### 4.2.1 Context

For context about the Churchill Range, previous IRARs and previous monitoring activities in the Churchill Range please see the Ontario Boreal Caribou Monitoring Program 2023 Aerial Survey Results published on Ontario.ca.

In 2023, a caribou collaring study (50 collars), including aerial surveys with demographic classifications was initiated by a proponent to inform development of their environmental assessment in parts of the Berens, Churchill and Kinloch ranges.

#### 4.2.1.1 Monitoring Activities since the Ontario Boreal Caribou Monitoring Program 2023 Aerial Survey Results

Cumulative disturbance analysis was completed by MNR to estimate range-level disturbance for 2017 through 2023 (Table 13). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 13. Cumulative disturbance estimates for 2017 to 2023 in the Churchill Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|
| Anthropogenic (%) | 17.0 | 17.1 | 17.3 | 16.9 | 17.0 | 17.1 | 17.0 |
| Zone of Influence (%) | 22.5 | 22.6 | 22.8 | 23.1 | 23.2 | 23.7 | 23.9 |
| Natural (%) | 3.8 | 3.8 | 3.8 | 3.7 | 3.8 | 3.8 | 4.8 |
| **Total (%)** | **43.2** | **43.5** | **43.9** | **43.6** | **44.0** | **44.5** | **45.7** |

### 4.2.2 Results and Discussion

GPS collaring of adult female caribou within the Churchill Range by MECP was completed from February 21 to March 12, 2025. Collaring may not have been conducted on all dates due to weather conditions and other factors. Figure 10 shows the rotary-wing flightlines within the Churchill Range from both scouting and collaring flights. It also shows locations of observed and collared caribou.

To optimize collaring effort, rotary-wing flights were targeted towards areas with a higher probability of winter occupancy by caribou (e.g., some areas where caribou and their sign were not detected during aerial surveys conducted by MECP in winter 2023 were not targeted in 2025). Additionally, areas were avoided where previously collared caribou were located, including through those collaring efforts which occurred to inform development of an environmental assessment. During the scouting flights, collared caribou were encountered. Efforts were made to avoid collaring additional individuals within these groups to maintain an even distribution of collars across all groups in the range.

Snow station data available within the northeastern portion of the range, from the OPG Rat Rapids snow station indicated that there was an average of 51 cm of snow on the ground on February 15, 2025, and an average of 63.5 cm of snow on the ground on March 16, 2025.

Snow station data available within the southwestern portion of the range, from the MNR Ear Falls snow station indicated that there was an average of 40.9 cm of snow on the ground on February 13, 2025, and an average of 48.8 cm of snow on the ground on March 18, 2025.

Based on available weather data at the MNR Socket Lake climate station, the average daily temperature over these days was -8.2°C with the warmest days (February 24) being -1.6°C and the coldest day being -17.5°C (March 11).

There were 26 adult female caribou collared, nine of which were observed to have a calf with them. The average estimated age of the adult female caribou collared was five to six years, the youngest estimated age to be three and the oldest 11 years.

During the 2025 GPS collaring effort, 31 groups of caribou were observed totalling 181 individuals (the MAC). As per Environment Canada (2011) modelling, population sizes over 100 indicate a large enough population that has a minimum 70% probability of not reaching a quasi-extinction threshold of less than ten reproductively active females under stable conditions over 50 years.

A MAC of 181 caribou represents the minimum number of caribou occurring in the Churchill Range at the time of the survey and within the portion of the range that was sampled. It is assumed that additional caribou were also in the range but were not detected through these survey efforts. Therefore, the actual population size is expected to be greater than 181.

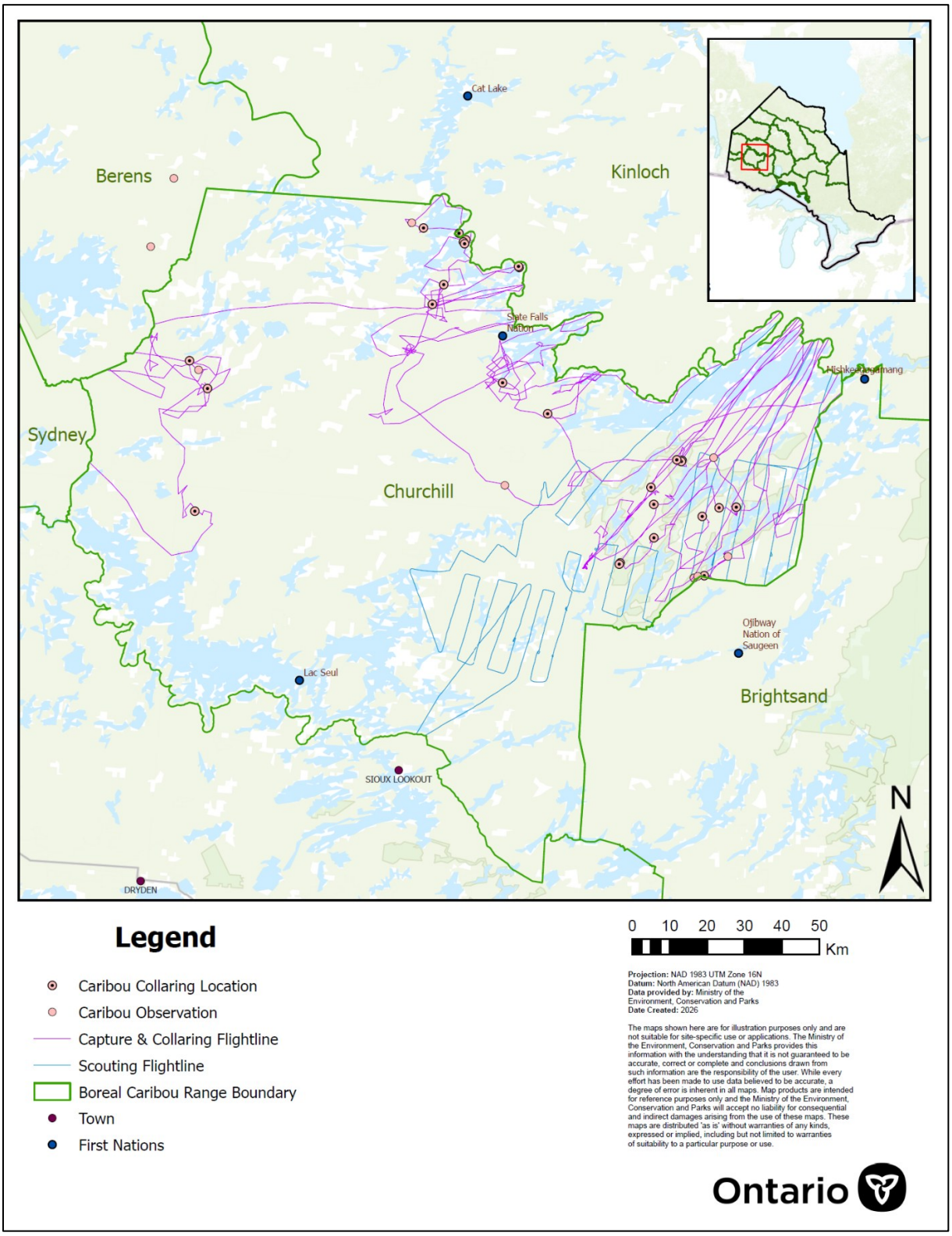


*Figure 10. Flightlines for the 2025 GPS collaring and scouting with observed caribou and GPS collar deployment locations in the Churchill Range.*

#### 4.2.2.1 Population Distribution

The spatial distribution of caribou observations and collar deployment locations during the 2025 GPS collaring effort in the Churchill Range is shown in Figure 10. It shows that caribou observations were distributed across the northeast portion of the range. During the 2023 MECP single-stage aerial surveys and 2014 IRAR for Churchill Range caribou observations were relatively even across the northern and central portions of the range, while the southern portion did not yield any observations (MNRF 2014d).

The 2025 GPS collaring effort has limitations in its ability to provide a comprehensive understanding of distribution patterns, as it reflects a single point in time and was based on incomplete survey coverage aligned with the specific objectives of the work. Distribution will be better understood through telemetry data from the collars in future years.

#### 4.2.2.2 Population Trend

*Recruitment and Survival*

The 2025 GPS collaring effort in Churchill Range provides the foundation to support estimates of recruitment and survival rates in future years. Survival and recruitment rates were not estimated in 2025.

*Demographic Structure*

Due to the methodology used (i.e., data gathered during GPS collaring), caution should be applied in drawing conclusions about the following information.

- The estimated proportion of calves observed in the Churchill Range during flights related to GPS collaring in 2025 is 21.2% (95% confidence intervals of 14.4%(lower confidence interval) and 30.0% (upper confidence interval)). The sample size was 22 calves in a total of 104 animals classified by age and/or sex.
    - This contrasts with the results of the 2023 survey of the Churchill Range (MECP 2024) where the proportion of calves was estimated at 18.3% (no 95% confidence intervals calculated). The 2025 results are likely higher as the methodology focused on identifying adult females for collaring and calves are likely to accompany adult females.
- The sex ratio is 95 adult females to 100 adult males (i.e., 49% adult females to 51% adult males). The sample size of adult caribou that were classified by sex is 42 males and 40 females.
    - This contrasts with the results of the 2023 survey of the Churchill Range (MECP 2024) of 238 adult females to 100 adult males based on the observation of 37 males and 88 females during the survey. Although the 2025 methodology focused on identifying adult females for collaring, the observed sex ratio was lower than that observed during the 2023 survey.

The demographic breakdown of the observed animals for the Churchill Range is provided in Table 14.

*Table 14. Observed caribou demographics in the Churchill Range during the 2025 aerial survey.*

| Adult Males | Adult Females | Calves | Unknown Age and Sex | Total |
|---|---|---|---|---|
| 42 | 40 | 22 | 77 | 181 |

*Group size*

From observations recorded during the 2025 GPS collaring effort (which covered only a portion of the range), the average group size was 5.8 ± 1.4 (95% confidence intervals of 4.4 (lower confidence interval) and 7.3 (upper confidence interval)). This average group size is larger than that reported for Boreal Caribou group sizes across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5).

- The average group size in the Churchill Range during the 2023 single-stage aerial survey was 6.2 ± 3.7 (95% confidence intervals of 2.5 (lower confidence interval) and 9.9 (upper confidence interval)) (MECP 2025).

Above-average caribou group sizes can be associated with environmental and demographic factors, including aggregation during winters with above average snowfall and, in some cases, changing population conditions (COSEWIC 2014; Jung et al. 2019). During the winter of 2025 there were below average snowfall conditions in northern Ontario, including that area overlapping the Churchill Range.

Further observations of caribou groups would improve the precision of average group-size estimates by reducing sampling variability, allowing changes in group size over time to be interpreted more confidently as potential indicators of changing population conditions rather than chance variation (Jung et al. 2019; Kasozi and Montgomery 2020).

## 4.3 Kinloch Range

### 4.3.1 Context

For context about the Kinloch Range, previous IRARs and monitoring activities in the Kinloch Range please see the Ontario Boreal Caribou Monitoring Program 2023 Aerial Survey Results published on Ontario.ca.

In 2023, a caribou collaring study (50 collars), including aerial surveys with demographic classifications, was initiated by a proponent to inform development of their environmental assessment in parts of the Berens, Churchill and Kinloch ranges.

#### 4.3.1.1 Monitoring Activities since the Ontario Boreal Caribou Monitoring Program 2023 Aerial Survey Results

Cumulative disturbance analysis was completed by MECP to estimate range-level disturbance for 2017 through 2022 (Table 15). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 15. Cumulative disturbance estimates for 2017 to 2022 in the Kinloch Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Anthropogenic (%) | 6.0 | 6.0 | 6.0 | 4.0 | 3.9 | 3.7 |
| Zone of Influence (%) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.3 |
| Natural (%) | 11.3 | 11.4 | 11.0 | 10.8 | 12.2 | 12.2 |
| **Total (%)** | **19.3** | **19.4** | **19.0** | **16.8** | **18.2** | **18.3** |

### 4.3.2 Results and Discussion

GPS collaring of adult female caribou within the Kinloch Range by MECP was completed from March 5 to 13, 2025. Collaring may not have been conducted on all dates due to weather conditions and other factors. Figure 11 shows the rotary-wing flightlines within the Kinloch Range from both scouting and collaring flights. It also shows locations of observed and collared caribou.

To optimize collaring effort, rotary-wing flights were targeted towards areas with a higher probability of winter occupancy by caribou (e.g., some areas where caribou and their sign were not detected during aerial surveys conducted by MECP in winter 2023 were not targeted in 2025). Additionally, areas were avoided where previously collared caribou were located, including through those collaring efforts which occurred to inform development of an environmental assessment. During the scouting flights, collared caribou were encountered. Efforts were made to avoid collaring additional individuals within these groups to maintain an even distribution of collars across all groups in the range.

Snow station data available within the southern portion of the range, from the OPG Rat Rapids snow station indicated that there was an average of 63.1 cm of snow on the ground on March 1, 2025, and an average of 63.5 cm of snow on the ground on March 16, 2025. Based on available Environment Canada historical weather data at the Pickle Lake A weather station, the average daily temperature over these days was -12.2°C with the warmest days (March 13) being -6.6°C and the coldest day being -18.8°C (March 11).

There were 33 adult female caribou collared, four of which were observed to have a calf with them. The average estimated age of the adult female caribou collared was six to seven, the youngest estimated age to be two and the oldest 12 years.

During the 2025 GPS collaring, 27 groups of caribou were observed totalling 176 individuals. As per Environment Canada (2011) modelling, population sizes over 100 indicate a large

enough population that has a minimum 70% probability of not reaching a quasi-extinction threshold of less than ten reproductively active females under stable conditions over 50 years.

A MAC of 176 caribou represents the minimum number of caribou occurring in the Kinloch Range at the time of the survey and within the portion of the range that was sampled. It is assumed that additional caribou were also in the range but were not detected through these survey efforts. Therefore, the actual population size is expected to be greater than 176.

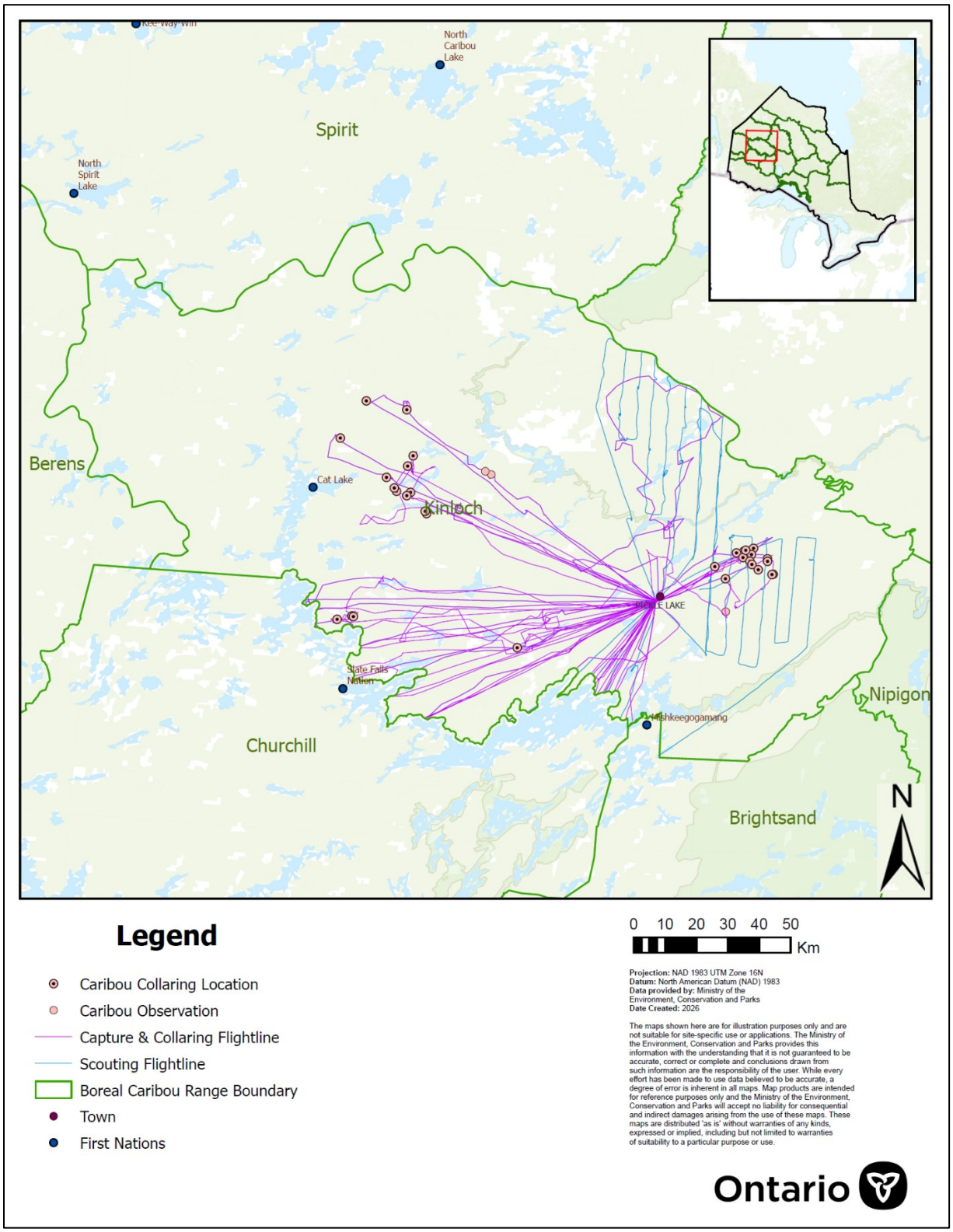


*Figure 11. Flightlines for the 2025 GPS collaring and scouting with observed caribou and GPS collar deployment locations in the Kinloch Range.*

#### 4.3.2.1 Population Distribution

The spatial distribution of caribou observations and collar deployment locations during the Kinloch Range GPS collaring is shown in Figure 11. It shows that distribution of caribou observations was predominately in the central and eastern portions of the range. During the 2023 MECP single-stage aerial survey and 2012 observations included in the 2014 IRAR for Kinloch Range, observed caribou were evenly distributed across the range (MNRF 2014b).

The 2025 MECP collaring effort has limitations in its ability to provide a comprehensive understanding of distribution patterns, as it reflects a single point in time and was based on incomplete survey coverage aligned with the specific objectives of the work. Distribution will be better understood through telemetry data from the collars in future years.

#### 4.3.2.2 Population Trend

*Recruitment and Survival*

The 2025 GPS collaring effort in Kinloch Range provides the foundation to support estimates of recruitment and survival rates in future years.

*Demographic Structure*

Due to the methodology used (i.e., data gathered during GPS collaring), caution should be applied in drawing conclusions about the following information.

- The estimated proportion of calves observed in the Kinloch Range during flights related to GPS collaring in 2025 is 14.6% (95% confidence intervals of 9.0% (lower confidence interval) and 22.6% (upper confidence interval)). The sample size was 15 calves in a total of 103 animals classified by age and/or sex.
    - This contrasts with the results of the 2023 survey of the Kinloch Range (MECP 2024) where the proportion of calves was estimated at 4.0% (no 95% confidence intervals calculated). The 2025 results are likely higher as the methodology focused on identifying adult females for collaring and calves are likely to accompany adult females.
- The sex ratio is 138 adult females to 100 adult males (i.e., 58% adult females to 42% adult males). The sample size of adult caribou that were classified by sex is 37 males and 51 females.
    - This contrasts with the results of the 2023 survey of the Kinloch Range (MECP 2024) of 133 adult females to 100 adult males based on the observation of 21 males and 28 females during the survey.

The demographic breakdown of the observed animals for the Kinloch Range is provided in Table 16.

*Table 16. Observed caribou demographics in the Kinloch Range during the 2025 aerial survey.*

| Adult Males | Adult Females | Calves | Unknown Age and Sex | Total |
|---|---|---|---|---|
| 37 | 51 | 15 | 73 | 176 |

*Group size*

From observations recorded during the 2025 GPS collaring effort (i.e., only a portion of the range), the average group size was 6.5 ± 1.3 (95% confidence intervals of 5.2 (lower confidence interval) and 7.8 (upper confidence interval)). This average group size is larger than that reported for Boreal Caribou group sizes across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5).

- The average group size in the Kinloch Range during the 2023 MECP single-stage aerial survey was 5.5 ± 3.2 (95% confidence intervals of 2.3 (lower confidence interval) and 8.7 (upper confidence interval)) (MECP 2024).

Above-average caribou group sizes can be associated with environmental and demographic factors, including aggregation during winters with above average snowfall and, in some cases, changing population conditions (COSEWIC 2014; Jung et al. 2019). During the winter of 2025 there were below average snowfall conditions in northern Ontario, including that area overlapping the Kinloch Range.

Further observations of caribou groups would improve the precision of average group-size estimates by reducing sampling variability, allowing changes in group size over time to be interpreted more confidently as potential indicators of changing population conditions rather than chance variation (Jung et al. 2019; Kasozi and Montgomery 2020).

## 4.4 Sydney Range

### 4.4.1 Context

For context about the Sydney Range, previous IRARs and monitoring activities in the Sydney Range please see the Ontario Boreal Caribou Monitoring Program 2024 Aerial Survey Results published on Ontario.ca.

#### 4.4.1.1 Monitoring Activities since the Ontario Boreal Caribou Monitoring Program 2024 Aerial Survey Results

Cumulative disturbance analysis was completed by MNR to estimate range-level disturbance for 2017 through 2023 (Table 17). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 17. Cumulative disturbance estimates for 2017 to 2023 in the Sydney Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|
| Anthropogenic (%) | 19.4 | 19.4 | 19.6 | 19.3 | 18.9 | 18.9 | 18.7 |
| Zone of Influence (%) | 30.7 | 30.8 | 30.8 | 31.2 | 31.5 | 31.4 | 31.7 |
| Natural (%) | 20.0 | 20.3 | 9.0 | 8.8 | 23.4 | 23.3 | 23.3 |
| **Total (%)** | **70.1** | **70.5** | **59.4** | **59.4** | **73.8** | **73.7** | **73.7** |

### 4.4.2 Results and Discussion

GPS collaring of adult female caribou within the Sydney Range by MECP was completed on February 9, 10, 11 and 20, 2025. Collaring may not have been conducted on all dates due to weather conditions and other factors. Figure 12 shows the rotary-wing flightlines within the Sydney Range from both scouting and collaring flights. It also shows observed and collared caribou.

To optimize collaring effort, rotary-wing flights were targeted towards areas with a higher probability of winter occupancy by caribou (e.g., some areas where caribou and their sign were not detected during aerial surveys conducted by MECP in winter 2023 and winter 2024 were not targeted in 2025).

Snow station data available from the MNR Red Lake snow station indicated that there was an average of 56.1 cm of snow on the ground on February 10, 2025, and an average of 53.1 cm of snow on the ground on February 18, 2025. Based on available Environment Canada historical weather data at the Red Lake A station, the average daily temperature over these days was -21.1°C with the warmest days (February 9) being -17.9°C and the coldest day being -23.1°C (February 11).

There were eight adult female caribou collared, two of which were observed to have a calf with them. The average estimated age of the adult female caribou that were collared was four to five years, the youngest estimated age was two years, and the oldest eight or nine years.

The targeted number of collars to be deployed was 20. A total of 12 adult female caribou were observed but not all were collared to minimize stress on the caribou during collaring.

During the 2025 GPS collaring effort, eight groups of caribou were observed totalling 31 caribou (the MAC). A MAC of 31 caribou represents the minimum number of caribou occurring in the Sydney Range at the time of the survey and within the portion of the range that was sampled. It is assumed that additional caribou were also in the range but were not detected through these survey efforts. Therefore, the actual population size is expected to be greater than 31.

The Sydney Range has been identified as part of a larger geographic area supporting the caribou population that includes the Owl-Flintstone Management Unit in Manitoba. The spatial extent of the Sydney Range is likely too small to support an independent and sustainable

population of caribou and therefore is considered to be ecologically inter-dependent on the Owl-Flintstone Management Unit.

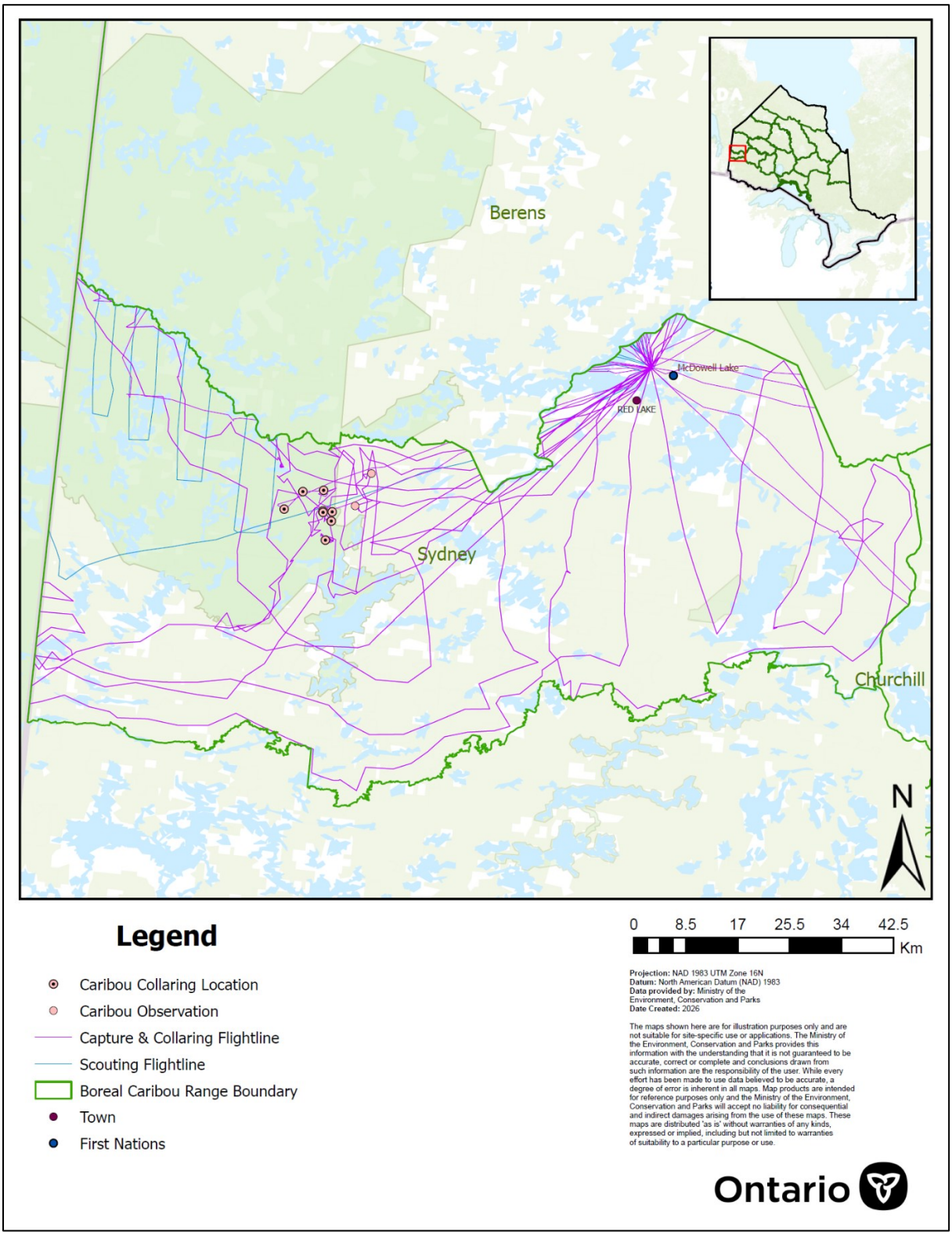


*Figure 12. Flightlines for the 2025 GPS collaring and scouting with observed caribou and GPS collar deployment locations in the Sydney Range.*

#### 4.4.2.1 Population Distribution

The spatial distribution of caribou observations and collar deployment locations during the Sydney Range GPS collaring is shown in Figure 12. It shows observations that are north of Sydney Lake. This area was intentionally targeted as caribou were thought to be located there. In both the 2024 MECP single-stage aerial survey and in the 2014 IRAR for Sydney Range most observations were documented in the western portion of the range and the eastern half of the range showed little caribou activity.

The 2025 MECP collaring effort has limitations in its ability to provide a comprehensive understanding of distribution patterns, as it reflects a single point in time and was based on incomplete survey coverage aligned with the specific objectives of the work. Distribution will be better understood through telemetry data from the collars in future years.

#### 4.4.2.2 Population Trend

*Recruitment and Survival*

The 2025 GPS collaring effort in Sydney Range provides the foundation to support estimates of recruitment and survival rates in future years.

*Demographic Structure*

Due to the methodology used (i.e., data gathered during GPS collaring), caution should be applied in drawing conclusions about the following information.

- The estimated proportion of calves observed in the Sydney Range during flights related to GPS collaring in 2025 is 20.0% (95% confidence intervals of 8.9% (lower confidence interval) and 39.1% (upper confidence interval)). The sample size was five calves in a total of 25 animals classified by age and/or sex.
    - The 2024 survey of the Sydney Range (MECP 2025) estimated the proportion of calves at 13.3% (95% confidence intervals of 6.0% (lower confidence interval) and 20.7% (upper confidence interval)). The 2025 results are likely higher as the methodology focused on identifying adult females for collaring and calves are likely to accompany adult females.
- The sex ratio is 150 adult females to 100 adult males (i.e., 60% adult females to 40% adult males). The sample size of adult caribou that were classified by sex is eight males and 12 females.
    - The 2024 survey of the Sydney Range (MECP 2025) reported 313 adult females to 100 adult males based on the observation of eight males and 25 females during the survey. Although the 2025 methodology focused on identifying adult females for collaring, the observed sex ratio was lower than that observed during the 2024 survey.

The demographic breakdown of the observed animals for the Sydney Range is provided in Table 18.

*Table 18. Observed caribou demographics in the Sydney Range during the 2025 aerial survey.*

| Adult Males | Adult Females | Calves | Unknown Age and Sex | Total |
|---|---|---|---|---|
| 8 | 12 | 5 | 6 | 31 |

*Group size*

From observations during the 2025 GPS collaring effort (i.e., only a portion of the range), the average group size was 3.9 ± 1.8 (95% confidence intervals of 2.1 (lower confidence interval) and 5.6 (upper confidence interval)). This average group size is smaller than that reported for Boreal Caribou group sizes across Canada for mid to late winter (Jung et al. 2019; Stuart-Smith et al. 1997; Rettie and Messier, 1998; all reported from 4.8 to 5.5).

- The average group size in the Sydney Range based only on direct caribou observations (including incidental observations) during the 2024 aerial survey was 11.3 ± 10.7 (95% confidence intervals of 0.5 (lower confidence interval) and 22.0 (upper confidence interval)) (MECP 2025).

Some caution should be recognized in comparing group sizes derived from the 2025 aerial surveys as only 31 caribou were observed.

# 5 MISSISA, OZHISKI AND JAMES BAY RANGES

## 5.1 Context

### 5.1.1 Missisa Range

The Missisa Range is almost 70,000 km$^2$ and covers much of the Shield-Lowland interface and the western portion of the James Bay Ecoregion. It is bordered by the Swan Range to the northwest, the Ozhiski Range to the west, the James Bay Range to the east and Nipigon and Pagwachuan Ranges to the south. The northern boundary is defined by the Northern Taiga ecoregion whereas the 2W-3 ecodistrict loosely defines the western boundary. The southern boundary is defined by the Albany, Kenogami and Little Current rivers. The eastern boundary does not reflect any major ecological pattern. Caribou in this area are generally widespread and make larger movements as compared to animals in the Ontario Shield. Larger numbers of caribou appear to be seasonally associated with Shield-Lowland interface and are distributed broadly in this portion of the range. Therefore, this is identified as one of the key features for caribou in the Far North of Ontario. The northern portion of the range is occupied by Eastern Migratory Caribou in the winter.

### 5.1.2 Ozhiski Range

The Ozhiski Range is approximately 38,700 km$^2$ and consists of the eastern portion of the ecoregion 2W, specifically 2W-3. It is bordered to the north and east by the Missisa Range, to

the south by the Nipigon and Kinloch Ranges, and to the west by the Spirit Range and a small portion of the Swan Range. The southern boundary follows the 2W-3 ecodistrict and the Albany River. The north and eastern boundary loosely follows the ecodistrict 2W-2. The western boundary follows the Pipestone River up to Misamikwash Lake, northwest to Nemeigusabins Lake, to the eastern shore of Big Trout Lake.

### 5.1.3 James Bay Range

The James Bay Range is approximately 60,300 km$^2$ and includes the eastern portion of the James Bay Ecoregion (2E). It is comprised of ecodistricts 2E-1, 2E-2 and a small portion of 2E-4. It is bordered by the Missisa Range to the west and the Pagwachuan and Kesagami Ranges to the south. The northern boundary is defined by the Northern Taiga Ecoregion (1E). The eastern boundary coincides with the James Bay coast. The Moose and Mattagami rivers form the boundary between the James Bay and Kesagami Ranges in the southeast, whereas the Missinaibi and Rabbit river network to the Albany River forms the southwest boundary that is shared by the Pagwachuan Range. The boundary in this area is largely based on approximations of treed density gradients on the lowlands. Caribou appear to have larger home ranges in the James Bay Range than caribou in other Far North Ranges, and utilize large areas of wetland complexes seasonally within the range.

## 5.2 Integrated Range Assessment Report

This section provides a summary of the approach for the Integrated Range Assessment undertaken from 2009 to 2013 for Ontario's Far North ranges including Missisa, Ozhiski and James Bay ranges, the results of which were published in 2014 (MNRF 2014b). The report is available at: Integrated Range Assessment for Woodland Caribou and their Habitat - The Far North of Ontario 2013.

### 5.2.1 Missisa Range

The 2014 IRAR (MNRF 2014b) indicated that the minimum animal count was 745, based on winter distribution survey results from 2009 to 2011. Recruitment estimates ranged from 0.0 to 22.21 and were below expected values thought to support a stable to increasing population trend. Mean annual survival estimate was low (80%) based on three biological years of data, and when modelled with the calf recruitment levels resulted in a declining population trend with a geometric mean of $\lambda = 0.86$. This estimate suggested a declining trend and was the result of generally low recruitment and one year of low survival.

A geospatial analysis of the natural and anthropogenic disturbances within the range revealed an estimate of 14.4% cumulative disturbance. The resulting likelihood of stable or increasing population growth was estimated to be 0.86. At this level it was likely the Missisa Range could sustain the caribou population. However, the Integrated Range Assessment concluded that risk to caribou was intermediate in the Missisa Range, and it was uncertain whether the range was sufficient to sustain caribou based on factors outside of habitat state e.g. declining population trend.

### 5.2.2 Ozhiski Range

The 2014 IRAR indicated that the minimum animal count was 148, based on winter distribution survey results from 2010 and 2011. Recruitment estimates ranged from 7.0 to 60.0 and were generally below expected values thought to support a stable to increasing population trend, but the 2010 winter distribution survey estimate (28.7) could be representative and is comparable to expected values thought to support a stable population trend. Annual survival and trend were not estimated for the Ozhiski Range as not enough collared caribou were present within the range during the Integrated Range Assessment.

A geospatial analysis of the natural and anthropogenic disturbances within the range revealed an estimate of 27.6% cumulative disturbance. The resulting likelihood of stable or increasing population growth was estimated to be 0.70 and at this level it was likely the Ozhiski Range was capable of sustaining the caribou population. The Integrated Range Assessment concluded that risk to caribou was low in the Ozhiski Range, and at that time the range was sufficient to sustain caribou based on all factors considered.

### 5.2.3 James Bay Range

The 2014 IRAR indicated that the minimum animal count was 177, based on winter distribution survey results from 2010 and 2011. Recruitment estimates ranged from 9.45 to 45.91 and apart from 2012 (45.91), were below expected values thought to support a stable to increasing population trend. Mean annual survival estimate was slightly low (84%) based on three biological years of data, and when modelled with the calf recruitment levels resulted in a declining population trend with a geometric mean of $\lambda = 0.91$. This estimate suggested a declining trend and was the result of generally low recruitment and survival.

A geospatial analysis of the natural and anthropogenic disturbances within the range revealed an estimate of 6.6% cumulative disturbance. The resulting likelihood of stable or increasing population growth was estimated to be 0.90 and at this level it was likely the James Bay Range could sustain the caribou population. However, the Integrated Range Assessment concluded that risk to caribou was intermediate in the James Bay Range, and it was uncertain whether the range was sufficient to sustain caribou based on factors outside of habitat state e.g. declining population trend.

## 5.3 Monitoring Activities since the 2014 IRAR

### 5.3.1 Missisa Range

Cumulative disturbance analysis was completed by MECP to estimate range-level disturbance for 2017 through 2022 (Table 19). The approach to estimating cumulative disturbance differed

from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 19. Cumulative disturbance estimates for 2017 to 2022 in the Missisa Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Anthropogenic (%) | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Zone of Influence (%) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Natural (%) | 3.3 | 3.4 | 3.3 | 3.3 | 3.2 | 3.2 |
| **Total (%)** | **8.5** | **8.5** | **8.4** | **8.4** | **8.4** | **8.4** |

### 5.3.2 Ozhiski Range

Cumulative disturbance analysis was completed by MECP to estimate range-level disturbance for 2017 through 2022 (Table 20). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 20. Cumulative disturbance estimates for 2017 to 2022 in the Ozhiski Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Anthropogenic (%) | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 | 3.2 |
| Zone of Influence (%) | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 4.0 |
| Natural (%) | 13.5 | 14.5 | 13.9 | 13.6 | 13.5 | 13.4 |
| **Total (%)** | **20.6** | **21.5** | **20.9** | **20.7** | **20.6** | **20.5** |

### 5.3.3 James Bay Range

Cumulative disturbance analysis was completed by MECP to estimate range-level disturbance for 2017 through 2022 (Table 21). The approach to estimating cumulative disturbance differed from the approach taken for earlier cumulative disturbance estimation reported in the IRAR in that updated data sources and estimation methods were used.

*Table 21. Cumulative disturbance estimates for 2017 to 2022 in the James Bay Range.*

| Type of Disturbance | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Anthropogenic (%) | 2.2 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| Zone of Influence (%) | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| Natural (%) | 3.3 | 3.4 | 3.4 | 3.2 | 3.1 | 3.1 |
| **Total (%)** | **6.7** | **6.2** | **6.2** | **6.0** | **6.0** | **5.9** |

## 5.4 Results and Discussion

### 5.4.1 Missisa Range

Out of 58 adult female collared caribou in the Missisa Range, there were 16 confirmed mortalities; six (6) due to probable or possible predation, mainly by wolves; eight (8) with undetermined cause of death; and two (2) associated with hunter harvest.

The Missisa Range includes both Boreal Caribou and Eastern Migratory Caribou ecotypes and vital rates (survival and recruitment) were determined separately for each. Caribou that spent more than 50% of the calving season in Ecoregions 0E and 1E of the Hudson Bay Lowlands Ecozone were classified as Eastern Migratory Caribou and caribou that spent more than 50% of the calving season outside of Ecoregions 0E and 1E as Boreal Caribou (Pond et al. 2016). Approximately half of the collared caribou were Eastern Migratory Caribou and half were Boreal Caribou.

The estimated annual survival rate of adult female Boreal Caribou was 87% and for adult female Eastern Migratory it was 88% in the Missisa Range.

The estimated annual recruitment rate was 45.5 calves per 100 adult female Boreal Caribou and 59 calves per 100 adult female Eastern Migratory Caribou.

Additional results are provided in Table 22.

### 5.4.2 Ozhiski Range

Out of 93 adult female collared caribou in the Ozhiski Range, there were 27 confirmed mortalities; 20 due to probable or possible predation, mainly by wolves; and seven (7) with undetermined cause of death. Some collars (n=8) stopped sending signals before investigations could be made. Only five (5) individuals were classified as Eastern Migratory Caribou so vital rates were determined using pooled data for both ecotypes.

The estimated annual survival rate of adult female caribou in the Ozhiski Range was 89%.

The estimated annual recruitment rate was 34 to 37 calves per 100 adult female caribou.

Additional results are provided in Table 22.

*Table 22. Minimum animal counts, estimated population trend and growth rate, and range condition for Missisa and Ozhiski ranges.*

| Range | MAC[1] | Population Trend[2] | Population Growth Rate[3] | Range Condition[4] |
|---|---|---|---|---|
| **Ozhiski** | 484 (2018)<br>325 (2019) | Stable or possibly increasing | λ = 1.07 (geometric mean 2020-2024) | Likely sufficient to sustain caribou |
| **Missisa** | 544 (2020) | Stable or possibly increasing | λ = 1.13[5]<br>λ = 1.25[6]<br>(geometric mean 2020-2023) | Likely sufficient to sustain caribou |

1. Minimum Animal Count (MAC) (year of estimate); 2. Short-term demographic trend; 3. Finite population growth rate (λ) (years taken into account to estimate survival and recruitment rates); 4. Based on the four lines of evidence; 5. Boreal Caribou; 6. Eastern Migratory Caribou.

# 6 NEXT STEPS

Implementation of the Boreal Caribou Monitoring Program is ongoing. In 2026, as part of the implementation of the monitoring program, collar-targeted caribou group demographic classification surveys were completed in the Berens, Sydney, Churchill, Kinloch, Missisa and Ozhiski ranges to assess calf recruitment and group composition. In addition, GPS collaring of adult female caribou occurred in the Brightsand, Churchill, James Bay, Kesagami, Nipigon and Pagwachuan ranges to lay the foundation for an assessment of recruitment and survival rates, and to collect information on annual movements, seasonal distribution and use of habitat areas.

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# 8 APPENDICES

## APPENDIX 1 – TWO-STAGE AERIAL SURVEY DESIGN – WITH FECAL PELLET COLLECTION AND DEMOGRAPHIC CLASSIFICATION

The following survey design was defined in the Request for Bids and used by the vendors for the aerial surveys in the Nipigon, Swan and Spirit ranges in 2025.

The two-stage aerial survey must be conducted between January 20 and March 15, 2025. The first stage is a fixed-wing aircraft survey following pre-established parallel transects spaced at approximately 4.6 km intervals in the Nipigon Range and 9.2 km intervals in the Spirit and Swan ranges. Observers record observations and evidence (i.e., tracks in the snow) of the presence of caribou and other species (e.g., moose, wolves and wolverine). The second stage is the sampling by helicopter of caribou fecal pellets at feeding/cratering sites identified during the first stage aerial survey.

The survey must be completed based on the methods as follows:

**Stage One – Fixed-wing Aerial Surveys:**

1. Each flight will require at least three (3) survey crew members. At least two (2) survey crew members will be supplied by the Vendor who will undertake the surveys. The pilot will be the third survey crew member, who may also participate in administering the survey. If an Indigenous community member joins the survey, then they will be the fourth person on the flight. When assigning each participant to a position in the aircraft, ensure that there is at least one (1) experienced observer on each side of the aircraft.
2. The Range must be surveyed using previously identified, mapped transect flightlines that are approximately 4.6/9.2 km apart (except for some areas of Lake Nipigon), at a height of approximately 600 feet above ground level (AGL), at a speed between 90 and 110 knots, to allow observers to identify caribou, moose, wolverine, wolf, and other notable species, as well as sign (i.e., tracks, bedding sites, caribou cratering and slushing areas).
3. Surveys are to occur with a minimum of 20 cm snow cover (30 cm preferred) and at least 24 hours after a snowfall of more than 15 cm. Surveys are not to occur while there is active snowfall.
4. Survey times on transects must be between two (2) hours after official sunrise and two (2) hours before official sunset.
5. All sign and observations of caribou, moose, wolverine, wolf, and other notable species must be recorded on the provided data sheet (see example in Appendix C) and must be logged on a GPS.
    a. If caribou are seen, indicate on the data sheet, the number of animals and age/sex if possible without interfering with the reconnaissance flight. Indicate if the caribou sign

is fresh (crisp tracks/cratering/beds) or older (tracks melted out or windblown and lacking in definition), to assist prioritizing the collection sites.
   b. For all observed caribou, take high resolution photographs where possible, for potential future use to classify groups.
   c. Methods for estimating the distance of observations from the flightline and probability of detection on the flightline will be provided as required by the Ministry.
   d. Identify and record potential nearby helicopter landing sites to aid helicopter survey crews in the landing and collecting of pellet samples.
6. Data must be compiled from the survey flights in preparation for pellet collection sites selection.

**Stage Two– Rotary-wing Fecal Pellet Collection:**

1. Ambient temperatures above 0° Celsius will degrade the DNA sample. If environmental conditions lead to the thawing of pellet samples, expert advice on DNA integrity must be used to identify if pellet collection activities can continue. The collection of pellet samples following a thawing and refreeze cycle will compromise the integrity of collected samples for use in genetic work.
2. Review caribou sign and observation areas identified in the Stage One aerial survey flights to prioritize sites for pellet collection, evenly distributed across the survey area (see #2 below). Because fresh snow can cover sites and hide caribou sign and pellets, sites need to be visited shortly following the Stage One survey flight (i.e., ideally the following day) to ensure that the observed tracks / cratering / bedding areas can be re-discovered. Where several sites are clustered within one (1) km, and where there are obvious trail connections and other evidence of the same group using the area, select one site for sampling, by prioritizing the site with freshest sign.
3. At each prioritized site, search for the freshest possible cratering and beds, preferentially, or a concentration of trails and find a place to land within approximately 500 meters of the collection site. If unable to identify an area to land and collect pellets, move on to the next priority collection site.
4. The helicopter crew must survey the area to ensure no caribou are present before landing. To minimize disturbance to caribou in the area, the crew must not land within one (1) km of caribou observed in open areas (e.g., lakes) or within 500 m of any caribou observed in forested areas.
5. For each potential collection site, estimate the number of caribou (from the air and on the ground) based on trails, beds, cratering, etc. Based on this estimate the crew should aim to collect 1.5 times as many pellet samples at the site, distributed throughout the activity area. This will help to ensure as complete sampling of caribou present as possible.
6. Once on the ground, the crew must first establish that a site was used by caribou – look for tracks to verify. Take note if there is combined caribou and other ungulate sign. If the sign indicates it is not caribou, do not collect pellets.
7. Once verified that the site was used by caribou, the crew may begin searching for and collecting pellet samples by spreading out, taking different trails to cratering sites in an effort to cover the area as completely as possible and avoid duplicating samples from the

same caribou. Some use of snowshoes to navigate through deep snow areas may be required.

8. Upon decision to collect pellets, take a GPS waypoint at location of collection site, save on GPS unit and begin filling in required fields in the provided pellet collection data sheet (see Appendix D) with available information.
9. For each sample, collect approximately 20-30 pellets, preferentially from pellet clumps (patties) rather than individual pellets dropped along a trail. Do not collect pellet clumps that do not have distinguishable pellets. Samples should be placed in Whirl-Pak (710ml, 3mil) bags.
    a. Ensure that the samples are not contaminated with human DNA. Do not touch samples, the inside of sample bags, the outside of gloves, or the end of sticks / chopsticks used for collecting pellets with bare hands. Use sticks / chopsticks / gloves for one sample only. Do not crush pellets. Keep snow in bags so samples do not dry out – drying degrades the quality of the DNA. Ensure pellets remain frozen after collection and prior to storage – melting degrades the quality of the DNA and the sample cannot be used for DNA analysis.
10. Once a sample is collected, place the sampling sticks / chopsticks upright in the snow to mark that a sample has been taken from that spot. Close the sample bag and legibly mark date, site number (including crew identifier), your initials and sample number on the sample bag (e.g., Feb 27, 2025 – A1 – TT – 2).
11. Once enough pellet samples have been collected, or efforts have been exhausted to find samples, all individual samples are to be placed in a site bag. The Site Number is to be marked (including crew identifier), Number of Samples collected, Date, and GPS LOCATION on each Site Bag (e.g., A1 – 2 – Feb 27, 2025 – N259039/E642330). The site number must be unique. If there are multiple crews, each should use a different letter identifier. Site number should not overlap, for example:
    a. Crew 1 samples 5 sites on day 1, 4 sites on day 2 – sample sites are named A1-A5 for day 1 and A6-A9 for day 2.
    b. Crew 2 samples 3 sites on day 1 and 5 sites on day 2 – sample sites are named B1-B3 for day 1 and B4-B8 for day 2.
12. On return to base, store samples in coolers outside or in a freezer where they will stay frozen. They must not be allowed to thaw, as this degrades the quality of the DNA.
13. Pellet samples must be shipped to Peterborough, Ontario by prior arrangement to ensure samples remain frozen.

**Stage Two – Rotary-wing Demographic Classification Aerial Survey (Spirit and Swan ranges):**

1. Complete a demographic classification aerial survey, either concurrently with Stage Two rotary-wing fecal pellet collection flights, or after the two-stage aerial survey over approximately six (6) days for both ranges (i.e., three (3) days for the Spirit Range and three (3) days for the Swan Range). The following steps are required to be completed:
    a. Use the caribou activity sites identified during the two-stage aerial survey to locate caribou and record the demographic composition of observed caribou groups. Any

caribou groups detected incidentally while travelling to and between targeted activity sites should also be recorded.

b. Once a group is detected, record demographic classifications of all individuals in the group as follows:
    - Document demographic classifications via low-level visual observation and verbal call out as per standard aerial recording procedures.
    - Record the number of bulls, cows, unknown adults, juveniles and calves in each group. This information will be used to determine recruitment rate, demographic composition and group size.
    - Take high resolution photographs for use as a general record of groups classified. Effort should be taken to take photographs that capture the rear ends of adults (for sex determination) and side view of whole group (to confirm the number of cows). Information that can be used to link photographs to waypoints (e.g., photograph numbers) should be recorded.

# APPENDIX 2 – CARIBOU CAPTURE AND COLLARING STANDARD PROTOCOL

## Woodland Caribou (*Rangifer tarandus caribou*)

The woodland caribou is a medium-sized member of the deer family that is found across northern North America. Caribou are well adapted for life in the boreal forest. They have thick coats and hollow hair that provide excellent insulation, and their large crescent-shaped hooves help them to walk easily on snow and soft ground, and to dig through deep snow to find lichens, their main winter food. Unlike other members of the deer family, both males and females can have antlers, although the antlers of the male are usually larger and more robust.

There are two types of woodland caribou in Ontario. The forest-dwelling woodland caribou, Boreal Caribou, lives year-round in the boreal forest, and usually occurs singly or in small groups. The forest-tundra woodland caribou, Eastern Migratory Caribou, may occur in large groups on the northern tundra of the Hudson Bay Lowlands during the spring and summer and moves into the boreal forest during the winter.

Free-ranging caribou may be captured and immobilized for a variety of research and management purposes such as deployment of GPS collars to determine habitat use, movement patterns, mortality and recruitment, to make morphological measurements, to collect biological samples (e.g., blood, hair, fecal pellets) for genetic, reproduction and condition studies, to make field measurements of condition and reproductive status (e.g., ultrasound), and for translocation. The capture method(s) should be selected to minimize trauma and stress to the animal with consideration given to the capture environment and study requirements.

## CAPTURE TECHNIQUES

### Aerial Net-Gunning in Winter

During the winter only, a capture crew may use a rotary-wing aircraft and net gun to capture caribou, then land and restrain them with hobbles. Aerial net-gunning is a widely used procedure to capture and restrain large mammals in remote field settings (Kock et al. 1987, Nelson et al. 2006, Webb et al. 2008, Government of Alberta Class Protocol #008).

Free-ranging caribou will be net-gunned from a highly manoeuvrable helicopter. The net gun comprises a stock and action (.308 cartridge) to which the “net basket” is attached. The netting is made from approximately 5-mm diameter nylon cord, mesh size of 15 cm, and total dimensions of approximately 6 m square. A cylindrical steel weight, approximately 15 cm long and 2 cm diameter is attached to each corner of the net. These weights are inserted into four “barrels”, which angle approximately 45 degrees outward on the outside of the “basket”. When the net gun is fired, these weights are discharged, thereby spreading the net rapidly.

The following procedures will be followed to ensure caribou will be handled in a manner that will reduce the risk of injury and stress.

**Pre-capture and Herding:**

- A rotary-wing aircraft should be used to herd animals to a capture area and effort made to minimize the herding time prior to pursuit. Crews should ensure animals are not unduly stressed and back away as necessary.

- During pre-capture, areas will be avoided with rough terrain, cliffs, thin ice and effort should be made to capture animals on level, soft terrain.

**Positioning and Selection of an Animal:**

- Following an initial terrain assessment, individual caribou will be moved slowly at a distance by the helicopter to a position near a selected capture site.

- Avoid animals that appear crippled, aged or in poor body condition.

- If the animal shows undue signs of stress, retreat or terminate contact with that animal. If possible, individual animals should not be pursued on multiple separate occasions if an initial pursuit fails.

**Pursuit:**

- Pursuit of animals at a full run should be less than 1 minute and must not exceed three (3) minutes. Total chase time, including the time to herd the animal to the capture site, will not exceed five (5) minutes.

- Chases will be abandoned if animals are excessively stressed or in unsuitable habitat.

- Pursuits should generally occur in relatively open areas with limited obstructions. Caribou on frozen lakes will be preferred, but animals located on other suitable flat, open terrain, such as frozen rivers, roads, or in clearcuts with minimal debris, may also be captured.

- No pursuit shall occur on lakes, rivers, or creeks with sheer ice.

- Animals should be slowly directed to the capture site to allow them to become accustomed to the helicopter sound and movement, thereby keeping the stress level low. The capture team should decrease the distance between themselves and the target animal as it approaches the capture site.

- Where possible, animals should be moved uphill and/or in deep snow to reduce the animal’s speed and minimize risk of injury as the helicopter moves within 3-5 metres for a shot.

**Capture:**

- Shoot the net over the animal in an open area.
- Multiple animals in one net must be avoided.
- The net is discharged such that it is placed fully open across the back of the caribou and half of it falls in front of the animal. If placed correctly, the animal's legs will rapidly tangle in the net.
- Where the net misses or the animal escapes from the net, the animal will not be considered for another capture on the same day.
- Once the caribou has stopped moving due to entanglement in the net, the helicopter immediately lands nearby and drops off the net gunner and handler.

**Handling:**

- Total handling time should typically take no more than 20 minutes and a maximum of 30 minutes unless complicating factors involving the safety of the animal arise.
- Minimize the number of people in close proximity to the animals. Handle the animal without sudden movements, minimizing auditory, touch, and visual stimuli throughout the procedure.
- Work from the dorsal side of the animal, staying above and behind the animal, especially when the net is being removed.
- The capture net will be carefully removed and any potentially harmful objects (e.g., sticks, sharp rocks, etc.) in the immediate vicinity removed to assure comfort and safety of the caribou and capture personnel.
- Captured animals shall be promptly physically restrained with hobbles (front leg strapped to the back leg on each side) to prevent thrashing and potential injury to staff and to the captured animal.
- Animals should be positioned so that breathing is not restricted, e.g. by keeping the neck straight and avoiding blocking the nostrils and mouth, and by not sitting on the head, chest or neck unless the animal has to be temporally physically restrained.
- Bloat - Captured animals shall be in the sternal recumbency position. The head shall be elevated above the rumen to avoid regurgitation or aspiration of fluids/ stomach contents into the lungs. If bloat is observed (distended abdomen) the animal shall be immediately released.

- A blindfold shall be placed over the eyes of the captured animal to reduce stress by visual stimuli and ear plugs inserted in both ears to reduce stress by auditory stimuli.

- Each animal will first be physically examined for obvious signs of injury or abnormalities and if any are found, an attempt made to ascertain if these are chronic or as a result of the capture process. Any animals with obvious injuries or abnormalities will not be collared but biological samples may be collected prior to release.

- Animals that are noted to be extremely old and in poor condition will be released immediately without further handling or attachment of a collar.

- The well being of each animal will be closely monitored during the handling process. Physiological function (respiration and pulse rate, mucous membrane colour, rectal temperature), signs of myopathy, shock and hypothermia will be constantly monitored for signs of distress. If there are any signs of severe stress (e.g., prolonged and excessive muscle tremors or extremes in respiration rate beyond what is typical for animals during handling), the observed animal shall be released immediately without a collar.

- Physiologic response must be assessed, and the assessment should include the following measures:

    - Respiratory function: evaluated by respiratory rate, depth, and sound. Although respiratory rate is affected by many factors (age, activity, drugs, etc.), it should remain > 4 breaths per minute. Each breath should be quiet and characterized by full expansion and relaxation of the rib cage. If the respiratory rate is less than 4 breaths per minute, artificial ventilation (chest compressions) are indicated. If the animal continues to pant excessively with an increased body temperature, it should be released.

    - Cardiovascular function: evaluated by pulse or heart rate, mucous membrane color, and capillary refill time. Although pulse or heart rate is affected by many factors (age, activity, drugs, etc.), it should remain between 40 and 130 beats per minute. In addition, mucous membranes (i.e., gums, anus, vulva) should be pink and the capillary refill time should be < 3 seconds. Capillary refill is determined by pressing the gums with a finger so the gum turns white under the pressure. Upon release, the gum tissue should turn pink immediately. If the pulse or heart rate increases or decreases outside of the recommended range, respiratory function should be re-assessed immediately and corrected, or the animal released.

    - Body temperature: evaluated rectally using an electronic digital thermometer. A spare thermometer should always be carried in case the active thermometer malfunctions. The rectal temperature should range between 37C and 41.5C. Temperatures greater than 41.5 C indicate hyperthermia. Cooling methods

should be attempted, including dousing with cold water and snow, and cold-water enemas particularly in the less-haired areas such as the groin. Effectiveness will vary with the size of the animal, the thickness of its hair coat (and subcutaneous fat stores), and the rate of temperature increase. Hypothermia (rectal temperature <35C) may also develop in some caribou, especially smaller-sized or aged animals that are captured under cold ambient conditions. Treatment should be directed toward active warming of the animal first (heating pads, place in sleeping bag, drying wet hair coat).

- Caribou that exhibit capture myopathy or injuries that could have long term effects of capture will be euthanized on site using standard criteria set out by the Canadian Council on Animal Care (2003, 2010). Euthanized animals will be left at the site. Such events should be reported to the assigned Ministry of the Environment, Conservation and Parks (MECP) contact within 24 hours of occurrence.

- Animal welfare – If at any time during the capture operation the rate of injury exceeds 2 animals the capture crew will halt operations and review technique and capture plans with the staff. The Ministry of Natural Resource's Wildlife Animal Care Committee and the assigned MECP contact shall also be contacted for discussion of procedures.

**Sampling Procedures:**

- When possible, measurement and sampling should be done to the rear and backside of the animal (i.e., not facing the legs) to minimize risk of human injury from kicking or sudden head movements (especially where antlers are present)

- Hair samples:

    - Collect from the shoulder area. Plucked hair with roots is necessary for genetics.

- Fecal Samples:

    - Take directly from the anus.

- Attaching GPS collars:

    - The combined weight of the transmitter and neck collar should not exceed 4-5% of the animal's body mass.

    - Collar size/diameter must be appropriate for the size of the animal.

    - All collars should be equipped with a pre-programmed release mechanism that will allow the collars to drop off. If not, at the end of the study, all practical attempts will be made to recapture the animals for removal of the collars.

    - Collars will not be placed on any animals with obvious injuries or abnormalities.

**Release:**

- Minimize the number of people around the animal.
- Direct the animal towards an open area away from people, equipment and other obstructions. The chances of injuries may be reduced by selecting appropriate capture sites and preventing animals from attempting fast downhill escapes.
- Remove the lower of the two leg belts. Next, the blindfold and ear plugs are removed and finally, the second upper leg belt is released.
- Personnel will move to a safe location and observe the animal from a distance until it is standing and walking steadily away, to identify any signs of injury or abnormal behaviour.
- Any animal that does become injured will be assessed for the seriousness of the injury. If an animal is deemed unfit, it will be humanely euthanized on site using standard criteria set out by the Canadian Council on Animal Care (2003, 2010) (e.g., dispatched with a high powered rifle bullet to the brain.) If anaesthetized first, the carcass should be buried or removed.