

**Clear Creek Caribou Herd  
Population Estimate  
2018**



# Clear Creek Caribou Herd Population Estimate 2018

Government of Yukon  
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## Executive Summary

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- We conducted a mark-resight population survey of the Clear Creek caribou herd northwest of Mayo, Yukon in 2018. The purpose of this survey was to provide information on the current size of the population. The last population estimate conducted on this herd was in 2001, which estimated 900 animals in the herd.
- We delineated 30 survey blocks in the herd range based on terrain features, and GPS satellite-collared animals served as the “marked” animals. Three discrete resight sessions were conducted via helicopter with three separate crews from 28 September to 5 October 2018. The animals were also classified as calves, cows, immature and mature bulls during the third resight session.
- Results of the composition survey indicated stable fall calf recruitment of 23 calves per 100 cows, and an adult sex ratio of 37 bulls per 100 cows. Longer-term monitoring of adult sex ratios and calf recruitment is needed to better understand the trajectory of the herd.
- The 2018 population estimate of the Clear Creek herd is 792 (95% CI: 767–820) animals. Although the population survey methods in 2018 differed from 2001, which limits our ability to directly compare the population estimates, the trend appears to be stable or decreasing at a slow rate.

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## Introduction

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The Clear Creek caribou herd (CCCH) is part of the Northern Mountain (NM) population of woodland caribou (*Rangifer tarandus caribou*), which is currently listed as Special Concern under the federal *Species at Risk Act*. Located northwest of Mayo, Yukon, the herd was first studied in the late 1990s in response to residents reporting caribou occupying this area year-round, suggesting they were distinct from the neighbouring Hart River herd (O'Donoghue, Farnell, Fraser, & Laberge, 2001). This led to the deployment of VHF radio-collars starting in 1997, a stratified random block population survey in March 2001, and irregular fall composition surveys in the years 2001–2005, 2007, 2009, 2012, 2014, and 2017. Since the 2018 population survey, three additional fall composition surveys were conducted (2019–2021).

The Clear Creek herd has extensive human disturbance throughout the southern portion of its range, which also provides a high degree of hunter access to the herd. Information is currently lacking to assess the cumulative effects of industry and the sustainability of current harvest on this herd. Based on these concerns, we consider the CCCH to have a high level of conservation concern among Northern Mountain caribou in the Yukon. Increased monitoring of the Clear Creek herd was also identified as a key caribou-related item in the *Community-Based Work Plan for the First Nation of Na-Cho Nyäk Dun Traditional Territory 2014–2019*.

This report summarizes the results of a mark-resight population survey of the Clear Creek caribou herd, conducted from 28 September to 5 October 2018. The purpose of this survey was to update the status and population estimate for the Clear Creek herd, which will help inform harvest management and land-use decisions in the area.

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## Study Area

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The survey area was located on the Stewart Plateau, northwest of Mayo, bounded by the McQuesten River in the south, the North McQuesten River in the east, Davidson Creek and the upper North McQuesten River in the north, and the junction of the Klondike and Little South Klondike Rivers in the west (Figure 1). The herd range overlaps with the traditional territories of the First Nation of Na-Cho Nyäk Dun in the east and the Tr'ondëk Hwëch'in First Nation in the west. The survey area for the 2018 population survey focused on known rutting areas within the Clear Creek herd range. These areas were identified through historical monitoring and inventory work that started in the late 1990s, recent fall composition surveys, GPS collar locations (from March 2017 onwards), and local knowledge. Many of the known rutting areas were located in alpine and subalpine shrub and open willow ridge habitats north of the McQuesten River on and near West Ridge, East Ridge, Red Mountain, and the mountain block between the Klondike River and Davidson Creek. The total survey area was 2,922 km<sup>2</sup> and, within that area, 30 survey blocks were initially delineated across the herd's range. Survey blocks ranged in size from 24 km<sup>2</sup> to 238 km<sup>2</sup> and were delineated to follow natural terrain features as much as possible (Figure 1).

The terrain in this area consists of rolling uplands and broad, deeply cut valleys, with the highest peaks ranging from 1,585 to 1,920 meters. Northern boreal forest can be found at elevations under 1,500 m, with talus slopes and shrub and lichen tundra found at higher elevations. In the boreal forest, open black spruce with a moss or lichen understory is dominant (Yukon Ecoregions Working Group, 2004).

The climate in the area is cold and continental, with mean annual temperature in the region near - 5°C, with strong seasonal variability at different elevations. Mean January temperatures range from below -30°C in the lower valleys to above - 20°C higher up, with mean July temperatures around 15°C down low and 8°C up high (Yukon Ecoregions Working Group, 2004). Snow cover is mostly continuous from October to May, with an average annual depth in Mayo of 45 cm, with approximately 92 cm in the mountains. Overall, there has been a trend towards higher temperatures and more precipitation in the region (O'Donoghue, Farnell, Fraser, & Laberge, 2001).



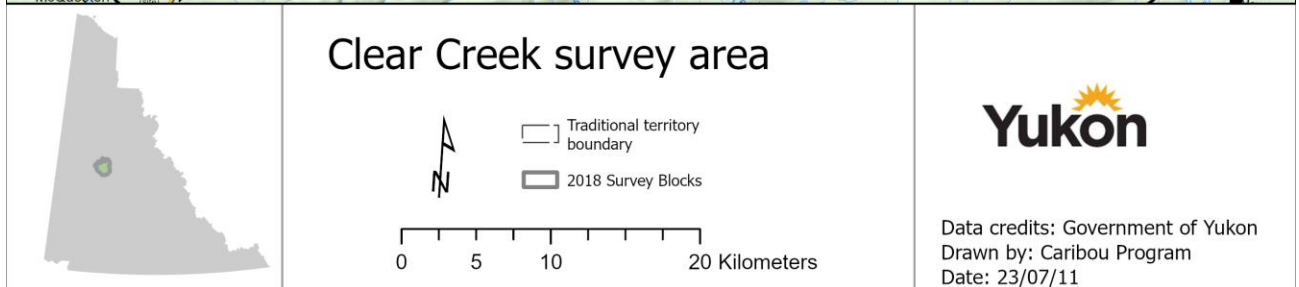
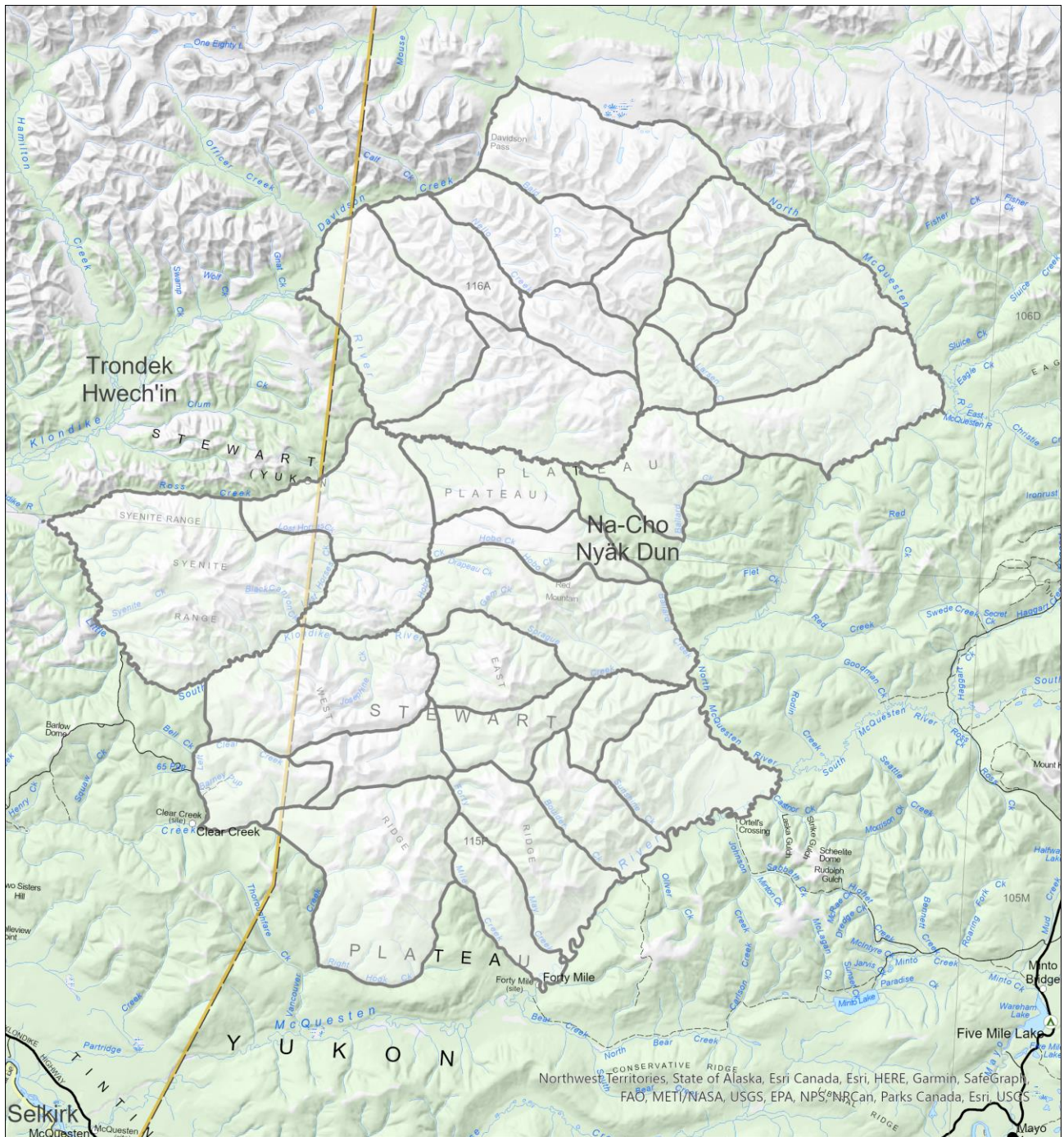


Figure 1. Clear Creek caribou herd 2018 population estimate survey area and blocks.

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## Methods

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To update the population estimate, a mark-resight estimation technique was used, with GPS satellite-collared animals serving as the “marked” animals. Prior to the resighting surveys, 30 GPS satellite-collars were deployed on the herd in late winter (March) 2017 and nine in late winter 2018. All collared animals were also fitted with coloured visibility-bands with unique number IDs to facilitate identification of marked individuals. When a group of caribou was located, the numbers of marked and unmarked animals were recorded, and a waypoint was taken using a handheld GPS unit. Marked animals were identified by their unique visibility-bands, where possible. During the third resighting session, animals were also classified as calves, cows, or immature and mature bulls to estimate herd composition.

Three discrete resighting surveys were conducted with a Bell 206 Long Ranger helicopter, with three separate crews, from 28 September to 5 October 2018. The 30 survey blocks were used to guide survey efforts across the herd’s range. To ensure each survey crew had roughly the same effort, each block was allocated a proportion of the total survey time based on block size as well as the relative number of groups observed in the blocks during previous years’ fall composition surveys. Each survey block was to be flown by each crew. Within each survey block, crews focussed survey efforts on subalpine and alpine habitats assumed to have a relatively high probability of caribou occurrence.

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## Results and Discussion

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Survey conditions were generally clear and sunny or partly cloudy with light wind and good visibility; however, patchy snow in some of the alpine habitat lowered the crews' ability to sight caribou at times. Of the initial 39 GPS collars deployed on the herd, eight collars malfunctioned, three mortalities occurred, and two animals moved out of the range, reducing the number of available marks to 26. Although some of the collars failed (i.e., animals' fates at the time of the survey were unknown), those that were observed during a particular resight session were considered available for that session. However, those that were not observed were censored (not included), as their availability was unknown. Three of the failed collars were censored, while five of the failed collars were observed and included in the analysis, resulting in a maximum of 31 marks available throughout the survey.

Resight sessions one and three surveyed all blocks, while unfavourable survey conditions prevented resight session two from completing two of the blocks (Figure 2, Figure 3, Figure 4). As a result, not all marked animals were "available" to be observed during the second resighting session. This was important to account for so we didn't artificially inflate the population estimate by biasing the resighting rate low. Marked animals located within a survey block, when crews were surveying, were deemed to be available for sighting. This availability was determined by using collar relocations after surveys were complete. Crews did not know which marked animals were present in a block during their survey, and no telemetry equipment was used to locate animals, as that would have biased the resighting rates high. Resighting rates (i.e., recapture probability), based on data in Table 1 for sessions 1, 2, and 3 were 0.65, 0.50, and 0.52, respectively.

Table 1. Mark-resight survey results for the Clear Creek caribou herd, 28 September to 5 October 2018.

Resight session	Survey effort (km/min)	Total marked animals available	Total marked animals observed	Total unmarked animals observed	Resighting rate
1 (28–29 September)	2.12	31	20	528	0.65
2 (30 September–1 October)	2.69	26	13	335	0.50
3 (2–5 October)	2.63	31	16	442	0.55

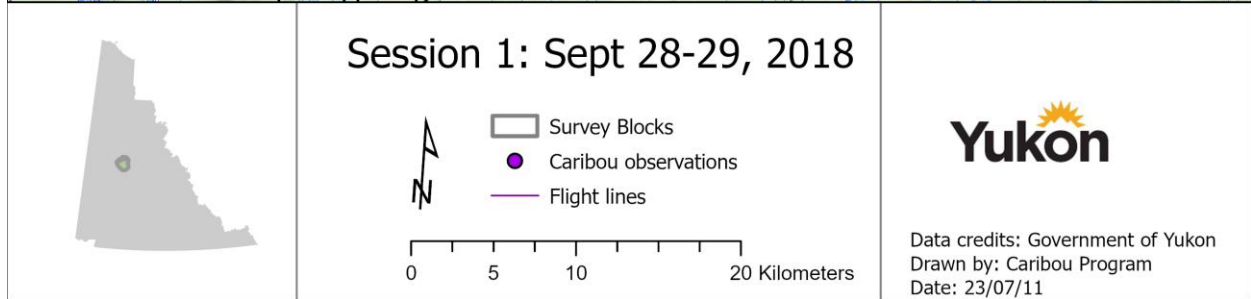
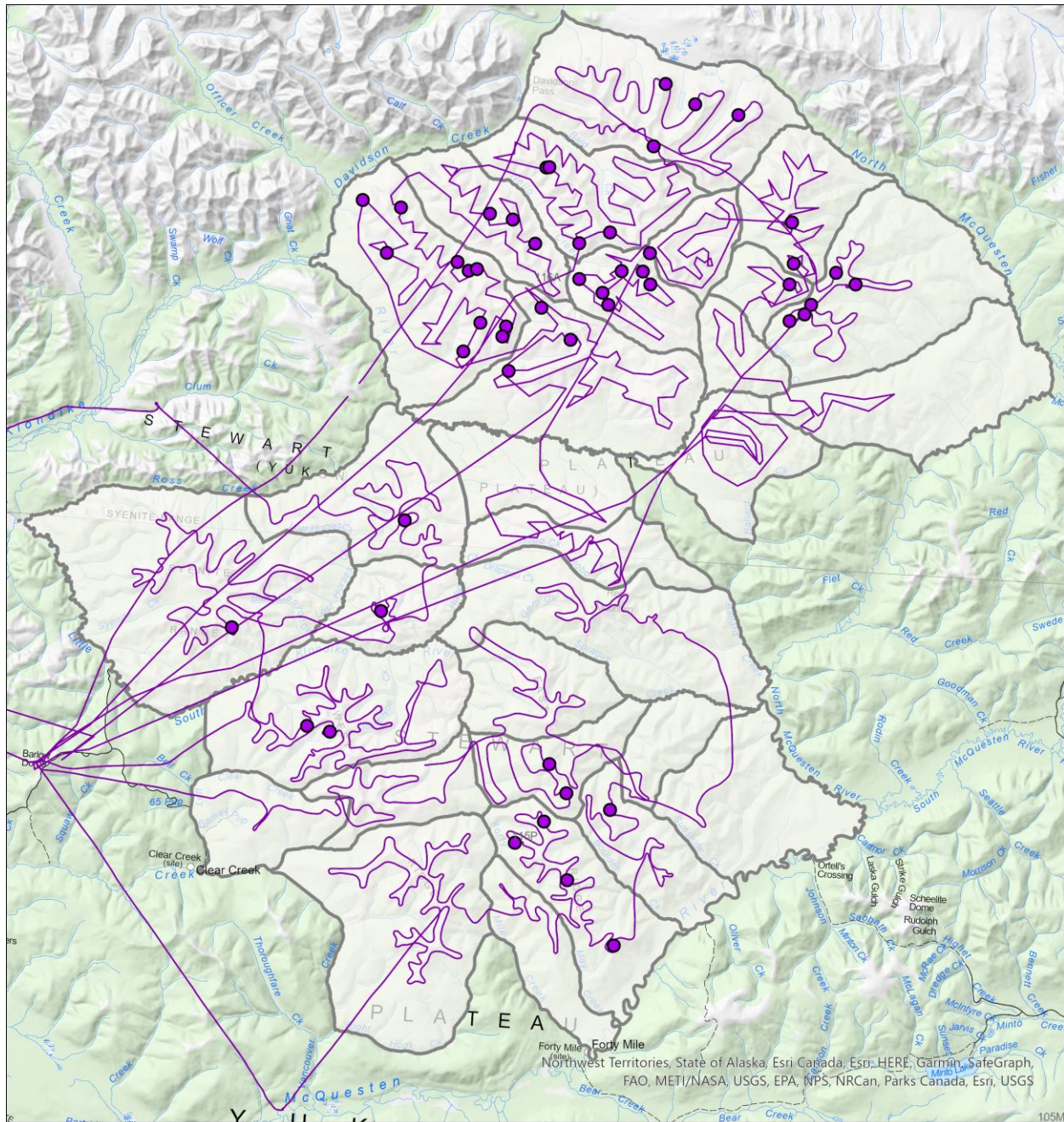


Figure 2. Flight lines and caribou observations from session 1 of the 2018 Clear Creek caribou population estimate survey.



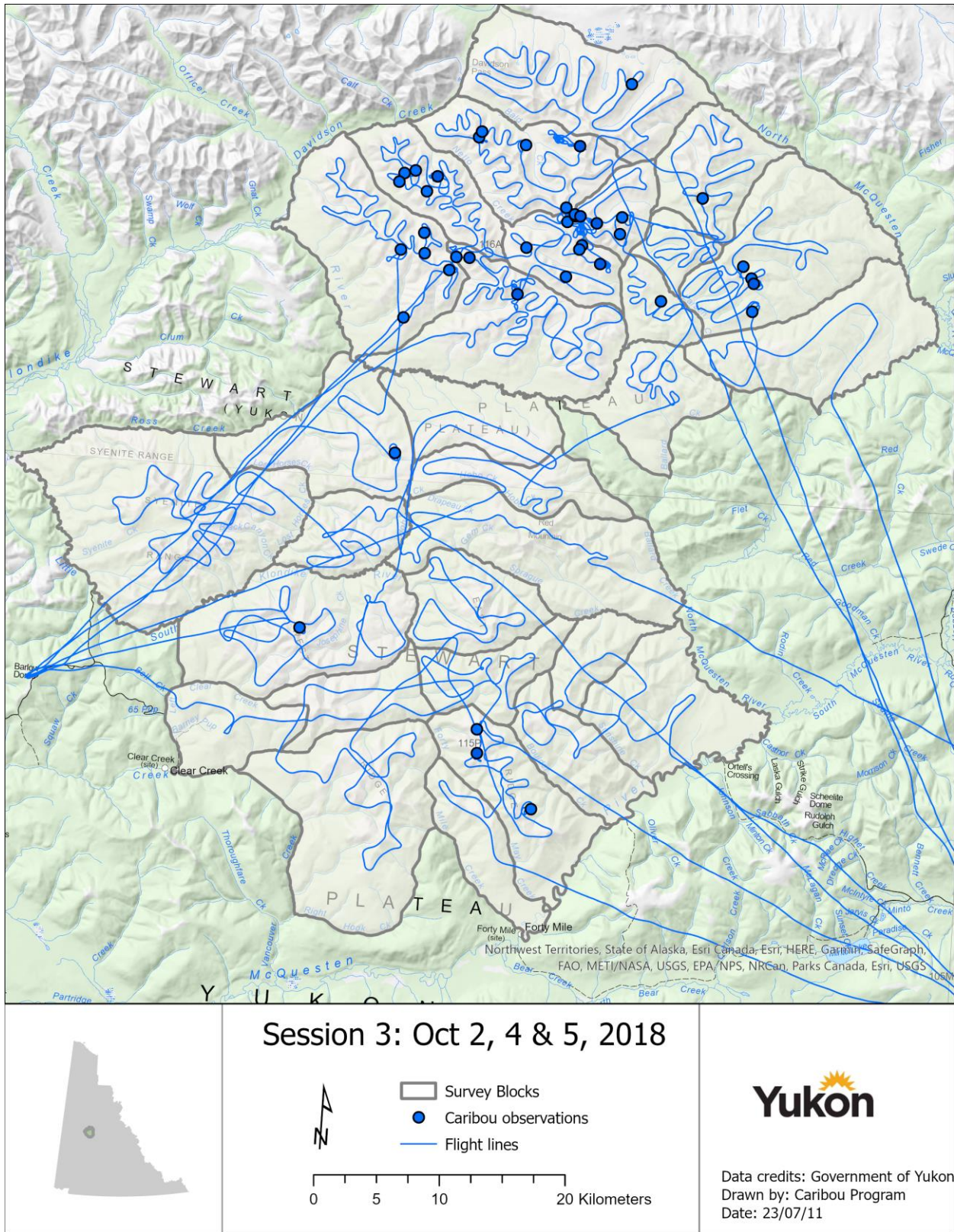


Figure 4. Flight lines and caribou observations from session 3 of the 2018 Clear Creek caribou population estimate survey.

## Population Estimate

We used Program MARK (ver. 9.0; McClintock and White 2012) to derive a population estimate. Immigration-emigration (IE) mixed logit-normal models were used because the entire herd range was not surveyed during each resighting session (two blocks missed in session two), thus it had to be considered geographically and demographically open. The IE model accounts for not all marked animals being available during the second session by deriving a super-population estimate. Although this model allows for individual heterogeneity in resighting probabilities by treating each animal as a random effect, this value was fixed at zero.

The final 2018 population estimate for Clear Creek was 792 (95% CI: 767–820) animals. Results of the composition survey indicated a calf recruitment ratio consistent with stable population growth (23 calves per 100 cows; Table 2) and a sex ratio indicative of a productive herd (37 bulls per 100 cows; Table 2), as per the *Science-based guidelines for management of Northern Mountain caribou in Yukon* (Environment Yukon 2016; Table 2). This is the first time since 2007 that the fall index of calf recruitment has approached the sustainable threshold; however, it is important to examine trends in recruitment over time as opposed to single-year estimates, as these values may vary considerably from year to year. The long-term trend for adult sex ratio is 43 bulls per 100 cows, which is above the recommended number of 30 bulls per 100 cows, to ensure all females have the opportunity to reproduce and genetic diversity is maintained (Figure 5; Environment Yukon, 2016).

Table 2. Composition of the Clear Creek caribou herd based on estimated age and sex ratios and the population size estimate determined during the mark-resight session, October 2018.

Herd composition ratios <sup>1</sup>			Estimated herd composition		
Calves per 100 cows	Bulls per 100 cows	Number of caribou classified	Calves	Cows	Bulls
23.3	36.7	392	115	495	182

<sup>1</sup>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.

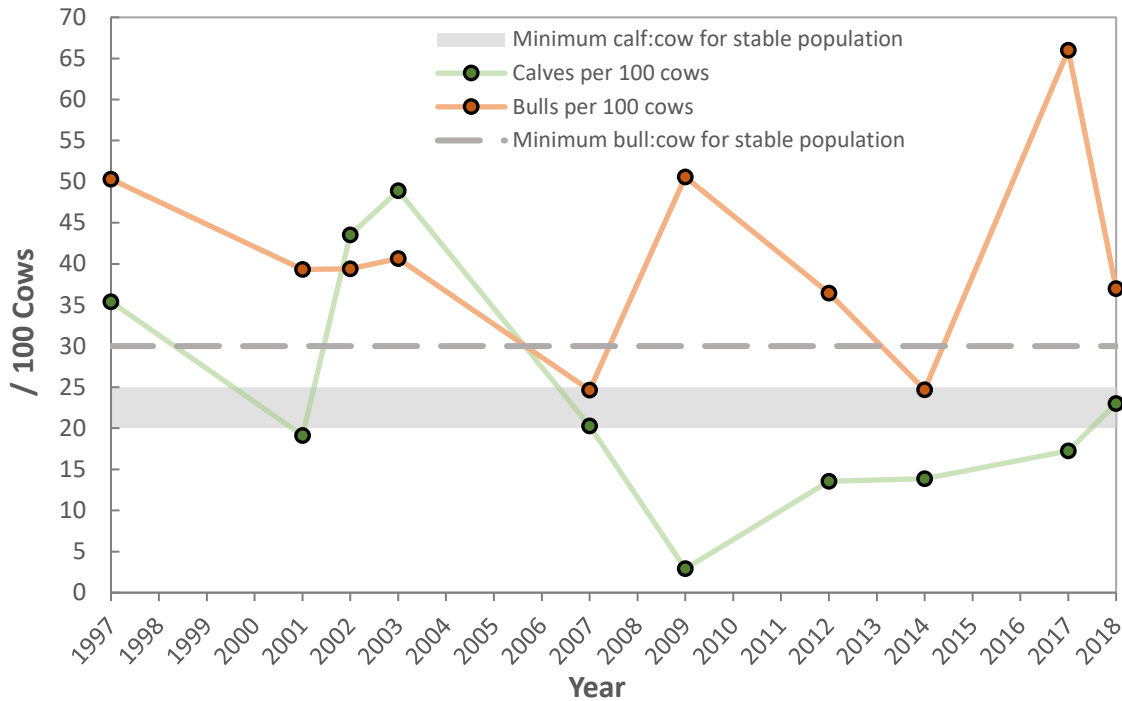


Figure 5. Composition (number of calves and bulls per 100 cows) observed during Clear Creek caribou fall composition surveys from 1997 to 2018. Survey results from 2004 and 2005 were excluded due to low sample sizes.

The previous estimate of the Clear Creek herd of 900 animals in 2001 was derived from a stratified random block survey that corrected for missed animals by applying the average sightability correction factor from previous surveys in the Yukon to the total number of animals observed during the survey (543 caribou observed; O'Donoghue, Farnell, Fraser, & Laberge, 2001). Although this is not typically the approach for sightability correction, it was necessary due to unforeseen challenges with the number and distribution of radio-collared animals. Prior to correcting for missed animals, the estimate was 728 (90% CI: 453–1,004) animals; however, the derived estimate of 900 animals did not include confidence intervals, thus it should be interpreted cautiously. The 95% confidence interval of the current Clear Creek population estimate does not include 900; however, without a concrete estimate of error in 2001, it would be inaccurate to assume that the herd has declined since 2001. It is likely the herd is either stable or decreasing at a relatively slow rate. It is very unlikely that the herd is increasing in size.



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## Management Implications

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The Clear Creek caribou herd currently has an estimated population of approximately 792 animals, with a 95% confidence interval ranging from 767 to 820. This number is lower than the previous estimate of 900 animals conducted in 2001. It is worth noting that the survey methods used in 2018 differed from those used in 2001. Despite the methodological differences, both estimates indicate that the population trend of the herd is either stable or experiencing a slow decline.

While the composition values observed during the 2018 survey suggested a stable herd, it is important to analyze long-term trends in calf recruitment (the number of new calves entering the population) and adult sex ratios to gain a more comprehensive understanding of the herd's overall trajectory.

The Clear Creek caribou herd faces significant challenges due to the extensive industrial activity taking place within their range and the accessibility of the area to hunters. Given these circumstances, regular monitoring of herd composition, harvest rates, and habitat use is crucial to ensure the population remains sustainable. By closely monitoring these factors, conservation efforts can be tailored to mitigate negative impacts and promote herd stability and growth.

Ongoing monitoring initiatives for the Clear Creek caribou herd are planned to continue in the future. During late winter 2023-2024, an additional 30 GPS satellite collars will be deployed on caribou within the herd. This will enable managers to track their movements, gather valuable data on habitat use, and provide marks for an additional population estimate. Fall rut surveys will also be conducted regularly. Furthermore, there are tentative plans to carry out another mark-resight population survey in the fall of 2024. These comprehensive monitoring efforts will contribute to a more accurate assessment of the herd's population dynamics and inform management and land use planning efforts accordingly. A range assessment is also being conducted on this herd and is expected to be completed in 2023.

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