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Finlayson caribou herd late winter population survey 2017

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Abstract

- We conducted a late winter census of the Finlayson caribou herd from 7 – 10 March 2017 (stratification) and 15 – 19 March 2017 (census). The purpose of the survey was to estimate abundance, distribution, and composition of the herd.
- We surveyed 65% of the survey blocks and found a total of 1,785 caribou.
- We calculated a population estimate of 2,712 caribou and are 95% confident that the population was between 2,454 and 2,970.
- We estimated that there were 31 calves for every 100 adult cows in the herd. To ensure a stable population growth rate a minimum ratio of 20 to 25 calves per 100 adult cows is generally required (Government of Yukon 2016).
- We estimated there were 42 bulls for every 100 cows in the herd. This adult sex ratio is above the ratio of 30 bulls per 100 cows identified for herd stability in our caribou management guidelines (Government of Yukon 2016).
- The previous population estimate of the herd was 3,077 animals in 2007. This results in an average annual population growth rate of 0.987 between 2007 and 2017. Since 1990, we have observed a slowly declining population trend.
- As a declining population, a bull only harvest of up to 1% of the total population may be considered; however, both historical data and recent anecdotal information suggests that subsistence harvest alone may be equal to or greater than 1%.

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Introduction

The Finlayson caribou herd (FCH) is part of the Northern Mountain Population (NMP) of woodland caribou, which are currently listed as Special Concern under the federal *Species at Risk Act*. This report summarizes the results of a late winter population survey of the FCH, conducted from 7 – 10 March 2017 (stratification) and 15 – 19 March 2017 (census). The purpose of this survey was to estimate the abundance, distribution, and population trend of the herd.

This information will be used to assess the population status and the harvest pressure on the herd. In addition, the results will help to inform land use decisions in the Finlayson caribou herd's range. Conservation and effective management of this herd is a priority given its value as a subsistence harvest resource for both the Ross River Dena Council and Liard First Nation.

Management and monitoring history

In the late 1970s and early 1980s, the FCH was thought to be declining due to wolf predation and high human harvest (Adamczewski et al. 2010). At this time the herd was estimated at approximately 2,000 animals; however, no formal counts or studies had been carried out.

In response to concerns that the herd was declining, the Department of Environment initiated an intensive population recovery program and management study in the FCH's range to look at the effects of predatory population reduction and the recovery of caribou and moose populations. From 1983 to 1989, an annual aerial wolf control program was carried out in the FCH range. During this time wolf numbers were reduced by approximately 85% from pre-control numbers. The herd grew from an estimated 2,000 animals in 1982 to nearly 6,000 animals in 1990. Additionally, fifty-two very high frequency (VHF) radio collars were deployed on female caribou and were used to examine distribution and habitat use from 1982 to 1986.

Following wolf control (1990 to 1998), we conducted aerial surveys and monitoring of caribou, moose, and wolf populations. We found that wolf numbers rebounded within 4 to 5 years to numbers comparable to pre-control estimates, and a population census in 1996 of the Finlayson caribou herd showed that the herd had declined to approximately 4,500 animals. During this time, there was interest in the community to maintain the herd at post-wolf control numbers. In 1998, on the recommendation of the Yukon Fish and Wildlife Management Board, the Department of Environment implemented a Permit Hunt Authorization (PHA) regulation for licenced resident hunters. Additionally, outfitters were placed on quota. In 1999, we completed another census and the herd was estimated at 4,130 animals. Eight years later, in 2007, the herd was estimated at 3,077 animals.

Fall composition surveys have been completed annually on the herd from 1982 to 2020. These surveys provide an estimate of the recruitment rate (i.e., number of calves per 100 cows) and the adult sex ratio (i.e., the number of bulls per 100 cows). The average calves per 100 cows in

the last 38 years (1982 to 2020) is 27.5 calves:100 cows, with a range of 9.1 to 61.6 calves per 100 cows. For Northern Mountain caribou in the Yukon, a fall calf:cow ratio of about 20 to 25 calves per 100 cows is generally consistent with a stable population growth rate (Government of Yukon 2016). In the Yukon, a sex ratio of 30 bulls per 100 cows should ensure all females have the opportunity to reproduce. The average bulls per 100 cows in the last 38 years is 50 bulls:100 cows, with a range of 31.2 to 72.5 bulls per 100 cows.

Study area

The summer and fall ranges of the FCH are primarily located on alpine plateaus south of Finlayson Lake. However, approximately one-third of the herd uses a widely-scattered group of alpine blocks north of the Robert Campbell Highway, ranging close to the Northwest Territories border (Figure 1).

The herd's winter range is located north of the Pelly Mountains and east of the community of Ross River, on both the north and south sides of the Robert Campbell Highway. It is a lowland forested area where there are abundant ground lichens under relatively open black spruce, white spruce, and lodgepole pine forests. The mountains create a snow and rain shadow effect by intercepting the predominant weather systems from the southwest. The low snow cover and abundant ground lichens in the core winter range are typical of Yukon woodland caribou winter ranges. The core of the spring, summer, and fall range of this herd in the Pelly Mountains overlaps a mineral belt that has undergone exploration over the past 20 years.

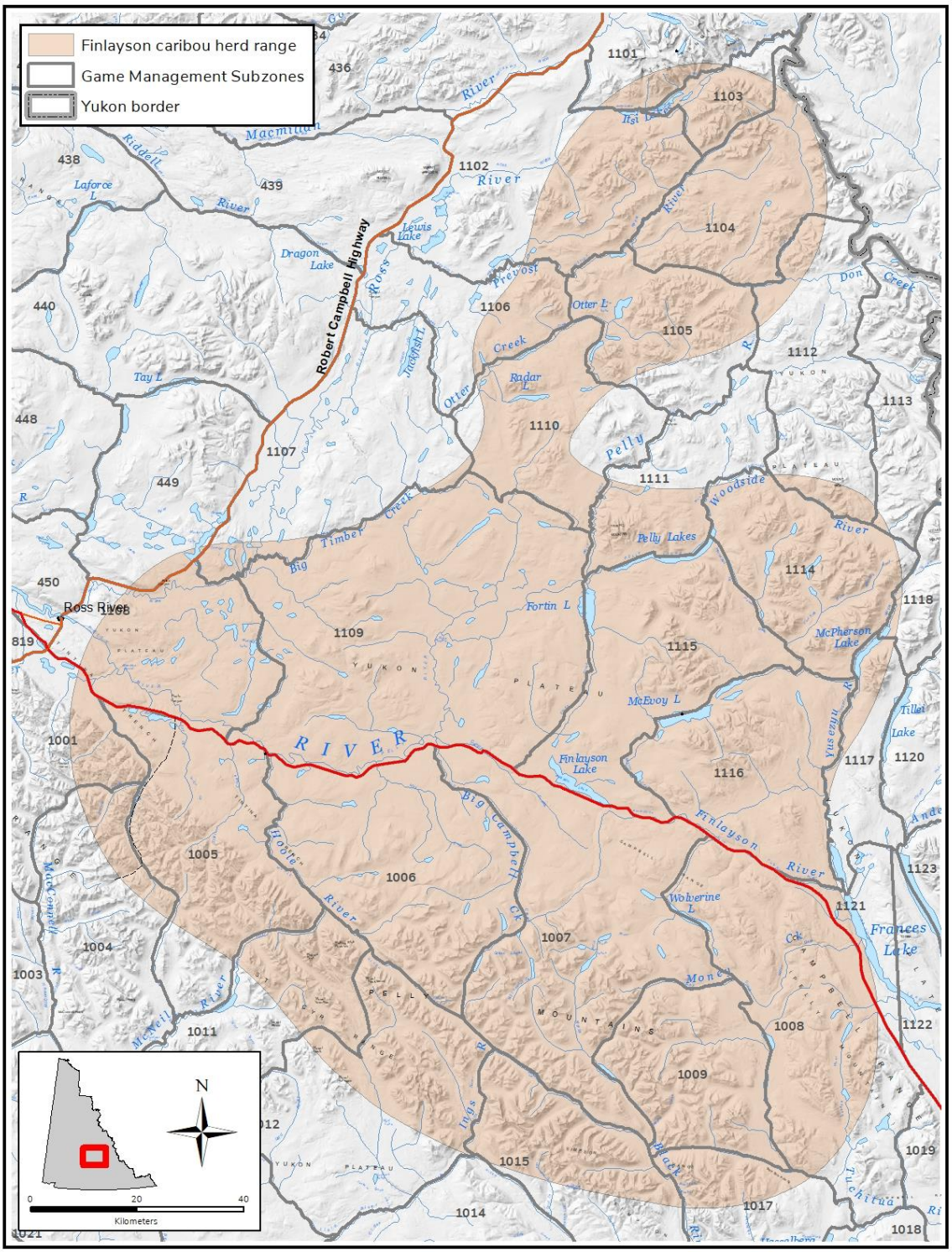

Fig. 1. The Finlayson caribou herd range is located east of the community of Ross River in the southeast Yukon.

Methods

A random quadrat survey method was used to estimate the herd's size in 2017, similar to the methods used in the five previous census surveys of this herd (1986, 1990, 1996, 1999 and 2007). The method is an adaptation of a survey first developed for moose and adapted for woodland caribou in the Yukon (Farnell and Gauthier 1983) and has been used for many herds in the Yukon. The Caribou Program has developed alternate census methods (mark-resight surveys) for herds in the rest of territory; however, due to timing constraints and to be comparable with previous herd estimates, a consistent method was employed.

Stratification

Prior to the census flights, a stratification survey was flown to classify the study area according to observed caribou use. The following steps were followed:

1. The survey area was divided into 214 blocks covering an area of 6,779 km^2, identical to those used in previous surveys.
2. Experienced observers flew in a small fixed wing aircraft through each of the survey blocks looking for caribou or signs of caribou. Caribou, or caribou sign (e.g., tracks, cratering), were used to categorize blocks into one of three strata: high use, low use, or out (i.e., no caribou use). Criteria for distinguishing between high and low use were the same as in 2007, with at least 12 caribou observed or abundant fresh sign indicative of a high use block.

Census

Following the fixed-wing stratification survey, a helicopter-based "census" survey was conducted in which survey blocks were flown more intensively and caribou groups counted and classified. The following steps were followed:

1. Two helicopters were used for the census to help minimize the chance that caribou might move between survey blocks. Each helicopter contained three observers. Blocks were intensively surveyed by flying evenly spaced transects (~ 400 m apart) across the entire block. Low use blocks were selected to provide a reasonable spatial coverage of the survey area.
2. Caribou were classified opportunistically from helicopters as cows, calves, young bulls, and mature bulls, and the location of each group was recorded with a GPS (Global Positioning System).
3. Resources were not available to conduct separate sightability surveys to develop a correction factor to account for missed animals in the surveyed blocks. However, sightability correction trials (n=43) have been conducted for the herd during several previous surveys (1986, 1990, 1996, and 1999), and data from those sightability trials were used to generate a correction factor for the 2017 survey. A logistic

regression model using data from all available sightability trials was fitted accounting for year by treating it as a random effect (using the lme4 package in R ver. 3.4.0). The estimated coefficient (on the logit scale) from the model was 1.238 (SE = 0.212) which is equivalent to a 0.776 (SE = 0.037) sightability rate (i.e., 77.6% of the total number of animals in the population were observed), which is also the same as a correction factor (i.e., multiplier) of 1.289 (SE = 0.061). Data to develop separate correction factors for high and low use blocks were unavailable.

Data analysis

We analyzed caribou abundance in two steps: first for the high use blocks and second for the low use blocks. Abundances of each stratum were summed for a total estimate of the FCH's size. Because all high use blocks were surveyed, the total number of caribou observed in them can be directly adjusted by the estimated correction factor. The only source of uncertainty (i.e., variance) for this step is associated with the variance of the correction factor itself.

To estimate caribou abundance in the low use stratum, observed caribou numbers in each survey block were first converted to densities. This observed density was then applied to all (surveyed and unsurveyed) low use blocks to obtain an overall estimate of caribou abundance in the low use stratum, uncorrected for sightability. Subsequently this uncorrected abundance estimate was adjusted for sightability using the estimated correction factor. Summing the abundance estimates of the high and low use strata yielded an overall estimate.

Results and discussion

Survey results

The stratification survey was completed from 7 to 10 March 2017 and took approximately 17 hours. Weather conditions were good for flying; however, snow conditions were not ideal for using tracks as it had been weeks since the survey area had received any significant snowfall. Nevertheless, where possible, tracks were used to distinguish between strata. From this initial stratification, 37 blocks were identified as high use, 43 as low use, and 134 as out, representing 1,159, 1,440, and 4,179 km², respectively (Figure 2). Block 28, in the westernmost portion of the area, was identified as low use. Based on GPS radio collar data, caribou in this block likely represented Tay River animals rather than Finlayson and it was thus removed from the analysis.

Ideally, the census would have occurred immediately following the stratification survey. However, logistical issues and snowfall immediately following the stratification survey delayed the start of the census survey and contributed to greater variability with the stratification survey results. The survey crew observed that the recent snowfall appeared to make the herd more aggregated into fewer high use blocks. Low use blocks not formally surveyed were informally assessed via helicopter as crews were ferrying to and from fuel or between other survey blocks.

To account for the lack of reliability of the initial stratification results, blocks were subsequently post-stratified using a density threshold of 1 caribou/km² which roughly represented the mean caribou across all blocks (Figure 2). The final numbers of high and low use blocks were 16 and 63, respectively (Table 1, Figure 3).

The census was completed from 15 to 19 March 2017. All high use blocks and 35 low use blocks were surveyed. Low use blocks were selected to provide a reasonable spatial coverage of the survey area and also to account for possible movement of animals between blocks because of the time between stratification and the census surveys. Weather conditions were considered good, and ranged from light to no snowfall, with fog on one day. The survey took approximately 45 hours and on average, survey intensity was 1.76 minutes/km^2. Across all surveyed blocks, 1,785 caribou were observed (Table 1).

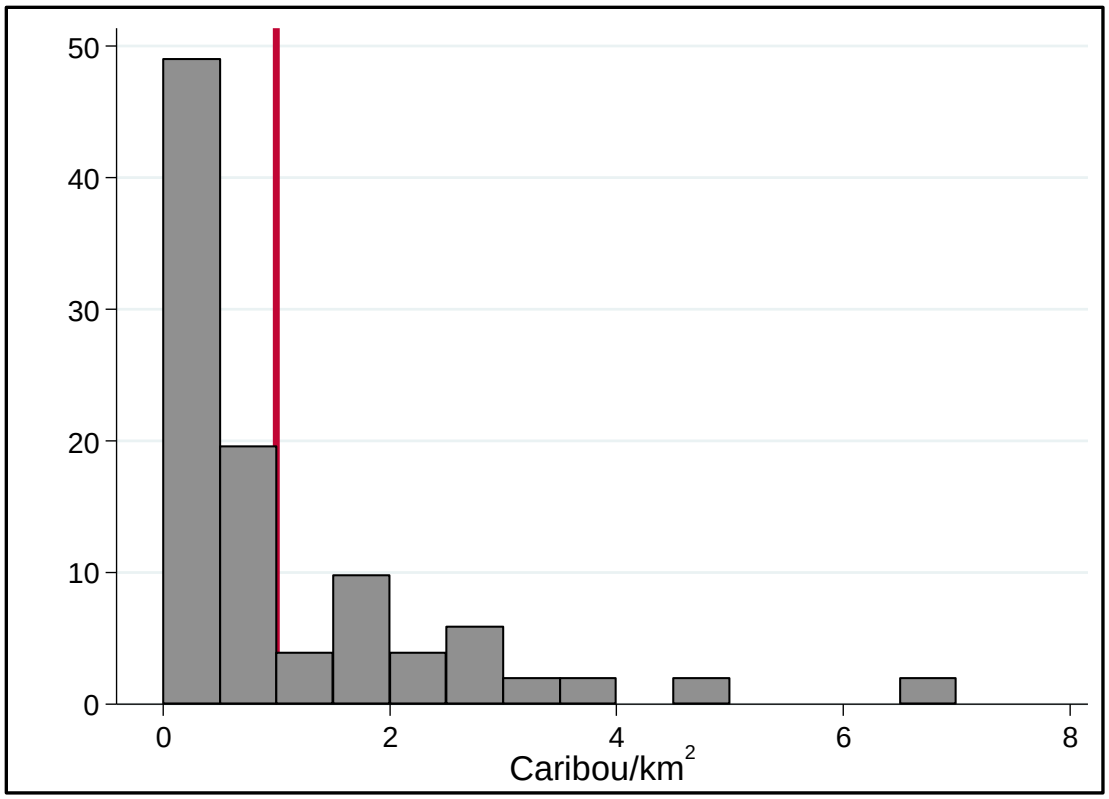

Fig. 2. Histogram of observed Finlayson caribou densities in surveyed blocks, 15 to 19 March 2017. The red vertical line indicates 1 caribou/km².

Table 1. Observed caribou during the March 2017 census survey of the Finlayson caribou herd.

Strata	# of Blocks	Area (km²)	# Blocks Surveyed	Surveyed Area (km²)	Caribou Observed	Caribou/km² (SE)[1]
Low-use	63	2,006	35	1,012	343	0.33 (0.05)
High-Use	16	546	16	546	1,442	2.59 (0.37)
Total	79	2,552	51	1,558	1,785	1.04 (0.19)

[1]Caribou density averaged across all surveyed blocks.

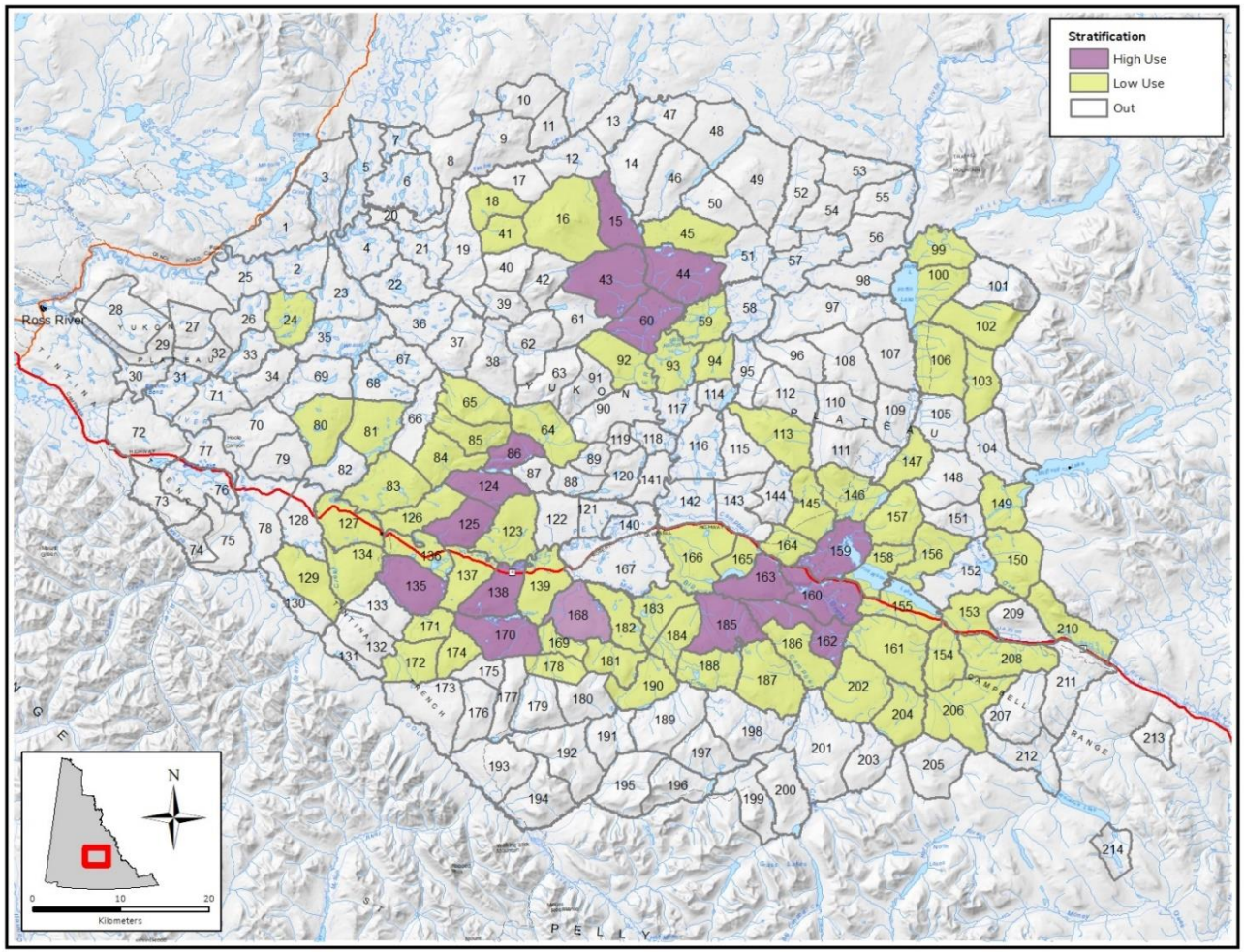

Fig. 3. Survey block stratification for the Finlayson caribou herd census based on a post-hoc assessment of caribou densities in surveyed blocks, and locations (and sizes) of observed caribou groups.

Distribution

Caribou were distributed in three general areas: north and south of the Robert Campbell Highway in the Caribou Lakes area, north of the Pelly River in the Slate Rapids area, and north, south, and southwest of Finlayson Lake (Figure 4). This distribution is comparable to that observed during the 2007 census (Adamczewski et al. 2010), where caribou were also primarily concentrated in three locations (Figure 5).

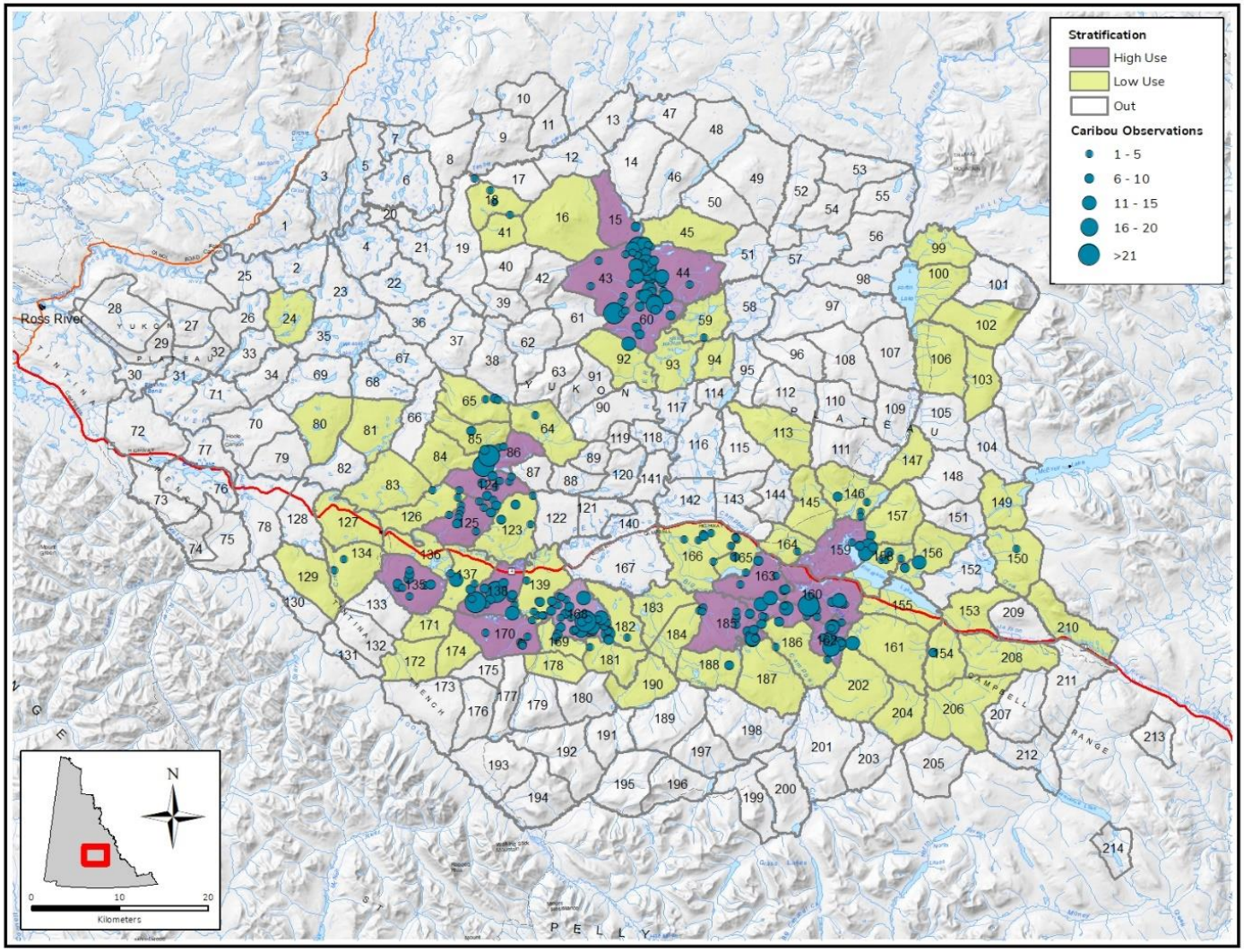

Fig. 4. Finlayson caribou herd locations and group sizes during the 2017 census.

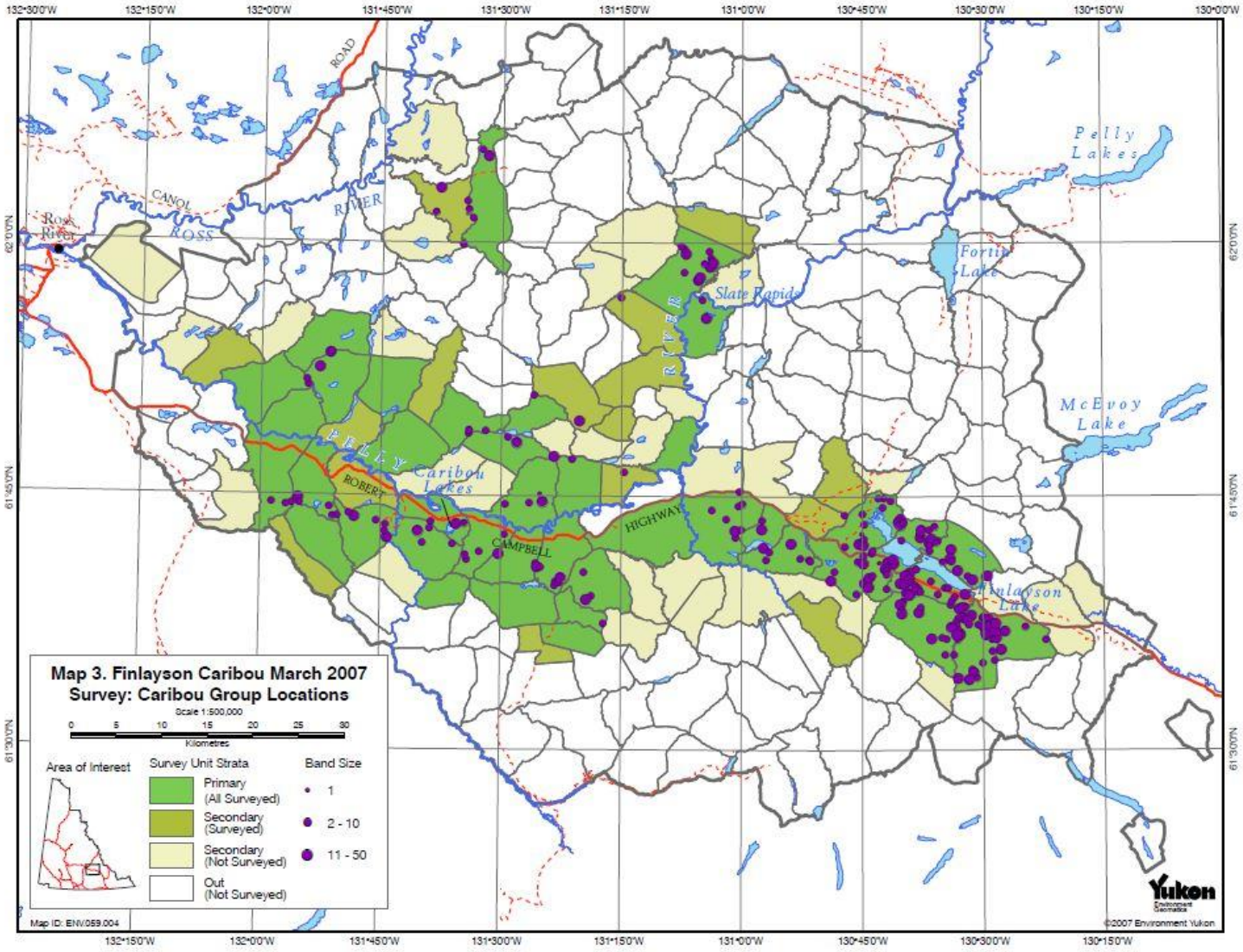

Fig. 5. Finlayson caribou herd locations and group sizes during the 2007 census.

Population estimate, composition, and trend

One thousand four hundred and forty-two caribou were observed in the high use stratum. Correcting this value for unobserved animals yielded a total estimate of 1,859 (SE=113) caribou in the high use stratum. In the low use blocks that were surveyed, 343 caribou were observed yielding a density of 0.33 caribou/km^2. This observed density was applied to all unsurveyed and surveyed low use blocks to obtain an overall estimate of caribou abundance (N=662, SE = 59) in the low use stratum (uncorrected for sightability). The total, corrected abundance of caribou in the low use blocks was 853 (SE = 67). The majority of animals were observed in blocks adjacent to the Robert Campbell Highway, in addition to the Slate Rapids area (i.e., blocks 43, 44, and 60).

Summing the estimated high and low use strata yielded a total estimate of 2,712 (SE = 131) caribou in the Finlayson herd (Table 2).

Table 2. Estimated abundance, corrected for sightability, of the Finlayson caribou herd, March 2017.

Strata	N	SE[1]	95% Confidence Interval
High Use	1,859	113	1,638-2,080
Low Use	853	67	722-984
Total	2,712	131	2,454-2,970

[1]Standard error

During the survey, observed caribou were classified into calves, cows, or bulls when possible. Of the 1,785 animals observed, 64% or 1,139 animals were classified. A composition survey was also completed in the fall of 2016. Values from both surveys were similar, and given the greater sample size from the March 2017 survey and that it directly represents the herd during the time of the population estimate, its values were used to provide an estimate of the composition of the herd. In March 2017, the calf to cow ratio was estimated at 0.31 and 17.6% of the herd were calves. The bull to cow ratio was estimated to be 0.42 (Table 3). Using these ratios, the herd was estimated to have 477 calves, 1,578 cows, and 657 bulls (Table 4).

Table 3: Composition ratios of the Finlayson caribou herd obtained during surveys in October 2016 and March 2017.

Survey	Calf: 100 Cow Ratio	% Calves in the Herd	Bull: 100 Cow Ratio	Number of Caribou Classified
October 2016	0.27	16.2	0.39	660
March 2017	0.31	17.6	0.42	1,139

Table 4: Estimated composition of the Finlayson caribou herd, March 2017.

Herd Size	Calves	Cows	Bulls
2,712	477	1,578	657

Population trend

Since 2007, the Finlayson caribou herd has continued its decline, albeit at a slower rate than previously observed (i.e., between 1999 and 2007 the herd declined by roughly 25%, Figure 6). This reduction in herd size by approximately 365 animals represents a decline since 2007 of approximately 12% (1.2% decline per year) and corresponds to an average annual population growth rate (lambda, λ) of 0.987 (SE = 0.006; 95% CI: 0.976–0.998). From 1999 to 2007 the population's average annual growth rate was 0.964 (SE = 0.011; 95% CI: 0.942–¬0.986).

A stable population is indicated by a lambda value of 1 and given that the confidence intervals of the 1999 to 2007 and 2007 to 2017 growth rates do not include 1, there is high confidence that the population has decreased since 1999. While the average annual population growth rate from 2007 to 2017 is higher than that of 1999 to 2007, confidence intervals of each rate overlap and thus there is likely not a statistically significant difference between the two.

Composition surveys completed on the herd from 1982 to 2020 indicate variable recruitment rates (Figure 7); however, the long-term trends (5-year moving average) roughly track with the observed decline in population from 1990 to 2017 (Figure 6). A stable population generally requires an average fall recruitment level of 20-25 calves per 100 adult cows. The most recent calf to cow trends (27 calves per 100 cows, based on 5-year moving average; Figure 7) indicate the herd may be stabilizing or increasing; however, an updated population census is required to confirm this.

To ensure reproduction is maximized and herd size is sustained, a sex ratio of 30 bulls per 100 cows is required (Government of Yukon 2016). Ratios above 30 bulls per 100 cows have been consistently observed in the Finlayson herd since studies began in the 1980s, with the most recent sex ratios continuing this trend (48 bulls per 100 cows, based on 5-year moving average; Figure 7).

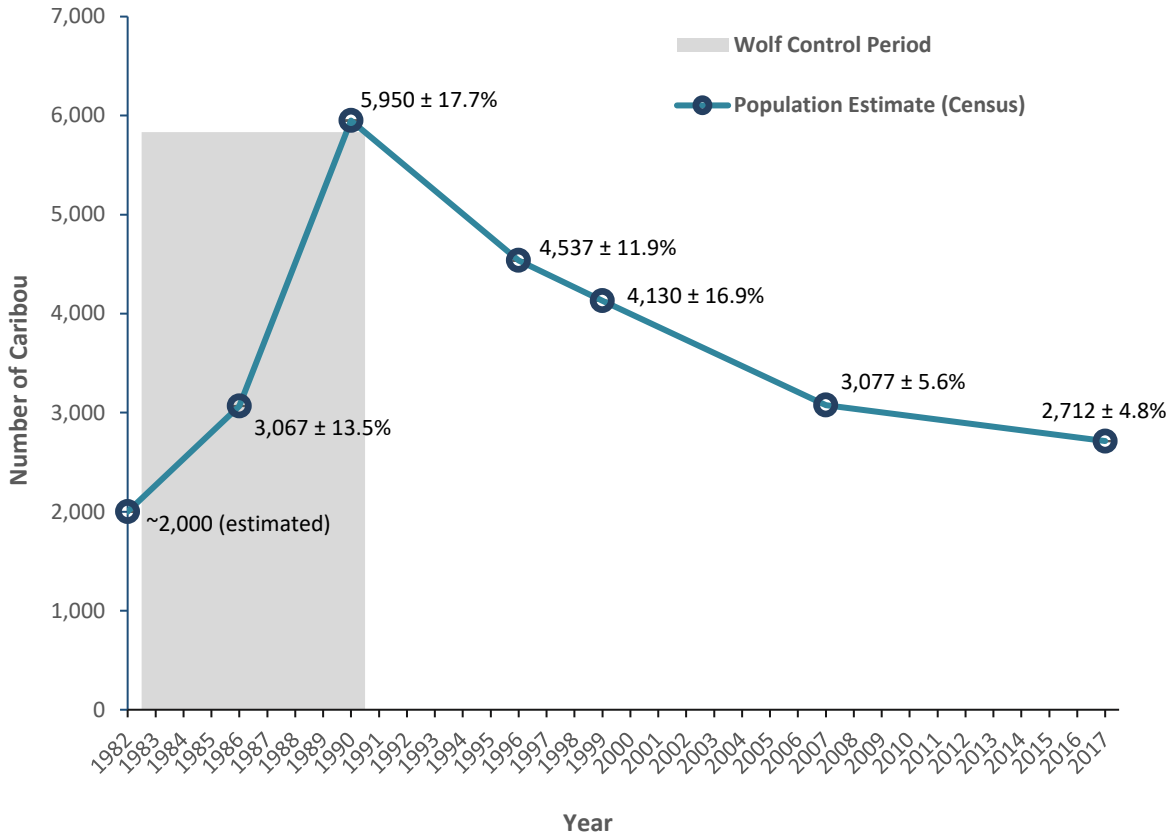

Fig. 6. Population trend of Finlayson caribou herd from 1982 to 2017.

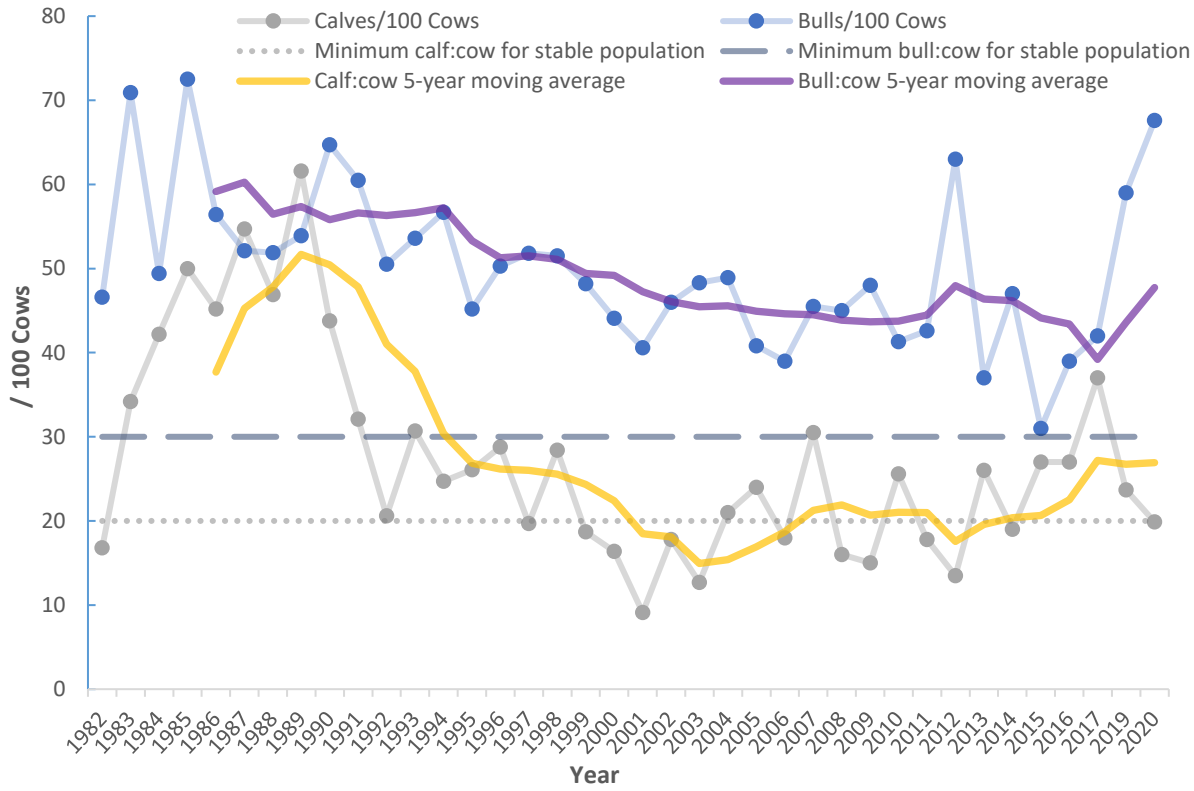

Fig. 7. Results of 38 years of fall composition surveys on the Finlayson caribou herd (1982 – 2020), including the 5-year moving average to demonstrate trend. The dashed lines represent the minimum number of calves and bulls per 100 cows to maintain a stable population, as per the Government of Yukon's 2016 caribou guidelines.

Harvest

The Finlayson caribou herd is harvested as a subsistence resource for members of both the Ross River Dena Council and Liard First Nation. Harvest of the Finlayson herd has varied over time likely due to fluctuating population numbers in relation to the predator program and changing harvest regulations.

Since 1998, harvest has been managed through a Permit Hunt Authorization for licenced resident harvesters and quotas for non-resident harvesters. A 3% harvest rate of the estimated 4,000 caribou in the Finlayson herd was considered sustainable based on the 1996 caribou harvest guidelines (120 animals; Figure 8). Of the 120 animals available for harvest, a 75% First Nation and 25% licensed harvest split was established, and 30 permits were made available for licensed resident harvesters.

The highest licensed harvest occurred during the early 1990s, with a decrease in harvest in the late 1990s when permits and quotas were implemented (Figure 8). From 1996 to 2004, a winter game guardian program was established to collect subsistence harvest information along the Robert Campbell Highway. While subsistence harvest varied between years, game guardians reported considerable harvest rates of both cow and bull caribou. The cow harvest component is noteworthy because it has a disproportionate effect on populations (harvest of one cow is equivalent to the harvest of three bulls; Government of Yukon 2016),

and can precipitate or exacerbate population declines. Recent anecdotal information has indicated that cow harvest still occurs.

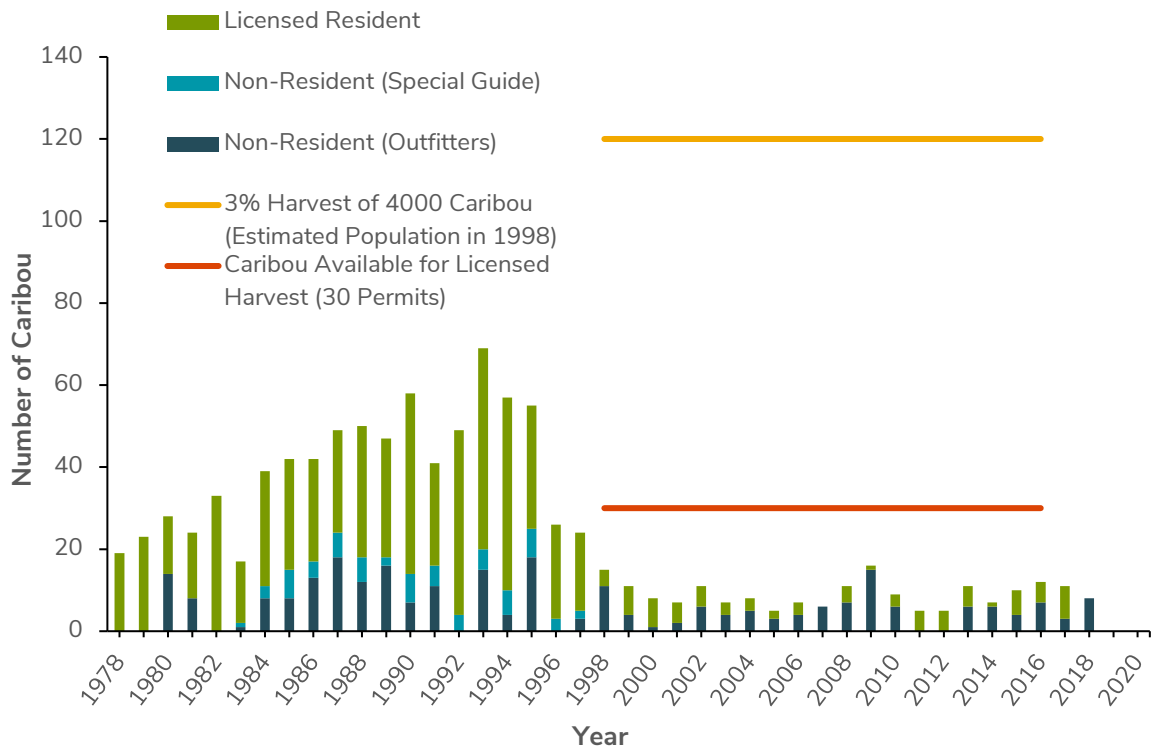

Fig. 8. Licensed harvest of the Finlayson caribou herd from 1978 to 2020. The data in this figure depicts licenced harvest only and does not include subsistence harvest. The Permit Hunt Authorization (PHA) was established in 1998 and provided 30 permits to resident hunters.

Management implications

The caribou management guidelines were updated in 2016 based on empirical data from Yukon caribou herds and provide an overview of the scientific information used by the Government of Yukon to make monitoring and harvest management decisions (Government of Yukon 2016). As the Finlayson caribou herd is presently considered a declining herd, a bull-only harvest of up to 1% of the total population may be considered sustainable. It is assumed that harvest currently exceeds 1% (27 bulls or bull-equivalents) based on historical estimates of subsistence harvest and recently obtained anecdotal information.

The Finlayson caribou herd has continued its decline, which was first observed in 1996 following cessation of the wolf control program, with approximately 365 less animals estimated in the herd since 2007. Although this long-term trend has continued, the rate of decline has slowed compared to the decline observed from 1999 to 2007. Concerns stemming from the continued decline of the herd led to the closure of resident harvest in 2018, and non-resident harvest in 2019. The Government of Yukon will continue to monitor this herd and work toward stabilizing it through continued collaboration with management partners. In addition to continuing annual composition surveys, a population census is planned for late winter 2022 to provide a five-year update on the status of the herd.

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