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2019 Population Estimates

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Authors

Kelsey Russell, Jaylene Goorts, Shannon Stotyn, and Conrad Theissen[1]

[1]*Affiliation: Government of British Columbia, Fish and Wildlife, Skeena Region*

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Copies available from:

Government of Yukon
Fish and Wildlife Branch, V-5
Box 2703, Whitehorse, Yukon Y1A 2C6
Phone 867-667-5721
Email: environmentyukon@yukon.ca
Online: Yukon.ca and open.yukon.ca

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Executive Summary

In 2018, a monitoring and inventory project was initiated to determine the population status, demographic characteristics, seasonal range use, and range delineations of the Southern Lakes caribou herds – Carcross, Ibex and Laberge. In the fall of 2019, three simultaneous mark-resight surveys were conducted on the Southern Lakes caribou herds to update the herds' population estimates.

Our understanding of caribou range use and movement in the Southern Lakes has changed with the advent of GPS collars. As such, previous population estimates were derived from different study area boundaries for the three herds, so this must be considered carefully when discussing trends.

Key findings

Ibex herd

- The population estimate of the Ibex herd is 1,732 (95% CI: 1,462–2,053) animals.
- The calf recruitment estimate of 21 calves per 100 cows falls within the range of 20 to 25 calves required for a stable population growth rate. The productive sex ratio of 47 bulls per 100 cows is above the threshold required to ensure successful breeding opportunities. The herd range is expanding westerly.
- This herd has increased since the previous estimate.

Carcross herd

- The population estimate of the Carcross herd is 851 (95% CI: 724–1,001) animals.
- The calf recruitment estimate of 31 calves per 100 cows is above the range of 20 to 25 calves required for a stable population growth rate. The productive sex ratio of 50 bulls per 100 cows is above the threshold required for successful breeding.
- The herd is likely stable.

Laberge herd

- The population estimate of the Laberge herd is 746 (95% CI: 594–938) animals.
- The calf recruitment estimate of 28 calves per 100 cows is above the threshold of 20 to 25 calves that is required to ensure a stable population growth rate. The productive sex ratio of 53 bulls per 100 cows is above the threshold required for successful breeding.
- The herd range delineation is currently being reviewed for the Laberge herd.
- The herd is likely stable.

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Introduction

Caribou in the Southern Lakes region are part of the Northern Mountain (NM) population of woodland caribou (*Rangifer tarandus caribou*), which are currently listed as Special Concern under the federal *Species at Risk Act*. This region is home to four herds: Carcross, Ibex, Laberge, and Atlin. Elders from Southern Lakes First Nations tell of a time when caribou used to exist in such large numbers that the mountains themselves seemed to move. During that time, First Nation people had a strong cultural relationship with caribou. However, this relationship has faltered due to impacts from the gold rush, settlement, residential schools, overhunting and decades of voluntary restrictions. By the end of the 20th century, caribou in the Southern Lakes region had dwindled to just a few hundred animals, and they had disappeared from many parts of their historical range.

In response, the Southern Lakes Caribou Recovery Program was initiated in 1993 as a collaborative effort between six Southern Lakes First Nations Governments, the Government of Yukon, the Government of British Columbia and Parks Canada to recover the Carcross, Ibex, Laberge and Atlin caribou herds from historic declines (Farnell 2009). Although the Laberge herd was not formally recognized at that time, southern portions of the herd's range were included in the broad recovery area (O'Donoghue 1996). Similarly, the original recovery area did not cover the southern portion of the Atlin herd range. The Recovery Program established broad objectives relating to herd size with the overarching goal of having healthy, self-sustaining populations which would allow for a carefully managed harvest once objectives were met. One objective was to eliminate harvest (O'Donoghue 1996, Florkiewicz et al. 2007), thus, all licensed harvest of Southern Lakes caribou in the Yukon was closed for those overlapping Game Management Zones (GMZ 7 and 9 closed in 1990-91) and all six First Nations enacted a voluntary harvest moratorium. First Nations describe a generational loss of culture around hunting practices and a loss of connection with caribou because of these voluntary actions to recover caribou in their traditional territories.

Previous herd population estimates were conducted throughout the Recovery Program. As advancement in survey techniques were made, survey methods and the areas used to estimate populations changed and our understanding of herd distribution improved. Historical population estimates and survey techniques used to derive the Southern Lakes herds were as follows:

- Ibex: 800 animals in late winter 2008 using a stratified random quadrat survey;
- Carcross: 800 animals in late winter 2008 using a stratified random quadrat survey, and

- Laberge: 100–300 animals in late winter 2003 using a stratified random quadrat survey.
- Atlin: 777 animals in late winter 2008 using a stratified random quadrat survey.

In 2012, the Southern Lakes Wildlife Coordinating Committee (SLWCC) recommended that the parties update the population status of the herds, develop and implement a managed harvest of caribou, and put in place measures to protect caribou habitat. The results of the October 2019 mark-resight surveys address one of the above recommendations.

The Atlin herd, which ranges mostly within British Columbia (BC) and is primarily managed and monitored by the BC provincial government, was surveyed using mark-resight in fall 2018 to update the population estimate. This resulted in an estimated 1,527 animals (95% confidence intervals = 1,077–1,927) — a marked increase from the previous 2008 estimate. The focus of this report is on the surveys conducted on the Carcross, Ibex and Laberge herds in 2019.

Study areas

Winter ranges for the Carcross, Ibex and Laberge herds are located in south-central Yukon, and overlap the traditional territories of the Carcross/Tagish First Nation, Champagne and Aishihik First Nations, Kwanlin Dün First Nation, Ta'an Kwäch'än Council, Taku River Tlingit First Nation and the Teslin Tlingit Council. They also straddle the Yukon-British Columbia border (Figure 1). Florkiewicz et al. (2007) describes the area as being characterized by large lakes, broad valleys and several large mountain peaks over 2,000 m above sea level. The winter range falls within the heart of the Coast Mountains rain shadow where precipitation varies between 200 and 325 mm annually of which one third to one half falls as rain. Forests are largely open coniferous and mixedwood, dominated by pine (*Pinus contorta*) or mixed pine/spruce (*Picea* spp.). White spruce forest stands are scattered in lowland habitats and shrub birch (*Betula glandulosa*) dominated stands, underlain by lichen and forbs, occur at higher elevations. These areas provide ideal winter ranges for caribou because these mature forests (50–200 years old) support abundant terrestrial lichen which remain accessible throughout the winter due to low snow depths.

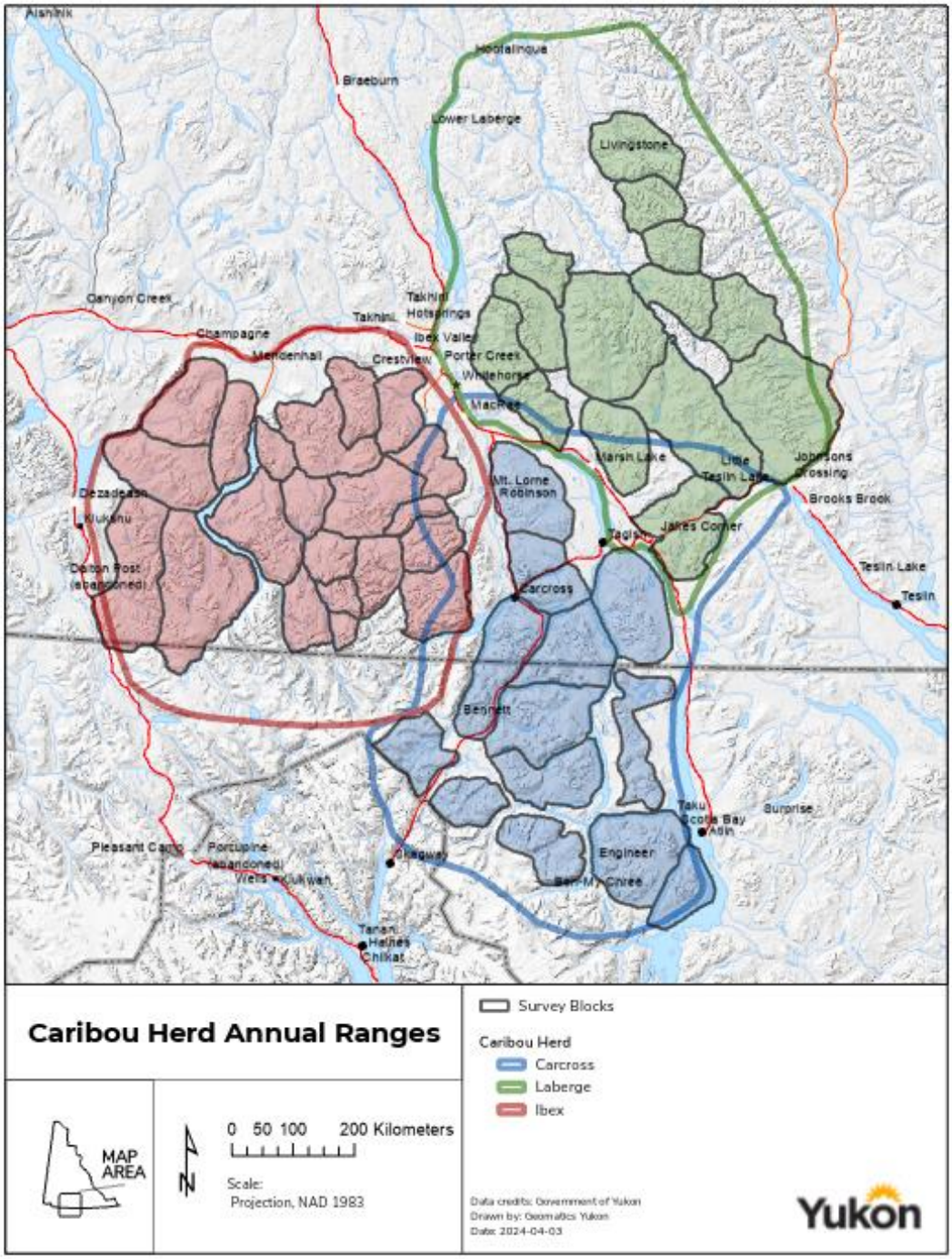

Figure 1. Study areas for the 2019 mark-resight population surveys. The individual herds are delineated by colour: Ibex (red), Carcross (blue) and Laberge (green).

Methods

We used a survey method known as mark-resight to estimate the number of caribou in each of the Ibex, Carcross and Laberge caribou herds. The method uses collared caribou as 'marks', and the proportion of marked to unmarked caribou seen during the survey to estimate the total population size. For each herd, three discrete resighting sessions were conducted via helicopter during the fall rutting season, between 2 and 21 October 2019. Prior to the surveys, survey blocks for the three herds (14, 21, and 14 blocks in Carcross, Ibex, and Laberge herd ranges, respectively) were delineated based on terrain features and past caribou locations (Figure 1). To ensure each survey had consistent effort, each block was allocated a proportion of the total survey time based on block size as well as the number of groups observed in the blocks during previous years' composition surveys. Identical survey blocks were flown by each crew.

Crews did not use telemetry equipment, nor did they know where marked animals were during their surveys; in this way, resight bias was minimized. Within each block, crews high-graded suitable habitat (largely subalpine and alpine areas). When groups were detected, crews focused on getting a total count and identifying all marked individuals (by getting close enough to read vis-band numbers on collars). Availability of undetected, marked individuals (with functioning collars) was determined after the survey using collar locations. During one resight session, animals were also classified as calves, cows, immature and mature bulls, as per a typical fall composition survey.

Collaring activities

Prior to our resighting surveys, a total of 80 GPS Lotek satellite-collars were deployed among the three herds in early winter (November) 2018, late winter (February/March) 2019, and summer (July) 2019 by Yukon and BC government capture crews. Crews deployed 30, 29 and 21 collars within the Carcross, Ibex and Laberge herd ranges, respectively.

Various collar types were purchased and deployed (Table 1). Some collar models had expanded capabilities to transmit more locations, have flexible scheduling, activity sensors, geofencing[1], and the ability to make post-deployment modifications to collar schedules. Additionally, all collars were fitted with numbered visibility bands, uniquely coloured for each herd (white on blue and black on orange for Carcross/Laberge, and green on yellow for Ibex), as well as drop-off mechanisms that were scheduled to release 156 weeks from their deployment dates.

Table 1. Specifications and the number of satellite collars deployed among the Southern Lakes caribou herds.

Collar make and model	Satellite service	Location programming	Number deployed
Lotek Lifecycle Pro 500	Globalstar	13 hr fixes	13
Lotek Track Pro LU	Globalstar	13 hr fixes	38
Lotek Litetrack 420	Iridium	1, 2, or 4hr fixes, geofence[1]-dependent	22
Lotek Lifecycle 330	Iridium	13 hr fixes	5
Lotek LiteTrack 360	Iridium	12 hrs	2

[1]*Geofencing is the ability to define the frequency of collar locations (i.e., fix rate) by a pre-specified area. For example, a geofence may have been defined within 1 km of a road to receive more frequent locations to better understand caribou-road interactions.*

Collars were deployed only on female caribou using a helicopter (A-Star), three person crews, and a net-gun, to capture caribou. Captures (n=6) were conducted in the Laberge herd post-rut range in November 2018 before heavy snow pushed caribou to lower elevations and weather conditions became less suitable for capture. Most captures (n=71) took place during February and March 2019. An additional three collars were deployed in July 2019 to boost the number of active marks in each herd after an unprecedented number of collars failed early in their deployment. For these captures, caribou were darted and drugged from the helicopter as opposed to using a net-gun.

All collars began transmitting immediately after deployment. However, between the initial collar deployments and when the populations were surveyed in the fall of 2019, 27 of the 80 collars went offline due to caribou mortality (n=4) or collar failure (n=23), leaving only 53 active collars. However, caribou whose collars failed remained in the population as 'marks', which is described further in the Results section.

Data analysis

To derive a population estimate for each herd, analyses were conducted in Program MARK (ver. 9.0; McClintock and White 2012). As each herd's range was considered geographically closed and marks were individually identifiable, a mixed logit-normal modeling approach was used for all estimates. This model allows for individual heterogeneity in resighting probabilities by treating each animal as a random effect; however, if this parameter was not supported during model selection, the data was considered to have no individually identifiable marks and was fixed at zero (McClintock 2018).

This mark-resight model has three estimable parameters:

- $\boldsymbol{p}$ – resighting rate;
- $\boldsymbol{\sigma}$ – individual heterogeneity in resighting rate; and
- **N** – population size.

For each herd, a set of five or six (depending on observed differences in survey effort across resighting sessions) candidate models were developed by varying *p* and *σ* (Table 2). The most parsimonious model was identified using Akaike's Information Criterion difference corrected for small sample sizes (AIC_c; Akaike 1973; Burnham and Anderson 1998) and Akaike weights (AIC_cw_i) to select the model(s) with the fewest predictor variables that explained the greatest variation in the data (*i.e.*, the most parsimonious model). All models with a Δi AIC_c of ≤2.00 were considered plausible (Richards 2005; Symonds and Moussalli 2011).

In the past, a clear distinction between Carcross and Laberge animals was not always made when estimating population size. Based on caribou locations from the recent collaring project, it appears the caribou use of the Laberge and Carcross herd ranges may be changing. Additionally, caribou from the Pelly herd may also interact with Carcross and Laberge animals; however, more location data from collars in subsequent years will help to better characterize herd interactions and changes. Preliminary observations suggest caribou may move north and south of the Alaska Highway less than in previous years, with few undisturbed areas remaining that facilitate movement between the two ranges (e.g., Jakes Corner). Previous population estimates of the Carcross herd included areas north of the Alaska Highway and generally east of the Mount Byng survey block.

Table 2. Mark-resight candidate models fitted to the resighting survey data to estimate the abundance of the Southern Lakes caribou herds.

Model	Description
$N\ p.\ \sigma=0$	Constant *p* across all resighting sessions, σ fixed at zero
$N\ p_X\ \sigma=0$	Different *p* for resighting session *X*, with constant *p* for other 2 resighting sessions, σ fixed at zero
$N\ p_t\ \sigma=0$	Different *p* for each resighting session, σ fixed at zero
$N\ p.\ \sigma.$	Constant *p* across all resighting sessions, σ as a random effect
$N\ p_X\ \sigma.$	Different *p* for resighting session *X*, with constant *p* for other 2 resighting sessions, σ as a random effect
$N\ p_t\ \sigma.$	Different *p* for each resighting session, σ as a random effect

Model parameters: *p* – resighting rate; σ – individual heterogeneity in resighting rate; and N – population size.

Results and Discussion

The surveys took place between 2 and 21 October 2019 (Table 5); taking longer than anticipated due to poor weather conditions. Survey conditions were variable throughout, but were generally clear and sunny until 9 October, after which, overcast and low cloud conditions prevented continuation of the survey until 19 October. Snow conditions varied throughout the study area, surveys generally began with ~80% snow cover; however, no fresh snow fell until ~8 October.

Caribou groups were primarily distributed in alpine and subalpine rutting areas within each herd range. In the Ibex herd range, caribou were primarily distributed in the Ibex Mountain area, between Rose Lake and the Annie Lake Road, up on large rutting plateaus (Figure 5). Some groups were observed west of Kusawa Lake (Figure 5), representing a westward expansion of the herd into areas that have not been occupied in some time. Group sizes ranged from 1–363 (average = 27) individuals, with the two largest groups (363 and 209 caribou) located in the Friday Creek plateau area (Figure 2).

The Carcross herd was distributed primarily on alpine and subalpine ridges and plateaus east of the South Klondike Highway, between Mt. Lorne and the south end of Atlin Lake in BC (Figure 6). West of the South Klondike Highway, caribou were observed on Montana Mountain to the south end of Bennett and Lindeman Lakes (Figure 6). Smaller group sizes were observed in the Carcross herd range, ranging from 1–49 (average = 12) individuals, with the two largest groups (46 and 85 caribou) located on Mt. Lorne and Jubilee Mountain, respectively (Figure 2).

In the Laberge herd range, groups were primarily observed in the mountainous areas northeast of Whitehorse, from the Dycer Creek area to mountain blocks east of the Teslin River (Figure 7). Group sizes ranged from 1–54 (average = 10) individuals, with the largest groups seen on Teslin Mountain (54 individuals) and South Cap ridge (45 individuals; Figure 2**,** Figure 7).

Due to poor conditions, the time between survey sessions was somewhat longer than is typical. This may have resulted in differences in group sizes, particularly for the Ibex herd (Figure 2). However, due to our inability to model group size as a random effect (i.e., we would need information on both observed and unobserved group sizes), the assumption was made that resight probability is independent of group size. This is often inaccurate, as larger groups are typically easier to detect than smaller ones, thus introducing heterogeneity into the resight probabilities. This is not a concern if individuals stay within the same groups across sessions; however, with longer intervals between sessions, the probability of this decreases.

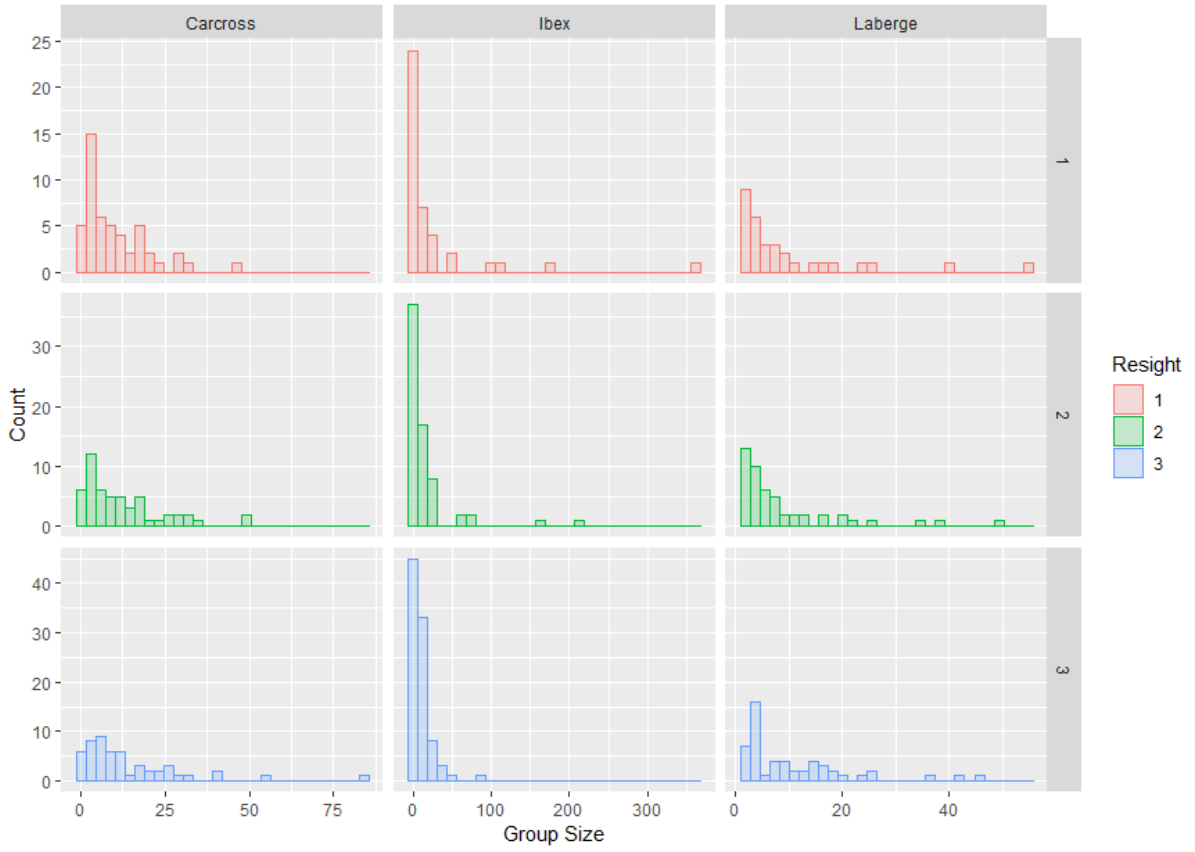

Figure 2. Variation in observed group sizes across resighting sessions during the Southern Lakes herds' mark-resight surveys, October 2019.

By the time the mark-resight surveys began, there were 42 fully functioning collars. Four mortalities of collared caribou had occurred (two each from Laberge and Carcross herd), there were 17 complete collar failures (sending no locations; eight in Carcross, five in Ibex and four in Laberge), and one collared animal moved outside the Laberge range (northeast of Quiet Lake). Seven collars malfunctioned, meaning they would send sporadic locations that deviated from the pre-programmed schedule (four in Carcross, two in Ibex, and one in Laberge). This resulted in incomplete histories for those marked animals during the resight sessions. For example, availability could be confirmed for one or two resighting sessions, but not all three (Table 4).

Due to the unexpectedly low number of functioning collars, the dataset used for each herd included all malfunctioning collars, including those that were not seen during any resight session. This assumes that those marked animals were available during sessions even if we could not confirm their availability via GPS locations after the survey. Several resight histories were observed for animals with malfunctioning collars during the surveys (Table 3). Only one marked animal with a malfunctioning collar (ICH1910 in the Ibex herd) was not observed during any session (Table 3); however, it was still considered to be available to have consistency in our assumption regarding unobserved marked animals with malfunctioning collars.

Table 3. Resight histories for marked animals with malfunctioning collars in the Carcross, Ibex, and Laberge herds during the mark-resight surveys, October 2019.

Herd	Observations[1] of marked animals with malfunctioning collars during resighting sessions			
	3 sessions	*2 sessions*	*1 session*	*Not observed*
Carcross	6	3	2[1]	1
Ibex	1	3	2	1
Laberge	1	2	2	0

[1] Observations include both sightings during resighting sessions and GPS locations checked after the surveys for animals that were not seen but had sporadic locations during all or some of the resighting sessions. For example, one marked animal with sporadic locations in the Carcross herd was not seen during any resighting session, but there were GPS locations available for one resighting session showing it was available but not seen.

Survey effort was consistent across resight sessions, except for the third Laberge resight session, where effort was less. Nonetheless a relatively high number of caribou observations were made compared to the first two sessions (Table 5). This may have been a result of fresh snow conditions making animal detections more efficient, and/or animals may have been more consolidated in rutting groups (Table 5).

Table 4. Status of collars in the Carcross, Ibex, and Laberge herds during the mark-resight surveys, October 2019.

Herd	Known availability[1]		Unknown availability[2]	
	Functioning collar	*Malfunctioning collar, observed during all resight sessions*	*Malfunctioning collar, sporadic locations during resight sessions*	*Malfunctioning collar, no locations*
Carcross	7	6	2	4
Ibex	22	1	1	5
Laberge	13	1	1	3

[1] Determined to be available if GPS collar was functioning properly throughout the duration of the survey (i.e., location known on all survey days) or if individual was observed during all three resight sessions.

[2] Unknown availability due to malfunctioning GPS collar during some or all of the resight sessions (i.e., location of animal was unknown during parts of the survey).

Table 5. Mark-resight survey results for the Carcross, Ibex, and Laberge caribou herds, October 2019.

Herd	Resight session	Survey effort (km/min)	Total marked animals available[1]	Total marked animals observed	Total unmarked animals observed	Resighting rate
Carcross	1 (3, 4, 8 October)	2.15	19	11	477	0.58
	2 (8–10 October)	2.22	19	16	645	0.89
	3 (10, 18–20 October)	2.37	18	13	677	0.72
Ibex	1 (2–4 October)	2.45	29	19	1,062	0.66
	2 (7–9 October)	2.33	29	19	1,139	0.66
	3 (19, 21 October)	2.58	29	15	931	0.52
Laberge	1 (3–4 October)	2.37	18	10	279	0.56
	2 (4, 5, 7, 8 October)	2.37	18	7	426	0.39
	3 (9, 10, 20 October)	2.04	18	13	534	0.72

[1]Includes marked animals with malfunctioning collars.

Population estimates

The final 2019 population estimate for the Ibex herd was **1,732 animals (95% CI = 1,462–2,053**; Figure 3). This estimate represents a 68% increase from the 2008 estimate and quadrupled from initial surveys conducted in 1998 and 2002 (Figure 3). The Carcross herd 2019 population estimate was **851 animals (95% CI = 724–1,001)**, which falls within the confidence intervals of previous surveys conducted in 2003 and 2008 suggesting that the population is likely stable (Figure 3). This estimate represents a 71% increase from the initial estimate in 1997. The population estimate for the Laberge herd in 2019 was **746 animals (95% CI = 594–938)**. Although the herd was surveyed only once in 2003, this represents a 115% or an almost four-fold increase in the estimate (Figure 3).

Top selected models for the Carcross and Laberge herds included a constant resighting probability across sessions, and the parameter for individual heterogeneity fixed at zero, while the top selected model for the Ibex herd also had constant resighting probability across sessions, but included individual heterogeneity as a random effect (Table 2.). The AIC_c weights were not particularly high for the top Carcross and Laberge models, suggesting candidate models did not differ considerably; however, parameter estimates from the model with the highest weight are presented. For the Ibex herd, the top model weights were relatively high, suggesting these models were best fit to the data compared to the other candidate models.

Only the Ibex herd estimate had the parameter for individual heterogeneity (σ) incorporated as a random effect. It is difficult to discern factors that contributed to this; however, as discussed above, the effect of group size across resighting sessions may have influenced resighting probabilities of individuals, with those that were in larger groups in open areas

potentially being more detectable than those in smaller groups and/or in areas that made it more difficult to detect groups (*i.e.*, fully or sparsely treed areas).

Table 6. Estimates of model parameters of the Southern Lakes caribou herds from the most supported mark-resight models.

Herd	Top model	AIC_c weight	Parameter	Value	SE	95% Confidence Interval
Carcross	*N p*. σ=0	0.33	*N*	**851**	**70**	**724 – 1,001**
			p	0.721	0.060	0.589 – 0.823
Ibex	*N p*. σ.	0.81	*N*	**1,732**	**150**	**1,462 – 2,053**
			p	0.616	0.056	0.501 – 0.719
			σ	0.318	0.792	0.020 – 4.998
Laberge	*N p*. σ=0	0.49	*N*	**746**	**87**	**594 – 938**
			p	0.551	0.067	0.418 – 0.676

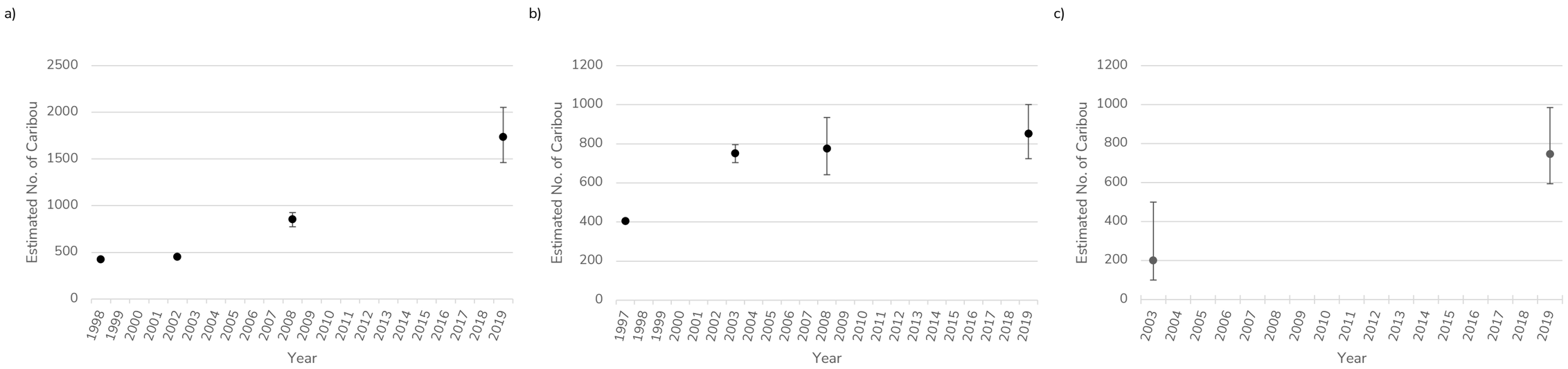

Figure 3. Population estimates of the Ibex (a), Carcross (b), and Laberge (c) caribou herds from 1997 to 2019 in southern Yukon.

[a]*The 1998 Ibex estimate had a minimum count of 366. In 2002, a mark-resight method was attempted but the estimate was not used (min. count 400). A modified stratified random block methodology was used in 2008 with 90% confidence intervals. In 2019, a mark-resight survey resulted in an estimate with 95% confidence interval with a minimum count of 1,159.*

[b]*The 1997 Carcross survey was estimated using random stratified random block method. In 2003 and 2008, a random stratified quadrat survey was conducted and analyzed using DISTANCE (90% confidence interval). In 2019, a mark-resight survey resulted in an estimate with 95% confidence intervals with a total minimum count of 661.*

[c]*The 2003 Laberge estimate used a random stratified quadrat sampling methodology with a confidence interval of 50%. In 2019, a mark-resight survey resulted in an estimate with 95% confidence interval with a minimum count of 547.*

Herd composition

Fall composition counts for Northern Mountain caribou herds in Yukon are one of the primary sources of monitoring information for caribou management. During the fall breeding season (rut), males, females, yearling and calves are congregated allowing us to locate, count and classify efficiently. Animals are classified via low-level helicopter flights as calves, cows, or immature and mature bulls to estimate herd composition. From these surveys we get an index of fall recruitment (calves per 100 cows), which is indicative of the number of calves entering the herd as adults, and adult sex ratios (bulls per 100 cows), which is indicative of the opportunity for females to breed and herd genetic diversity. These ratios, monitored over time, are indicators of population status and can help detect population growth or decline.

Results of the 2019 composition surveys for all herds indicated calf recruitment ratios consistent with stable population growth and sex ratios indicative of productive herds (Table 7), as per the *Science-based guidelines for management of Northern Mountain caribou in Yukon* (Environment Yukon 2016; Table 7[1]). Ibex had the lowest calf to cow ratio (21 calves per 100 cows); however, this value is above the minimum value indicative of a stable population (20–25 calves per 100 cows). All three herds had relatively high bull to cow ratios, which may partially be a result of low harvest pressure. Single year estimates of demographic trends, especially calf recruitment, are not reliable to infer population trend, as these values can vary considerably from year-to-year.

Table 7. Composition of the Carcross, Ibex and Laberge caribou herd based on estimated age and sex ratios and the population estimate ratios determined during the mark-resighting session, October 2019.

Herd	Herd composition[1]			Estimated herd composition		
	Total classified	*Calves per 100 cows*	*Bulls per 100 cows*	*Calves*	*Cows*	*Bulls*
Carcross	661	31	50	143	460	248
Ibex	1,159	21	47	217	1,031	485
Laberge	547	28	53	115	412	218

[1]The *Science-based guidelines for management of Northern Mountain caribou in Yukon* (Environment Yukon 2016) suggest a fall calf recruitment ratio of 20–25 calves per 100 cows allows for stable population growth of Yukon herds, and a sex ratio of 30 bulls per 100 cows ensures reproduction is maximized and herd size is sustained.

To separate long term trends from annual variation in recruitment or sex ratios, it is important to analyze data over multiple years (e.g., 5 or 10-year moving averages). The Ibex herd has the longest monitoring record of herd composition, with surveys conducted annually since 1983 (except 2002 and 2008). Fall composition surveys have been conducted on the Carcross herd annually since 1992; however, some of the areas covered during these surveys included parts of what is now distinguished as the Laberge herd. Separate composition surveys were conducted for the Laberge herd as of 2011. Since 2019, additional composition

surveys for the Southern Lakes herds herd continued in 2020, 2021 and 2023, and provide additional data from which to determine herd trends. Summaries of these data are available on www.yukon.ca. Monitoring of composition in the Atlin herd is led by the Government of BC, with surveys conducted irregularly since the 1990s.

Ibex

The five and 10-year moving averages for the calf recruitment ratios are approximately half those in the late 1980s but have been hovering within the range and minimum values required for a stable population (Government of Yukon, 2016) since early 2000s (Figure 4). Calf recruitment, in addition to adult female survival, are important indicators of population growth and are likely contributing to increases in the population. The five and 10-year moving average for sex ratios have slowly declined since the late 1980s but are still above the level required to ensure all female caribou have the opportunity to breed.

Carcross

Since 2011, calf recruitment and sex ratios for the Carcross herd are above minimum levels required for a stable or increasing population, although the 5-year average calf recruitment rate has been slowly declining since 2015 (Figure 4).

Laberge

The 5-year moving average for calf recruitment for the Laberge herd has been at the lower end or just below the minimum level required (Figure 4).

Figure 4. Annual and 5-year moving average fall composition survey results (calves per 100 cows, bulls per 100 cows) for the (a) Ibex, (b) Carcross (c) and Laberge caribou herds in the Yukon.

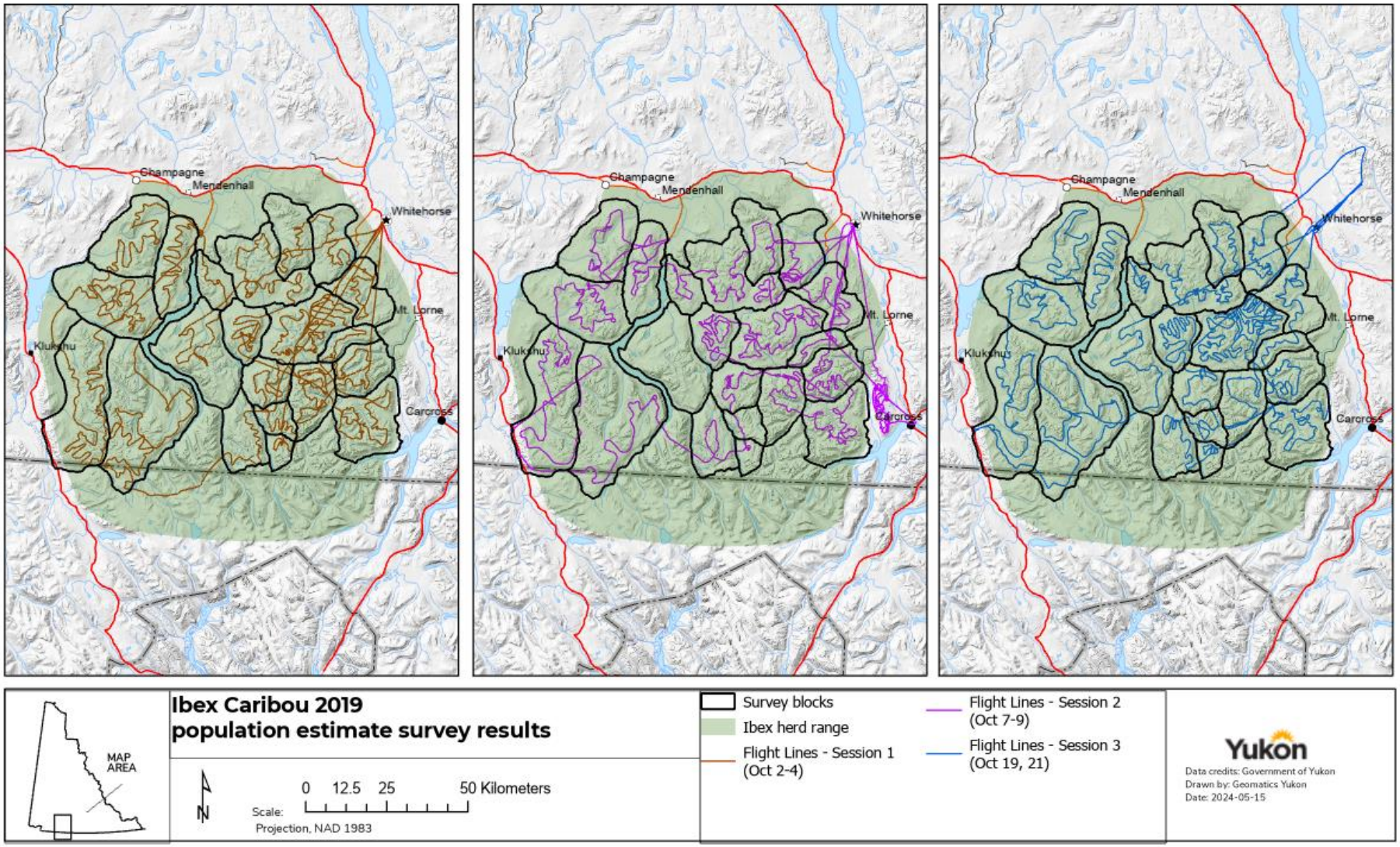

Figure 5. Flight lines from all three resight sessions of the 2019 mark-resight population survey of Ibex caribou herd.

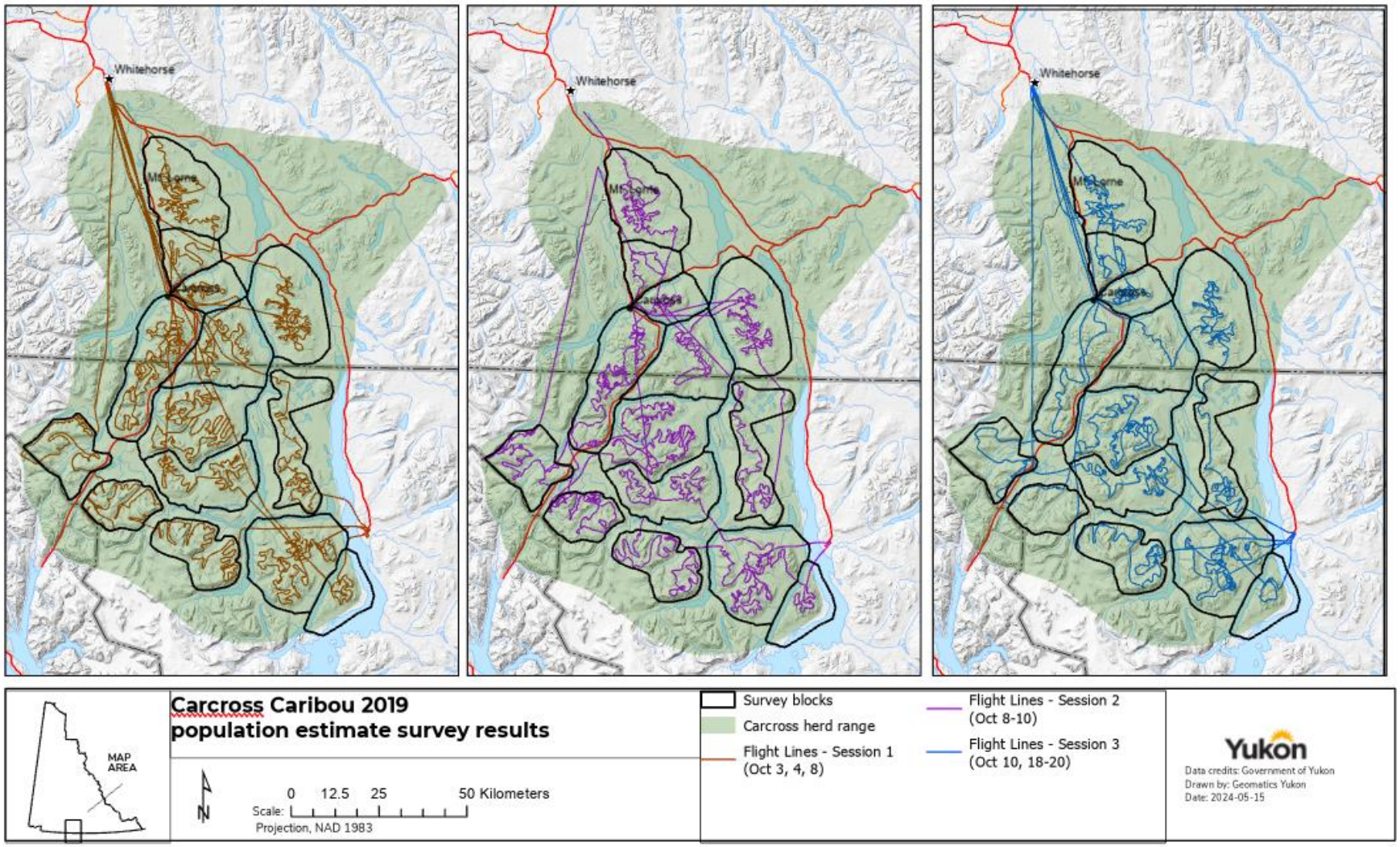

Figure 6. Flight lines from all three resight sessions of the 2019 mark-resight population survey of Carcross caribou herd.

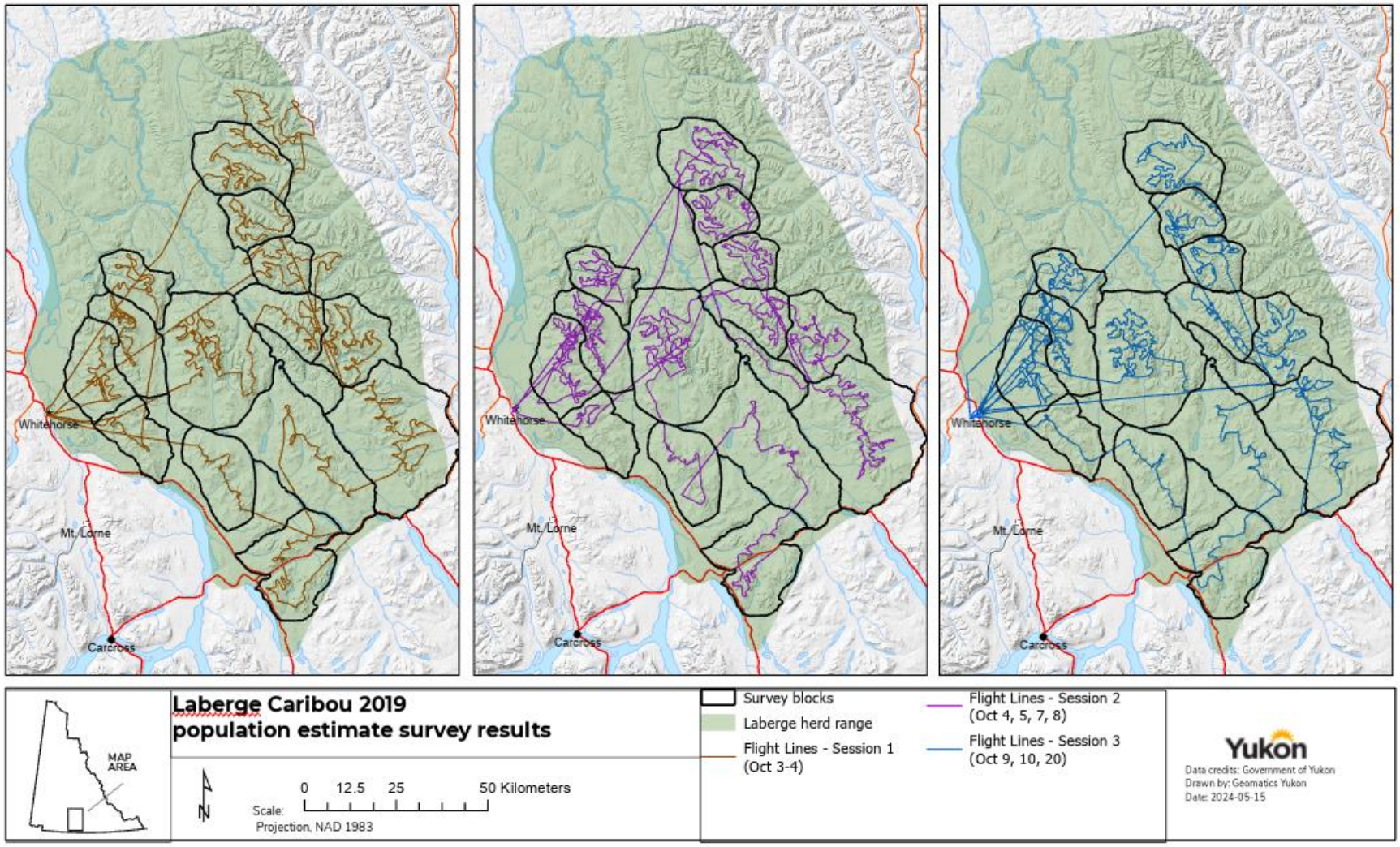

Figure 7. Flight lines from all three resight sessions of the 2019 mark-resight population survey of Laberge caribou herd.

Implications

The mark-resight population surveys conducted on the Southern Lakes caribou herds (Ibex, Carcross, and Laberge) provide valuable insights into the status and population size of the herds. Our understanding of caribou range use and movement in the Southern Lakes is changing with the addition of recent GPS collar location data. Previous population estimates were derived from different study area boundaries for all three herds, and this must be considered carefully when discussing trends. The population estimates are specific to the survey blocks they were derived from; each of which represents a discrete population unit. Population survey methods also differed for the previous estimates, so they are not directly comparable. Nonetheless, even in consideration of these factors, we are confident that all three herds have remained stable or have increased since the previous estimates.

Since the 2019 population estimates, recent fall composition surveys (2020, 2021, and 2023) provide current trends in calf recruitment. Composition results indicate that the growth of the Ibex herd has slowed, and the herd is now likely experiencing a decrease. For more information on current monitoring data, including the results of the most recent composition surveys, please visit www.yukon.ca. To ensure long-term trends in herd composition continue to be monitored, we suggest continuing fall composition surveys on a biennial basis (*i.e.,* every other year). Additional monitoring efforts (*e.g.,* collaring programs, population surveys, etc.) for these herds will be discussed and determined with partners on the SLCSC during regular meetings and at an annual gathering of knowledge holders.

This information has helped to inform the forthcoming Relationship Plan for Southern Lakes caribou currently being developed by the Southern Lakes Caribou Steering Committee (SLCSC). The SLCSC, represented by nine governments, is working to create a plan rooted in lived, Traditional Knowledge and western science to ensure a sustainable, long-lasting and respectful relationship between caribou and people within the Southern Lakes region. The Recovery Program has been remarkably successful. Caribou numbers have been increasing since the Recovery Program began and they are now regularly seen in areas that have long been empty of caribou. It is important to remember that the recovery program, particularly the harvest moratorium, was a significant sacrifice and took many years to gain momentum. Thirty years of harvest restrictions have had a profound impact on First Nation traditions, culture and communities. Along with working towards a greater cultural connection with caribou, several other issues that affect Southern Lakes caribou need to be addressed.

Although the 2019 population survey numbers indicate that the Southern Lakes caribou herds are currently stable, it is important to exercise additional caution to prevent subsequent declines. These caribou no longer inhabit the same landscape or face the same pressures as

they once did. The Southern Lakes caribou now exist in an urban landscape, making them vulnerable to a high number of road collisions, land development continues to limit the amount and effectiveness of their habitat, recreational activities and other sensory disturbances cause stress year-round that collectively impact herd health. Moreover, the increased frequency and intensity of extreme environmental events can significantly influence population dynamics each year. Therefore, it is imperative to exercise patience and implement careful management practices to ensure that the progress achieved through the Recovery Program is not reversed.

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