Ontario Boreal Caribou Monitoring Program

2024 Aerial Survey 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 report focuses on aerial surveys conducted in 2024 and is an addendum to the report on the aerial surveys conducted under the Boreal Caribou Monitoring Program in 2023.

As part of the Boreal Caribou Monitoring Program, helicopter surveys using a stratified-transect distance sampling approach were conducted in March 2024 in the Berens and Sydney Boreal Caribou Ranges by WSP Canada Inc. (WSP) on behalf of the Ministry of the Environment, Conservation and Parks (MECP).

This document provides information on the methodology and results of the 2024 aerial surveys. It was prepared by MECP and the Ministry of Natural Resources (MNR).

The number of caribou observed during the aerial surveys was more than 100 for the Berens Range (133 caribou observed) but below 100 in the Sydney Range (45 caribou observed). These observations represent the minimum number of caribou occupying a range; however, not all caribou are detected during an aerial survey and the true number of caribou present is very likely greater than the minimum number directly observed. 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.

Although less than 100 caribou were observed in Sydney Range, this 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.

Caution is recommended in drawing conclusions from the 2024 aerial surveys which is a single survey effort and where several years of data are preferred to assess the state of a caribou population. Further information on calf recruitment, adult female survival and habitat state is required to improve understanding of the projected future status of Boreal Caribou in each of the two ranges surveyed.

1. INTRODUCTION

1.1 Purpose

The purpose of this document is to describe the methodology and results of Boreal Caribou aerial surveys undertaken in 2024, as part of Ontario's Boreal Caribou Monitoring Program.

The 2024 aerial surveys were conducted in two ranges: Sydney and Berens. Earlier aerial surveys of the Brightsand, Churchill, Kesagami and Kinloch ranges were conducted in Winter 2023, and the results have been published on the Ontario Boreal Caribou Monitoring Program webpage. Additional work is underway or planned under the monitoring program to generate information to support updated Integrated Range Assessments for Ontario's Boreal Caribou ranges.

2. METHODOLOGY

This section describes the methodology applied to the 2024 aerial surveys completed in the Berens and Sydney ranges. The 2024 aerial surveys provide information to support two lines of evidence: population size and population trend. Updated Integrated Range Assessments for these two ranges require the collection of additional information to fully understand these two lines of evidence as well as the third and fourth lines of evidence (habitat disturbance and habitat amount and arrangement). Table 1 indicates how the 2024 aerial surveys contribute to the collection of information to support updated Integrated Range Assessments.

Table 1. The 2024 aerial surveys as they relate to the four lines of evidence to complete an Integrated Range Assessment.

	Line of Evidence	Measure	Details relevant to 2024 aerial surveys
Population state	Population size	Minimal Animal Count (the number of caribou physically observed).	A count of observed caribou is available for both ranges.
		Population density (the number of caribou per square kilometer).	Due to low sample size this was not estimated with confidence for either range.
		Population size (based on population density which is used to determine range-level population size estimates).	Due to low sample size this was not estimated with confidence for either range.
	Population trend	Recruitment rate (the number of calves per 100 adult females).	This was estimated for the Berens Range only (sample size was too low in Sydney Range).
		Demographic structure (the number of adult females, adult males, adults of unknown sex, and calves).	This was measured for both ranges.

	Line of Evidence	Measure	Details relevant to 2024 aerial surveys
		Group size (the number of caribou per group observed).	This was measured for both ranges.
Habitat state	Disturbance Assessment	Cumulative disturbance (estimate of the amount of natural and anthropogenic disturbances in a range).	Not completed with an aerial survey.
	Habitat assessment (amount and arrangement)	Habitat amount and arrangement for each range.	Not completed with an aerial survey.

The 2024 aerial surveys were conducted based on the methods provided in Appendix 1. They consisted of searching for evidence of caribou presence including animals, tracks, slushing and cratering and determining the distance of caribou detected using those observations from stratified transect flight lines.

The 2024 aerial surveys were conducted based on those methods previously used for rotary-wing surveys of caribou. These included the 2009-2014 surveys following the Integrated Range Assessment process, as well as the 2023 Boreal Caribou Monitoring Program surveys conducted in the Brightsand, Churchill, Kesagami and Kinloch Ranges. Survey efforts primarily consisted of flying set transects and searching for caribou or caribou sign (i.e., tracks, slushing and cratering areas). A key distinction in the development of the 2024 aerial surveys was the consideration of stratification techniques to maximize survey effort in those areas which had a higher potential for caribou use and observations.

Transects (parallel east-west flight lines) were stratified by WSP into either 7.5 km or 5 km spacing to represent medium and high survey intensities, respectively. Areas which incorporated the high intensity strata (5 km spacing) were based on the consideration of habitat modelling showing suitable winter habitat whereas areas which incorporated the medium intensity strata (7.5 km spacing) were based on areas showing not suitable winter habitat. Considered data sources included General Habitat Descriptions (GHD), forest harvest type, and caribou winter distribution and abundance data gathered during previous surveys and collaring efforts. Additional habitat related information on landscape disturbances were also considered, including recent forest fire events and forest damage caused through insect outbreaks.

2.1 Population Distribution and Size

Winter caribou distribution for each range was derived from the 2024 aerial surveys by recording accurate locations of observed caribou and their sign (e.g., fresh tracks and cratering). This single point-in-time information confirms winter occurrence of caribou at observation locations, but due to the difficulty in detecting caribou and the short duration of the survey, the lack of caribou evidence from other surveyed portions of the range cannot be definitively interpreted as indicating the absence of caribou from those areas.

Additional surveys within a relatively short timeframe (e.g., five years) can further support determination of winter caribou distribution, as can location information gained through caribou collaring.

Minimum Animal Counts (MACs) are provided in this report based on the observation of caribou during the 2024 aerial surveys. Similar to results reported in the Integrated Range Assessment Reports (IRARs), MACs identify the number of caribou observed in each surveyed range. It is the expectation that an additional number of caribou occur in each of the surveyed ranges.

2.2 Population Trend

Survival Rate

The surveys conducted in 2024 were not designed to update survival rates. As a result, population trend was assessed based on combining a spectrum of potential adult female survival rates, specifically: ‘low’ (0.80), ‘medium’ (0.85) and ‘high’ (0.88) survival rates derived from Environment Canada (2008, 2011) – with survey-based estimates of calf recruitment to estimate the range of potential population growth rates.

Recruitment Rate

The 2024 aerial surveys provided a single year of demographic data that were used to derive preliminary recruitment rate estimates. To estimate population trend, further efforts are required to estimate adult female survival rates and improve recruitment estimates (i.e., by collecting multiple years of data, to capture between-year variation in recruitment).

Demographic Structure

In the 2024 aerial surveys, caribou were classified by sex (males, females), general age class (adults, calves), and unknown/unclassified individuals were also counted and recorded. Each group was photographed to visually verify classifications based on criteria that included body size, antler configuration, rump patch size, presence of vulva patch or penis sheath, and behaviour. Demographic outputs included total count, number of adult males, adult females, calves, adults with unknown sex, and unknown age/sex.

Group Size

From the 2024 aerial surveys, mean group size and 95% confidence intervals were estimated from direct observations of caribou groups and the counted number of caribou present.

3. BERENS RANGE

3.1 Context

The Berens Range is approximately 28,000 km^2 and located in northwestern Ontario. It neighbours the Sydney, Churchill, Kinloch, and Spirit ranges as well as the Manitoba border where it shares a common boundary with the Atikaki-Berens Management Unit in Manitoba. It is believed that caribou on both sides of the provincial border utilize similar habitat types and share some level of connectivity across it. The proximity and a desire to collaborate on shared caribou conservation issues influenced the delineation of the Berens Range (MNRF 2014a). The Berens Range was intended to represent the caribou occupancy at the north end of Woodland Caribou Provincial Park and the unique and patchy caribou occupancy patterns associated with this naturally highly disturbed landscape (MNRF 2014a).

3.1.1 Integrated Range Assessment Report

This section provides a summary of the approach for the Integrated Range Assessment undertaken from 2012 to 2013 for the Berens Range, the results of which were published in 2014. The report is available at:
Integrated Range Assessment for Woodland Caribou and their Habitat - Berens Range 2012 (ontario.ca).

A two-stage (fixed-wing followed by rotary-wing) aerial winter survey for caribou was conducted during February 2012 in which observations of caribou and their signs (i.e., tracks, slushing and cratering) were recorded. 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 were used to determine caribou distribution and estimate population state metrics including the minimum number of caribou in the range and calf recruitment rates. Recruitment surveys were conducted during late winter 2013 to further assess calf recruitment to support estimates of population trend. Thirty adult female caribou were collared during February 2012 and monitored until 2015 for use in assessing annual calf recruitment and adult survival rates.

In the 2012 aerial surveys 237 caribou were observed in 28 groups. Most observations of caribou activity were recorded in the western portion of the range, including Woodland Caribou Provincial Park. The calculated sex ratio for 2012 indicated that adult females comprised of 61% of the identified adult population.

Additional surveys were conducted in the Berens Range from 2014 to 2015. Based on the recruitment surveys which occurred in 2013, 2014 and 2015, 185, 171 and 136 caribou were observed, respectively. These recruitment surveys did not use transects but rather used the locations of collared female caribou to complete demographic classifications of caribou groups. The calculated sex ratios in 2013, 2014 and 2015 for the Berens Range, indicated that adult females comprised 75%, 65% and 66% of the adult population, respectively.

The estimated recruitment rates from 2013, 2014 and 2015 (23.9, 24.6 and 20.8 calves per 100 adjusted adult females respectively) were 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, Environment Canada 2011) and were comparable to studies in which populations were known to be in decline (MNRF 2017). The data indicated that the current number of calves was likely inadequate to maintain the population unless adult female survival was above the 85% threshold. The annual adult female survival within the Berens Range was 87% during the 2011-2012 biological years, 82% during the 2012-2013 survey years and 80% during the 2013-2014 survey years. The resulting average population growth rate from 2011 to 2014 was in decline (0.92) (MNRF, 2017).

In conducting a cumulative disturbance assessment the 2014 IRAR included the results of a geospatial analysis which estimated 28.7% of the Berens Range was characterized as natural and anthropogenic disturbances in 2012 (MNRF, 2014a). The resulting likelihood of stable or increasing population growth was estimated to be 70%, at that time, and at that level it was likely that the Berens Range was capable of sustaining the caribou population.

In 2014, a completed habitat assessment was completed through analysis of the amount of caribou habitat, including refuge and winter habitat, and indicated alignment with the Simulated Ranges of Natural Variation (SRNV) expected within a natural landscape (MNRF, 2014a). Calculated SRNV levels are used to identify how close or how far away a caribou range is to a natural level, in consideration of both habitat arrangement and amount, and is used to inform probability of persistence for a caribou population. The calculated SRNV for habitat arrangement in the Berens Range, according to the 2014 IRAR (MNRF, 2014a), indicates the habitat is fragmented relative to what would be expected in a natural landscape.

The 2014 IRAR concluded that risk to caribou persistence was intermediate within the Berens Range, and it was uncertain whether range condition would be sufficient to sustain caribou (MNRF, 2014a; MNRF 2017).

Since the 2014 IRAR there have been changes in habitat within the Berens Range. Notably multiple forest fires occurred in 2021 covering approximately 430,000 ha (~15% of the total size of Berens Range). Additional changes in habitat are expected to have occurred based on further natural and anthropogenic changes since 2012.

3.1.2 Monitoring Activities since the 2014 IRAR

Ongoing caribou surveys have been conducted in Woodland Caribou Provincial Park, as well as within Forest Management Units overlapping Berens Range through activities related to Forest Management Planning. While results from these surveys do not provide updated information to assess population state, they do provide additional sub-range information on caribou distribution during the calving and winter periods.

3.2 Results and Discussion

Boreal Caribou aerial surveys within the Berens Range were completed from March 7-20, 2024. During that time 45 transects totaling 5,418 km were flown in the Berens Range. Figure 1 shows the flight lines along stratified transects within the Berens Range. Snow station data available from the MNR indicated that, through weekly collections which occurred at the Red Lake snow station, there was an average of 46.8 cm of snow on the ground on March 10, 2024, and an average of 42.2 cm of snow on the ground on March 17, 2024. Based on available Environment Canada historical weather data at the Red Lake A station, the average daily temperature over these 14 days was -6.7°C with the warmest days (March 11 and 12) being 3.1°C and the coldest day being -16.8°C (March 20). Survey effort may not have been conducted on all survey dates with survey timing variable based on weather conditions and other factors.

During the 2024 survey, 133 Boreal Caribou were observed, belonging to 21 groups. The number of caribou observed is higher than the critical threshold of 100 for a minimal viable population size for a population that has a minimum 70% probability of not reaching a quasi-extinction threshold of less than ten reproductively active females under stable conditions overs 50 years (Environment Canada 2011).

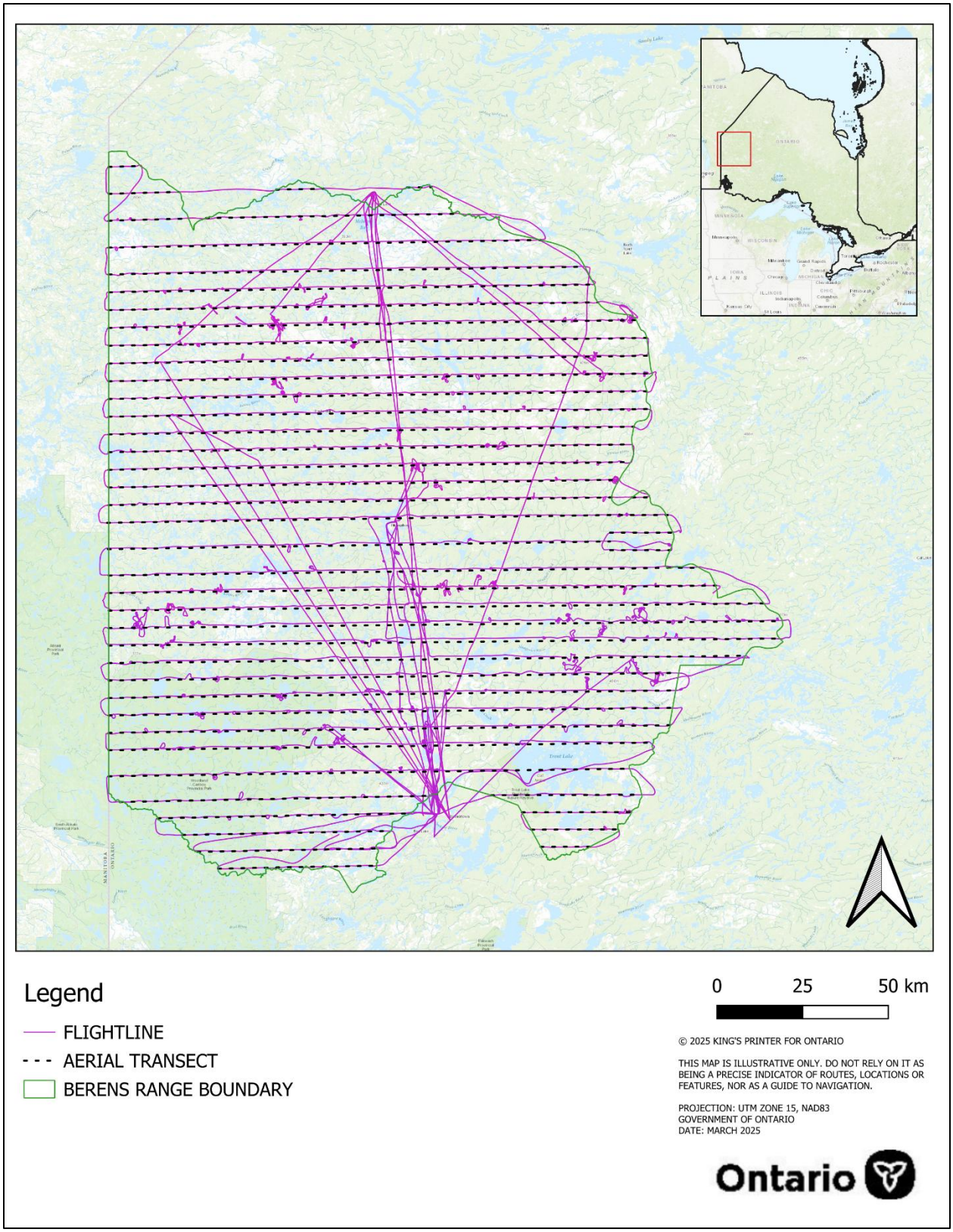

Figure 1. Flightlines for the 2024 aerial surveys in the Berens Range.

3.2.1 Population Distribution

Distribution mapping for observations of caribou and caribou sign (i.e., tracks, slushing, cratering) during the Berens Range survey (including intentional and incidental observations) 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 distribution of direct caribou observations in the Berens Range was predominately in the western half of the range which is largely consistent with the 2012 observations included in the 2014 IRAR for Berens Range (MNRF, 2014a). Caribou sign was more evenly distributed through the extent of the range (Figure 2). The information gathered through the 2024 aerial surveys may help inform future characterization of winter distribution patterns. The data could also be used with other recent and future distribution data to inform an assessment of changes in distribution since the last major monitoring effort in Ontario (2009-2015 IRARs). However, the 2024 aerial survey in the Berens Range is limited in its ability to provide a comprehensive understanding of distribution patterns because it includes information from one point in time and where survey coverage was incomplete based on identified transect spacing.

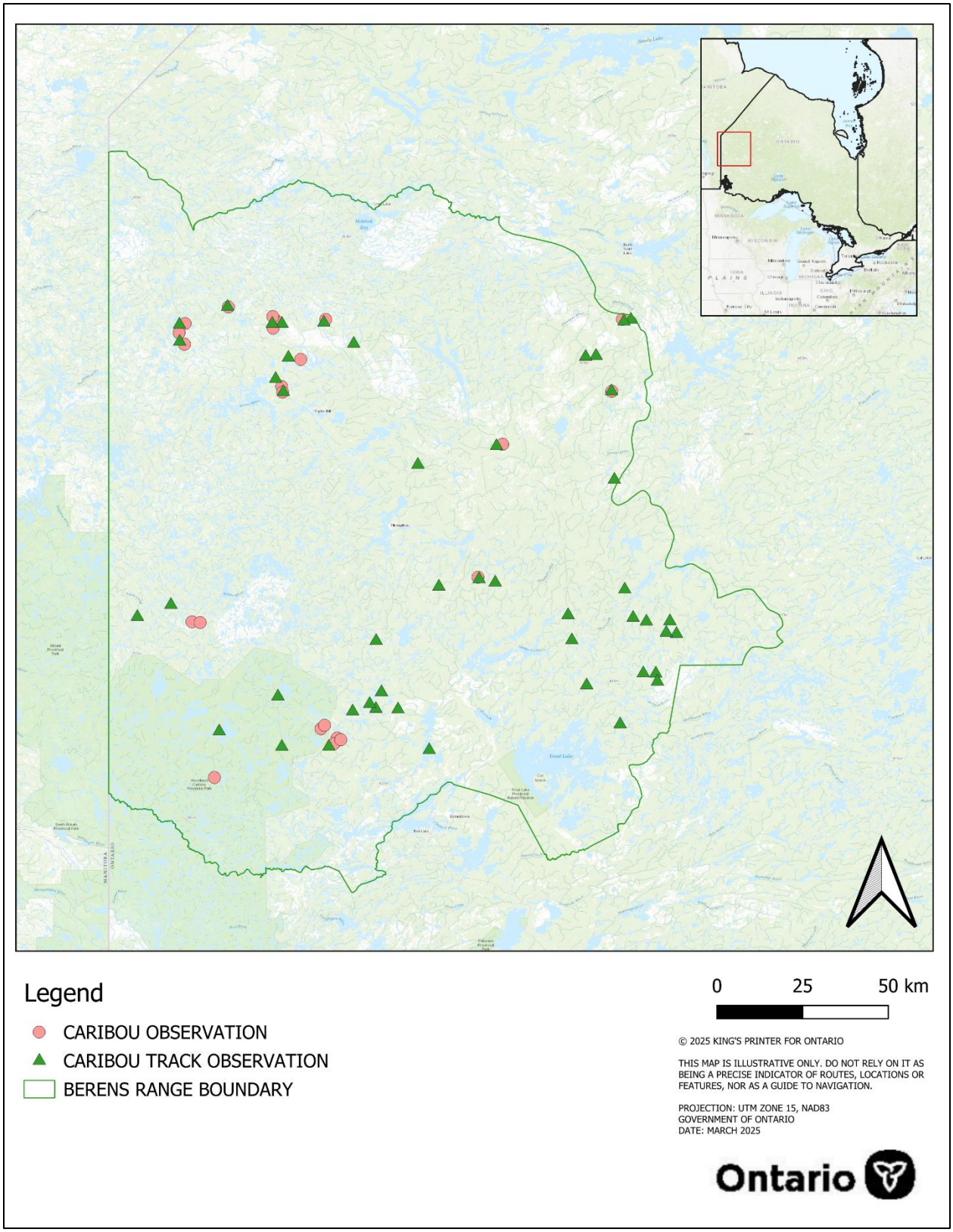

Figure 2. Observed caribou and caribou tracks in the Berens Range.

3.2.2 Population Trend

3.2.2.1 Recruitment and Survival

Based on the 2024 boreal caribou aerial survey results, recruitment rate was estimated to be 18.75 ± 14.67 (i.e., 4.08 to 33.42) calves per 100 adjusted adult females with 95% confidence (sample size of 59 including 9 calves and 50 adjusted adult females) (Table 3). The estimate of 18.75 calves per 100 adjusted adult females 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, Environment Canada 2011). Some caution should be given to this estimate recognizing the sample size is at the low end of that being required for reliable recruitment estimates (at least 50 adult females and calves combined) with the calculated 95% confidence intervals showing wide variation. Additional survey effort would be required to increase the sample size to a level that would support a reasonable degree of confidence in the recruitment estimates.

Recognizing the degree of uncertainty with this estimated recruitment rate, applying a conservative approach that focuses on the lower confidence limit of the recruitment rate (4.08 calves) suggests that recruitment 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, Environment Canada 2011) and suggest the population is decreasing within the Berens Range.

A current survival rate for adult females is not available. However, population trend can be estimated based on three survival rate scenarios (low, medium, high) and the estimated recruitment rate from the 2024 surveys (see Table 2).

Table 2. Population growth estimates in the Berens Range

Survival Scenario	S	R	R_{LL}	λ	$λ_{LL}$	n
Low	0.80	18.75	4.08	**0.88**	**0.82**	59
Med	0.85	18.75	4.08	**0.94**	**0.87**	59
High	0.88	18.75	4.08	**0.97**	**0.90**	59

S = assumed survival rate of adult females (Environment Canada, 2008, 2011); R = recruitment rate (calves: 100 adjusted adult females) from the 2024 survey; R_{LL} = lower confidence interval of the recruitment rate from the 2024 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 estimated recruitment rate (18.75 calves) from the 2024 surveys indicates that population growth is declining in all survival scenarios (λ = 0.88 (low), 0.94 (medium), 0.97 (high)) (see Table 2). Recognizing the degree of uncertainty with the estimated recruitment rate because of the sample size (59), a conservative approach using the lower confidence limit of the recruitment rate (4.08 calves), also indicates that population growth is declining in 2024 in all survival scenarios ($λ_{LL}$ = 0.82 (low), 0.87 (medium), 0.90 (high)). The annual adult female survival within the Berens Range

during the 2011-2014 biological years averaged 84%, which may suggest a potential survival scenario between low (0.80) and medium (0.85) levels. The past survival estimates across the 2011-2014 biological years and the 2024 recruitment results, under the low, medium and high survival scenarios, suggests the population trend in the Berens Range is declining.

Further consideration of population and habitat state through an Integrated Range Assessment process will be used to inform range condition into the future and will be based on available population level surveys as well as habitat modelling information.

3.2.2.2 Demographic Structure

The estimated proportion of calves in the Berens Range based on caribou that were classified by age was 6.82% ± 4.91% (95% confidence intervals of 1.91 (lower confidence interval) and 11.73% (upper confidence interval). The sample size was nine calves and a total of 130 caribou classified by age (121 adults in 21 groups). The calculated proportion of calves, and the calculated upper confidence interval, is below the range required for a stable population (13-15% calves in the population (Bergerud 1992; Bergerud 1996)).

The ratio of 71 adult females to 100 adult males (i.e., 41.5% adult females and 58.5% adult males) is unusually low. The sample size of adult caribou that were classified by sex was 62 males and 44 females. Based on the calculated sex ratio of 42% adult females to 58% adult males, from the observed animals, applied to the 15 adults of unknown sex, the adjusted number of adult females observed is 50 and the number of adult males is 71.

The demographic breakdown of the observed animals, for the Berens Range, is provided in Table 3.

Table 3. Observed caribou demographics in the Berens Range.

Adults, Sex Unknown	Adult Males	Adult Females	Calves	Unknown Age and Sex	Total	Adjusted Adult Males	Adjusted Adult Females
15	62	44	9	3	133	71	50

3.2.2.3 Group size

The average group size in the Berens Range, based only on caribou observations (including incidental observations), was 6.29 ± 1.49 (95% confidence intervals of 4.80 (lower confidence interval) and 7.77 (upper confidence interval)). The mean group size estimate in 2024 in the Berens Range is comparable to 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). The 2014 IRAR, based on a 2012 aerial survey, highlighted that most observed caribou groups varied from 2 to 13 animals with largest group size being 20 caribou (MNRF 2014a). Above-average caribou group sizes can be associated with factors including declining population trends and/or to mitigate for above-average snowfall conditions. During the winter of 2024

there were below average snow-fall conditions in northern Ontario, including that area overlapping the Berens Range. Further observations of caribou groups would increase the precision of group size estimates to assess the potential for a declining population using this metric.

4. SYDNEY RANGE

4.1 Context

The Sydney Range is a relatively small range in Ontario with a total area of approximately 7,500 km^2. It neighbours the Berens and Churchill ranges as well as the Manitoba border where it shares a common boundary with the Owl-Flintstone Caribou Management Unit in Manitoba. 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 proximity and a desire to collaborate on shared caribou conservation issues influenced the delineation of the Sydney Range (MNRF 2014b). The delineation of the Sydney Range was based on documented caribou occupancy at the south end of Woodland Caribou Provincial Park, caribou movement between Ontario and Manitoba, as well as historical occupancy patterns south of Red Lake. The spatial extent of the Sydney Range is likely too small to support an independent and sustainable population of Boreal Caribou, and therefore is considered to be ecologically inter-dependent upon the Owl-Flintstone Range (MNRF 2014b). A map identifying the extent of the Sydney Range and the Owl-Flintstone Range inside Manitoba, as of 2014, is available in Appendix 2 of this report.

4.1.1 Integrated Range Assessment Report

This section provides a summary of the approach for the Integrated Range Assessment undertaken from 2012 to 2013, the results of which were published in 2014. Further information about the assumptions that support this summary is available in the report: Integrated Range Assessment for Woodland Caribou and their Habitat - Sydney Range 2012 (ontario.ca)

A two-stage (fixed-wing followed by rotary-wing) aerial winter distribution survey for caribou was conducted during February 2012 in which observations of caribou and their signs (i.e., tracks, slushing and cratering) were recorded. During the 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 metrics including the minimum number of caribou in the range and calf recruitment rates. An additional aerial survey was conducted during late winter 2013 to further assess calf recruitment to support estimates of population trend. Ten adult female caribou were collared during February 2012 and monitored until 2015 for use in assessing annual calf recruitment and adult survival rates.

During the rotary-wing aerial survey in February 2012, 55 caribou were observed as part of eight groups. The largest group contained 29 caribou, but most groups consisted of three to six animals. During the fixed-wing portion of the survey, which also took place in February 2012, no caribou were observed but caribou sign was predominant in the western half of the range. At the time of these surveys, it was expected that the caribou observed only represented a portion of those occurring within the range and did

not constitute a complete count. Based on the completed aerial survey, females comprised 43% of the observed adults.

Additional recruitment surveys were conducted in the Sydney Range in 2014 and 2015. Based on the recruitment surveys which occurred in 2013, 2014 and 2015, 74, 65 and 46 caribou were observed, respectively. These recruitment surveys did not use transects but rather used the locations of collared female caribou to complete demographic classifications of caribou groups. Based on observed adult animals, the calculated sex ratios in 2013, 2014 and 2015, were 78%, 59% and 81% female, respectively.

Recruitment rates from 2013, 2014 and 2015 (13.6, 18.4 and 24.1 calves per 100 adjusted adult females respectively) were 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, Environment Canada 2011).

The consideration of collared adult females for survival estimates was based on data pooled with the neighbouring Berens Range and varied from 33 (2012) to 24 (2014) collared Boreal Caribou. The annual survival rate of adult female caribou in 2012, 2013 and 2014 was 91%, 87% and 68%, respectively. The short-term population trend was likely declining with a geometric mean of $\lambda = 0.92$. This estimate suggested a declining trend and was the result of comparatively low calf recruitment and was supported by other long-term trend indicators.

The completed disturbance assessment for the Sydney Range, as part of the 2014 IRAR, estimated that 62.7% of the range was characterized as naturally and/or anthropogenically disturbed (MNRF 2014b). The resulting likelihood of stable or increasing population growth at this level of total range disturbance was estimated to be 20% and at this level it was unlikely the Sydney Range could sustain the caribou population (MNRF 2014b). However, analysis of the amount and arrangement of caribou habitat, through the calculated SRNV indicated alignment with that expected in a natural landscape (MNRF 2014b).

The 2014 IRAR concluded that risk to caribou was high within the Sydney Range and that the range condition was insufficient to sustain caribou (MNRF 2014b).

Since the 2014 IRAR there have been changes in habitat within the Sydney Range. Notably a single forest fire, KEN51, occurred in 2021 covering approximately 230,000 ha (~30% of the total size of the Sydney Range). In comparison with how habitat state was considered in the 2014 IRAR, the KEN51 fire changed how the Sydney Range is characterized in its calculated portions of natural and anthropogenic disturbance (disturbance assessment) as well in considering if habitat amounts and configuration occur within the calculated SRNV (habitat assessment). It should be noted, however, that the KEN51 fire substantially overlapped areas where forest fires were documented in 2016 and 1983 and which were previously ‘disturbed’ in the context of calculated natural disturbance levels in the Sydney Range. Additional changes in habitat are also

expected to have occurred based on further natural and anthropogenic changes since 2012.

4.1.2 Monitoring activities since 2014 IRAR

Ongoing caribou surveys have been conducted in Woodland Caribou Provincial Park as well as within Forest Management Units overlapping Sydney 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 sampling periods.

4.2 Results and Discussion

Boreal Caribou aerial surveys within the Sydney Range were completed from March 13-17, 2024. During that time 27 transects totalling 1,403 km were flown in the Sydney Range along an east-west axis. Figure 3 shows the stratified flight lines along transects within the Sydney Range. As a result of limited caribou observations, eight additional transects were flown at 2.5 km spacing in an area which had high caribou sign and at a north-south axis. As a result of this additional search effort, approximately 141 km of additional transect line at 2.5 km spacing were flown and most caribou were observed during this survey.

Snow station data available from the MNR Red Lake snow station indicated that there was an average of 46.8 cm of snow on the ground on March 10, 2024, and an average of 42.2 cm of snow on the ground on March 17, 2024. Based on available Environment Canada historical weather data at the Red Lake A station, the average daily temperature over these five days was -4.6°C with the warmest days (March 13) being 0.7°C and the coldest day being -13.3°C (March 17). It should be noted that survey effort may not have been conducted on all survey dates with survey timing variable based on weather conditions and other factors.

During the survey, 45 Boreal Caribou were observed, belonging to four groups. The number of caribou observed is below the critical threshold of 100 for minimal viable population size for a stable population (Environment Canada 2011). It is uncertain whether the population size is above or below this threshold. However, it should be re-emphasized that 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 with the Owl-Flintstone Management Unit (MNRF 2014b). At the time of report preparation, limited demographic information on the Owl-Flintstone caribou range is available including the consideration of collared caribou movements between Ontario and Manitoba. Information provided on the Sydney Range, in this report, will provide a context for further discussions around the shared caribou movements between these two provinces.

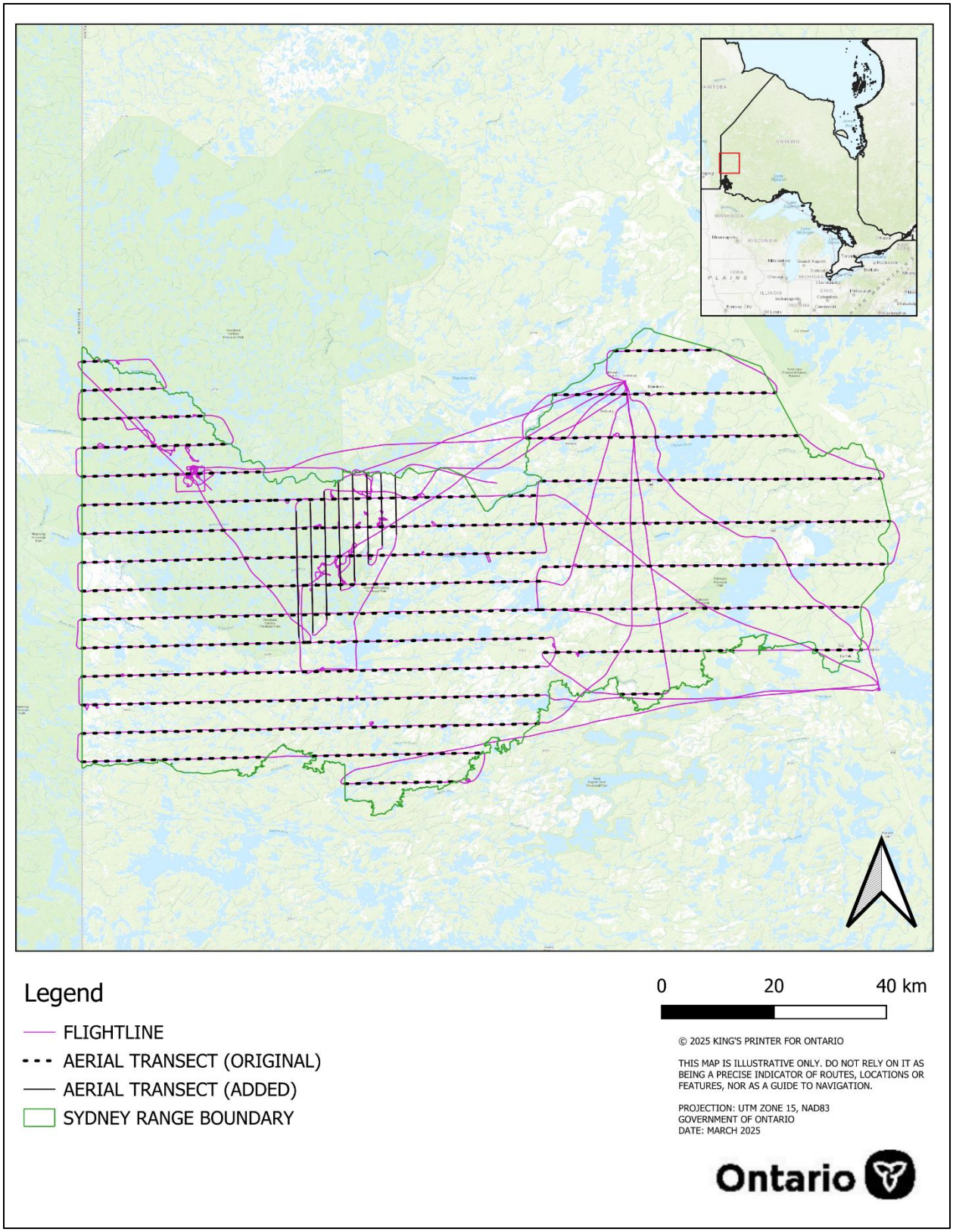

Figure 3. Flightlines for the 2024 aerial surveys in the Sydney Range.

4.2.1 Population Distribution

Distribution mapping for observations of Boreal Caribou and their signs (i.e., tracks, slushing, cratering) during the Sydney Range survey (including intentional and incidental observations) is shown in Figure 4. 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 Sydney Range during the 2024 survey was clustered in a specific portion of the range with some track observations occurring along the western border, adjacent to the province of Manitoba. The areas where caribou were observed during the 2024 survey are generally consistent with caribou sign observations included in the 2014 IRAR for Sydney Range where most observations were documented in the western portion of the range and where the eastern half of the range showed little caribou activity. There is some indication of decreased activity in the western portion of the range in comparing the 2024 aerial survey results to those conducted as part of the 2014 IRAR. This information may help inform future characterization of winter distribution patterns and inform an assessment of changes in distribution since the last major monitoring effort in Ontario (2014 IRAR). The 2024 aerial survey is limited in its ability to provide comprehensive understanding of distribution patterns because it includes information from only a single year and greater survey coverage in areas of the range where caribou are more likely to occur.

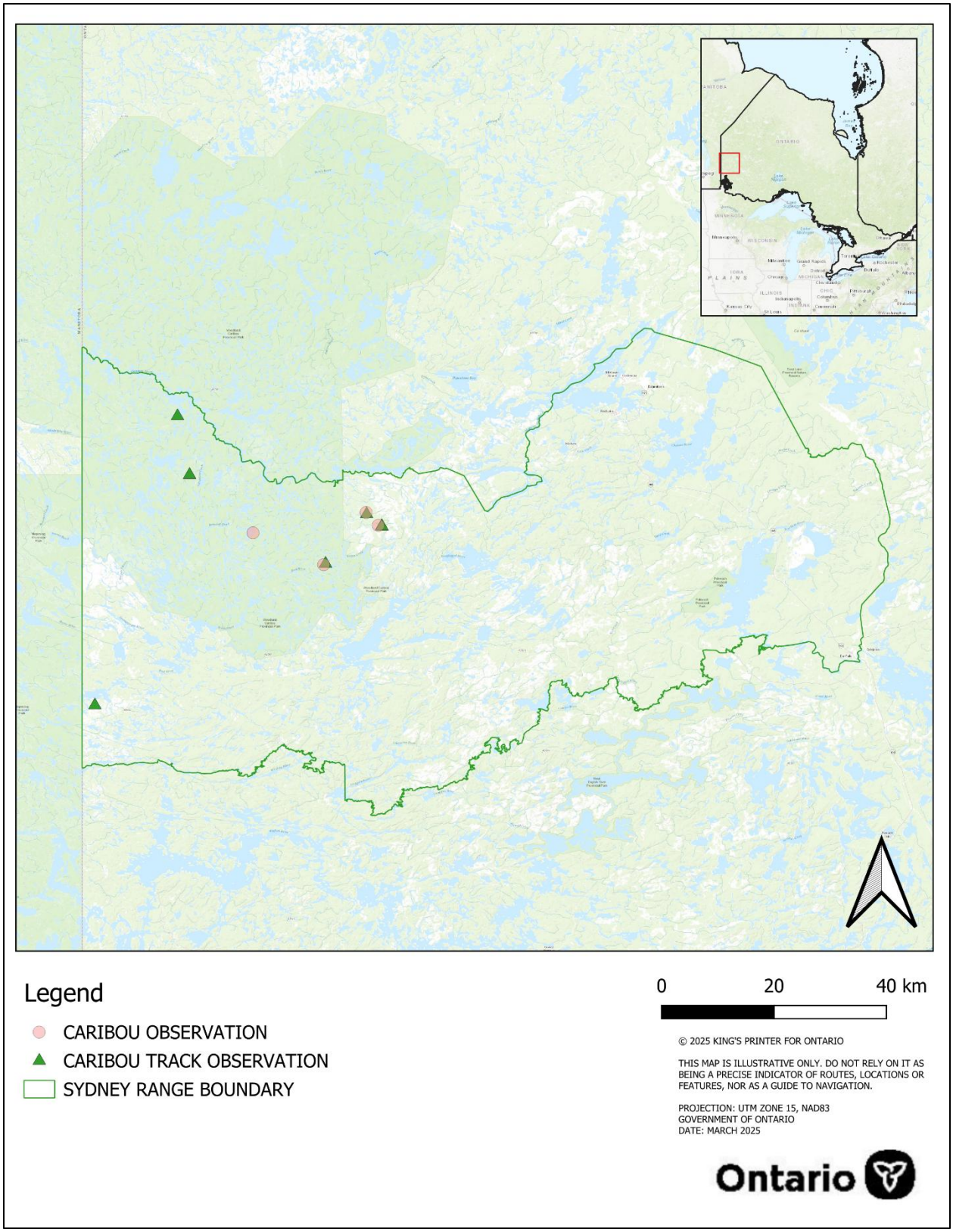

Figure 4. Observed caribou and caribou signs in the Sydney Range.

4.2.2 Population Trend

4.2.2.1 Recruitment and Survival

The sample size of observed and classified adult females and calves (36 caribou, 30 adjusted adult females, 6 observed calves) is below the recommended minimum 50 to 80 caribou (adult females and calves combined) threshold, meaning that uncertainty associated with the resulting recruitment estimate is high.

In addition, supplemental search effort was used to find most of the observed caribou and relied on a deviation from an initial survey design. This limits the relative comparability of the results from the Sydney Range with surveys performed of other ranges and which relied on a consistent sampling approach.

Based on the calculated sex ratio of 76% adult females to 24% adult males, from the observed caribou, when applied to the six adults of unknown sex the adjusted number of adult females observed is 30.

The consideration of calf recruitment in the Sydney Range is based on the observation of six calves to 30 adjusted adult females during the 2024 aerial survey, or a calculated recruitment rate of 20 calves per 100 adjusted adult females. This 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, Environment Canada 2011). As indicated, sample sizes are low so there is considerable uncertainty associated with the calculated recruitment estimate. Based on the low number of observed animals and the low ratio of calves to adjusted adult females, a conservative estimate would identify the Sydney Range as likely declining.

Further consideration of population and habitat state through an Integrated Range Assessment process will be used to inform range condition into the future and will be based on available population level surveys as well as habitat modelling information.

4.2.2.2 Demographic Structure

The estimated proportion of calves in the Sydney Range based on caribou that were classified by age was 13.3% ± 7.41% (95% confidence intervals of 5.95% (lower confidence interval) and 11.73% (upper confidence interval). The sample size was six calves and a total of 45 caribou classified by age class (39 as adults in four groups). The calculated proportion of calves, and the calculated upper confidence interval, is within the range required for a stable population (13-15% calves in the population (Bergerud 1992; Bergerud 1996)). This result should be considered cautiously, however, since the sample size is low and the majority of observations were from additional transects surveyed outside of the originally designed transects which followed a 5 km or 7.5 km spacing. The targeting of a larger group of caribou by selectively choosing an area of the Sydney Range to sample at a higher intensity (2.5 km spacing) could be representative of a large group with a higher likelihood of calves present in

comparison to smaller groups/track clusters which were not targeted for more intensive sampling (and had fewer calves present).

The sample size of adult caribou that were classified by sex was eight males and 25 females. The ratio of adult females to adult males is 75.76% to 24.24%, which is high. Given the low sample size of observed and classified individuals, there is considerable uncertainty as to whether this sex ratio estimate is representative of the true sex ratio.

The demographic breakdown of the observed animals is provided in Table 4.

Table 44. Observed caribou demographics in the Sydney Range.

Adults, Sex Unknown	Adult Males	Adult Females	Calves	Unknown Age / Sex	Total	Adjusted Adult Males	Adjusted Adult Females
6	8	25	6	0	45	9	30

4.2.2.3 Group Size

The average group size in the Sydney Range based only on direct caribou observations (including incidental observations) was 11.25 ± 10.73 (95% confidence intervals of 0.52 (lower confidence interval) and 21.98 (upper confidence interval)). The mean group size estimate in 2024 in the Sydney Range is above, but not statistically different from, 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 from 4.8 to 5.5). Some caution should be recognized in comparing group sizes derived from the 2024 aerial surveys based on the limited number of caribou observed in the Sydney Range and the modification of survey protocols to supplement observation numbers beyond the initial stratification.

5. NEXT STEPS

Implementation of the Boreal Caribou Monitoring Program is ongoing to update Integrated Range Assessments for each range in the Continuous Distribution and to improve understanding about the status of Boreal Caribou in the Lake Superior Coast Range and Discontinuous Distribution.

February to March 2025, as part of the implementation of the monitoring program, fixed-wing and rotary-wing aerial surveys and the collection of caribou fecal pellets were completed in the Swan, Spirit and Nipigon ranges. At this same time, additional demographic surveys were performed in the Swan and Spirit ranges to assess calf recruitment and group composition. For the Sydney, Berens, Churchill and Kinloch ranges, GPS collars were placed on adult female caribou in order to assess calf recruitment and survival rates, as well as to consider annual movements, seasonal distributions and use of habitat areas.

6. REFERENCES

The following references are an addendum to the report on the aerial surveys conducted under the Boreal Caribou Monitoring Program in 2023.

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Stuart-Smith, A.K., C.J. Bradshaw, S. Boutin, D.M. Hebert and A.B. Rippin. 1997. Woodland caribou relative to landscape patterns in northeastern Alberta. The Journal of Wildlife Management 61 (3): 622-633.

APPENDIX 1 – SURVEY DESIGN

The following survey design was used for the aerial surveys in the Berens and Sydney ranges in 2024.

Range Stratification

(a) Stratify each Range into high and medium intensity search areas based on cumulative information to determine expected likelihood of Boreal Caribou occurrence in winter. Use these strata to prioritize and quantify aerial search intensity that will be applied to undertake distance sampling surveys and to estimate caribou density and population size. This must be applied as uniform placement of transects / flight lines within each stratum. Aerial survey-based characterizations of caribou distribution across each range, will also be influenced by sampling intensity/transect spacing – specifically, there will be more intensive survey coverage/sampling effort in areas expected to have higher caribou densities. The following information is available to inform stratification for each range:

- Boreal Caribou Winter Use Areas according to the species' general habitat description.
- Boreal Caribou winter habitat classifications from the Forest Management Guide for Boreal Landscapes (pg. 44-45).
- Boreal Caribou winter distribution and abundance data from previous surveys and collaring efforts (which can be requested from the Natural Heritage Information Centre).

(b) Up-to-date data on landscape disturbances that have occurred since caribou observations have been detected should be considered when determining whether areas with pre-disturbance caribou observations are likely to still be suitable for caribou. Recommended sources for up-to-date disturbance data are as follows:

- Forest Harvest
- Fire Disturbance Area
- Forest Abiotic Damage Event
- Forest Disease Damage Event
- Forest Miscellaneous Damage Event
- Forest Insect Damage Event
- Active Mining Claims
- Buildings
- National Terrestrial Ecosystem Monitoring System for Canada

(c) Use the following transect spacing to conduct the surveys at two (2) levels of search intensity:

- High intensity (5 km spacing) in areas where there is suitable winter habitat.
- Medium intensity (7.5 km spacing) in areas where there is not suitable winter habitat.

Ideally, the sampling effort used to characterize range-scale distribution would be uniform and high intensity. However, due to limited resources, these density-based stratification requirements direct more intensive sampling efforts in higher density strata to improve precision of density and population size estimation (i.e., to account for higher variances commonly observed in higher density areas). This further increases the likelihood of achieving sufficient observations to calculate robust density and population size estimates.

Survey Approach

(a) Use a single-stage aerial survey approach using rotary-wing aircraft to locate, count, and classify Boreal Caribou, and to record accurate distances of Boreal Caribou from transect lines as per distance sampling procedures. Distance sampling is to be used to calculate density in each stratum and then translated to abundance to generate a population estimate.

(i) Each flight will require at least three (3) survey crew members. The pilot can be the third survey crew member, who may also participate in administering the survey.

(ii) If/when feasible, use a double-observer protocol to confirm Boreal Caribou observations. Collection of adequate double-observer data can allow for the application of a mark-recapture approach for estimating caribou density and population size, which can be used to directly account for imperfect detection on the survey lines. Collection of data using a double-observer approach requires two experienced observers on the same side of the aircraft and added measures to ensure that their observations are independent (e.g., delayed reporting by front observer), combined with adequate observer coverage on the pilot side of the aircraft, to ensure that animals/fresh sign detections are not missed on either side.

(iii) When Boreal Caribou are sighted, depart off the transect line to record GPS waypoints for locations where they were first sighted that will be used to calculate high precision distances of caribou from the transect line. These distances will be used for density estimation in each stratum.

(iv) Assess additional animal observation opportunities based on the presence of high-quality fresh tracks. If determined that high quality fresh tracks are present, then use the field protocol and analytical approach described below to record and analyze observations. These track-based observations must be separately recorded so they can be distinguished from direct animal observations. For track-based observations, also record that animals were not first detected by direct observation. Apply criteria on

maximum search distance for travel off the transect line when undertaking track-based observations.

- Record GPS location of fresh caribou tracks/sign spotted from the aircraft.
- Follow fresh tracks/sign to animals and record group size and GPS location of animals (ensure that linkage between initial sign observations and associated animal observations is clearly recorded).
- Set a standardized maximum search distance from the line that will be uniformly applied when undertaking search efforts and for determining which observations should be included in density/population size estimates – the standardized search distance shouldn't exceed 2.5 km perpendicular to flight line (i.e., half of the 5 km between-transect distance interval for the high density stratum). This off transect standardized search distance for animals associated with fresh tracks/sign should be applied uniformly in all strata.
- This standard maximum off transect search distance should result in additional Boreal Caribou confirmations while at the same time putting a limit on additional time expenditure and fuel consumption.

(v) Once off-transect distances have been recorded, count the number of Boreal Caribou and conduct demographic classifications as per the following:

- 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. Survey crews must assess the independence of groups (i.e., distinguish between loosely scattered animals in a general area versus cohesive groups that are deemed to be separate associations of animals).
- For each observation, record categorical forest cover levels and light / snow conditions as multiple co-variates (along with group size and whether initial observations were sign or animal group-based) to be used as part of the distance sampling analysis.

(vi) Return to the exact transect line departure point and resume transect.

(b) Document observations of other species as follows:

(i) The distribution, general density and habitat selection of Moose is important to the winter spatial organization and habitat selection of Boreal Caribou. However, conducting moose classifications at the same as time as recording Boreal Caribou and conducting distance sampling as part of a single-stage approach adds to search time and effort, additional fuel usage, additional data recording requirements, and cost inefficiencies. Therefore, record GPS locations on the line (when the observation is made) and document estimated position of animals within binned buffer distances off the transect line (i.e., less than or greater than 250 m), and record total number of animals seen. If crews are able to record whether Moose are within / outside of the strip / belt, there is no need to leave the flight line to record specific GPS locations of the sightings. Crews may determine it is necessary to depart the flight line to better place the binned distance off the line.

(ii) Document all Wolverine Observations:

- Record GPS locations for all observed animals. The sex of the animal does not need to be recorded.
- Confirm tracks by low-level observation near all suspected Wolverine tracks.
- Take a photograph of suspected Wolverine tracks (with window open for a clear photo).

(iii) Document all Wolf Observations:

- When a Wolf or pack has been identified, record GPS waypoint and map information. Record all wolves seen.
- If it is necessary to confirm tracks or get a pack count, do so. Do not circle to try to detect additional sign.

Flying Considerations for Aerial Surveys

(a) To ensure consistency in observations for comparability:

- Aircraft cruising altitude should generally be maintained at 100m AGL (325 ft) but can vary depending on tail winds, ground speed, terrain, forest type / patterns, and snow and light conditions.
- Cruising air speed should generally be maintained at 80 knots or 120 km per hour with higher speeds across large lakes.

(b) Optimal snow conditions for detectability of Boreal Caribou tracks are three (3) days since last snowfall of more than 15 cm.

(c) Light conditions and drifting snow are to be considered and recorded when conducting all flights with respect to safety and detectability of Boreal Caribou.

Modelling and Analysis

(a) Use the data collected through the aerial surveys to calculate a population size estimate for each range in a single survey period in accordance with the following:

(i) Use a multi-covariate distance sampling approach (MCDS) to analyze the data, wherein group size and observation type (i.e., initial observation was based on direct animal observation, or fresh track/sign detection, followed by offline searching) are included as covariates, along with key environmental variables (e.g., forest cover, light conditions).

(ii) For both sign types, use perpendicular distances from recorded animal locations to the line (i.e., not the initial sign locations, for sign-based observations) when using the MCDS approach to estimate probability of detection from the line.

(iii) If the number of double-observer observations collected on one side of the aircraft is sufficient for applying a mark-recapture analytical approach, these data can be analyzed separately using a mark-recapture MCDS approach (with identical covariate structure, if possible) to estimate probability of detection on the transect line. Mark-recapture MCDS analysis results can be used to adjust the initial density estimates derived by applying a general MCDS approach to the full distance sampling dataset collected for both sides of the aircraft (i.e., by accounting for imperfect detection on the transect line).

(iv) For all ranges where it appears appropriate, for density estimation purposes, 'null areas' should be defined to exclude all areas of the range with no reasonable expectation of current caribou use from the density estimation process. Affected portions of survey transects could be removed from the analysis and affected areas could be excluded from the application of density estimates to calculate population size. The following process is recommended for identifying 'null areas' for removal:

- Delineate a 100% Minimum Convex Polygon (MCP), using all caribou observations (animals and sign) recorded during aerial survey efforts.
- Buffer the MCP using a caribou movement-based buffer size – recommended at 35 km, based on approximate average of the distance between summer and winter ranges reported in Northeastern Ontario (42 km - Brown et al. 2003) and the maximum 'distance between successive seasons' reported for Northwestern Ontario (i.e., 25 km – Ferguson and Elkie 2004).
- Clip the buffered MCP to the caribou range, to define the area likely to be currently occupied by the population within the range.
- Portions of the range that fall outside this 'core area' should be excluded from the distance sampling and density estimation

analyses and should also be excluded when applying density estimates to calculate population size.

- Should also consider removing developed areas (i.e., any towns or other larger areas classified as ‘infrastructure’) and/or large waterbodies.

APPENDIX 2 – CARIBOU RANGES IN MANITOBA

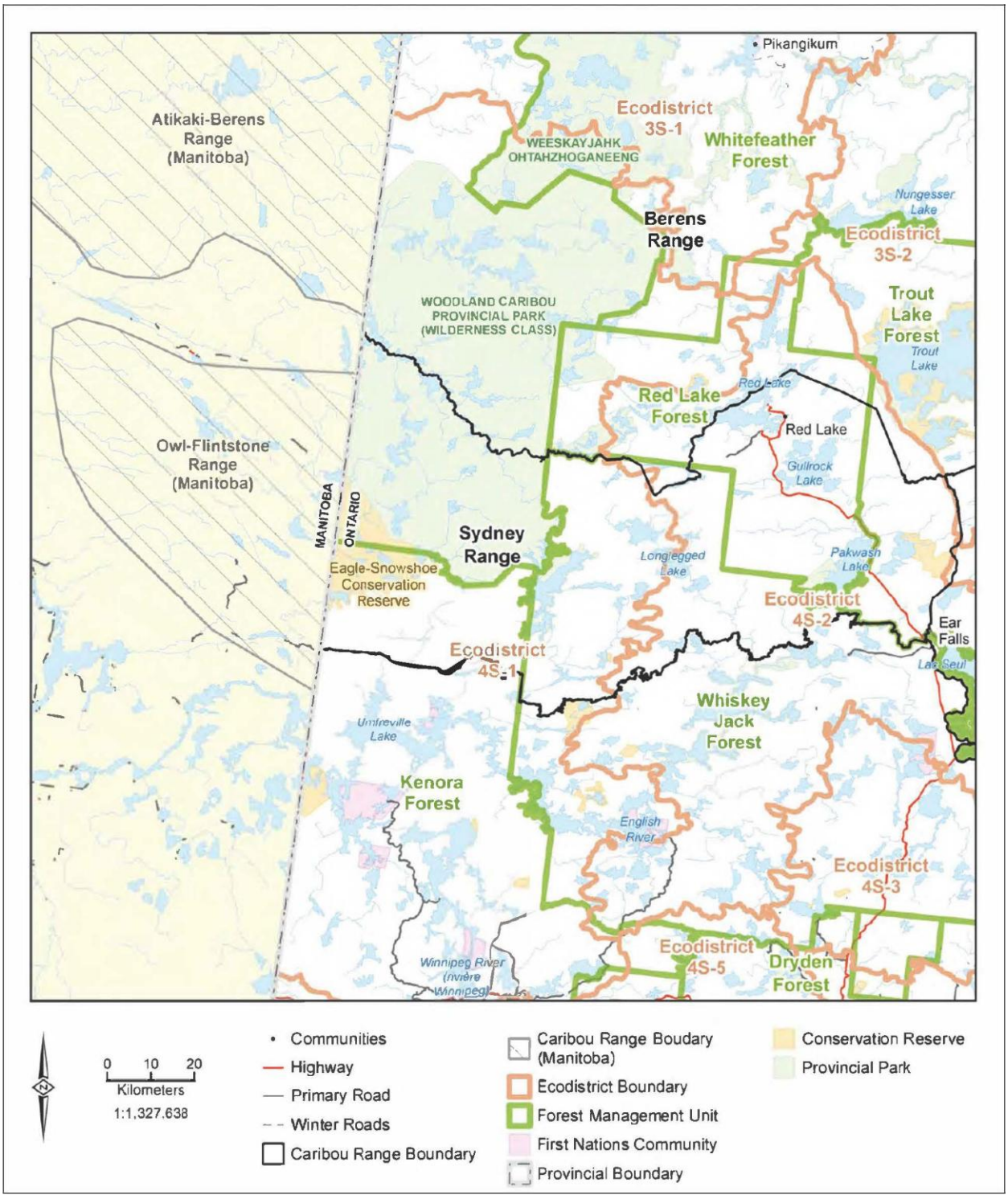

Figure 5. Sydney Range – Ecological Land Classification boundaries, relevant Conservation Reserves and adjacent caribou ranges in Manitoba (as of 2014). (MNRF 2014c)