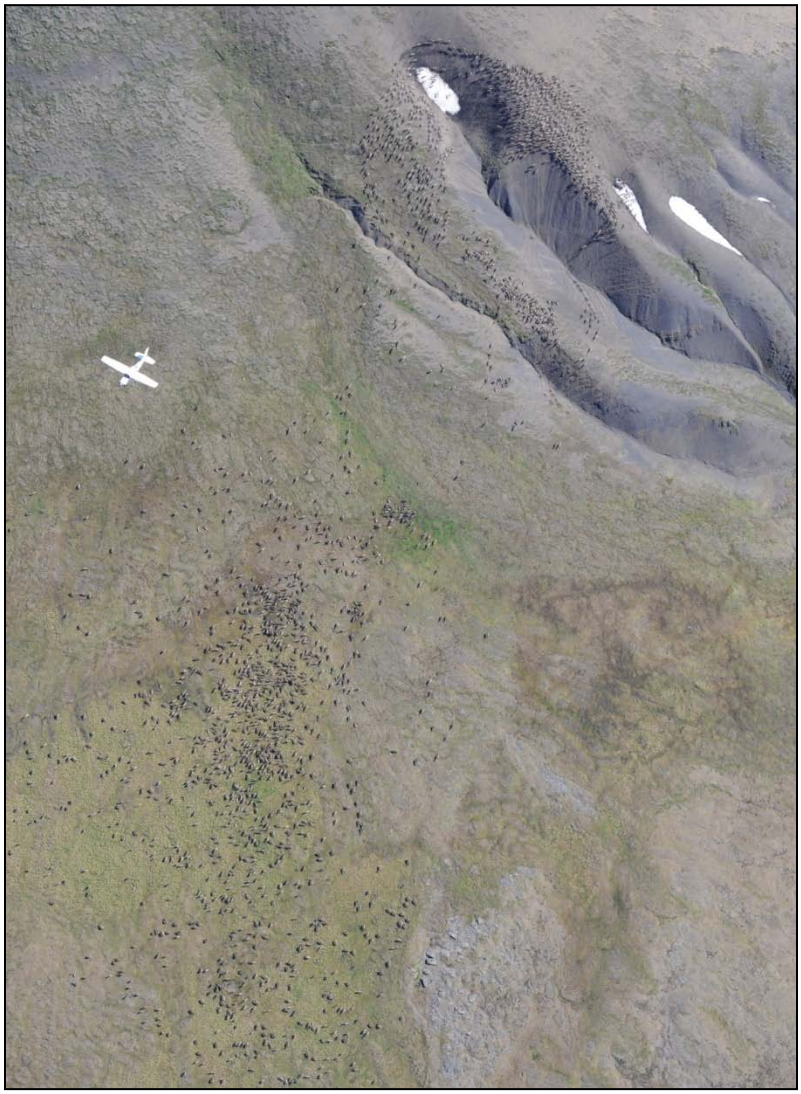
PORCUPINE CARIBOU
ANNUAL SUMMARY REPORT
2013



Photocensus plane in the Richardson Mountains, July 2013

FINAL

Submitted to: Porcupine Caribou Management Board

Submitted by: Porcupine Caribou Technical Committee

November 2013

Indicator Table

Annual Summary Report - November 2013

Prepared for the Porcupine Caribou Management Board

Indicator	Value	5 year average	Notes	Assessment and Year Represented
Population size and trend				
Population size	2013 = photocensus conducted; data will be provided when available	--	Declined by 55,000 caribou between 1989 and 2001. Recovered to 169,000 by 2010	TBA (2013)
Estimated population	2013 = TBA	--	Herd Estimator is in the final stages of review with members of the PCTC and PCMB. We anticipate the model will be available for use in 2014-2015.	TBA (2013)
Population trend	2013 = TBA	--	Once an updated 2013 population size is known, this value will be updated	TBA (2013)
Adult cow survival	2003 to 2006 study = 0.825 2011-12 = 0.879	0.879	Annual survival is quite variable but is a key variable in determining the population trend for the herd. This survival rate is relatively high and is indicative of a growing population.	Average but higher than 2003-2006 period (2011-12)
Calf birth rate	2013 = 0.86	0.838	24-year average = 0.81	Higher than average (2013)
Calf survival to 9 months	2006 = 0.39	0.36 (13 years)	Exceeded survival target of 0.30. Missing 2005, 2007 to 2011 due to overlap with other herds.	Unknown (2013)
Bull Ratio	2013 = no data	--	Cancelled in 2013 due to caribou mixing with Central Arctic Herd. Poor results in 2012.	Unknown (2013)
Peak of calving	2013 = 4 June	1 June	Average is within normal range	Average (2013)
Harvest				
Total harvest (2011/12)	---	---	Not available in time for report	TBA (2012-13)

Indicator	Value	5 year average	Notes	Assessment and Year Represented
% females in harvest	---	---	Not available in time for report	TBA (2012-13)
Hunters' needs met?	Majority met needs 2011-12 (61%)	64%	Borderlands data available from 2011-12 to 2000-01.	Slightly decreasing trend since 2006-07 but not statistically significant (2011-12)
Body condition				
Average backfat	F: no data M: 3.98 cm	F: no data M: 3.2 cm	Fall 2012 males only. 5 yr. averages males only. All animals reported for 2012-13 are from the fall of 2012. There is no data for the winter of 2012-13.	Higher than average (Fall 2012)
Hunter assessment	F: no data M: 3.9 cm	F: no data M: 3.2	Fall 2012 males only. 5 yr. averages males only	Higher than average (2012-13)
Condition of caribou	2012 = Very Good	N/A	Note: rating used by YG from Very good, good, fair, and poor.	Very Good (2012)
Health (abnormalities)	No clear trends variable	N/A	Borderlands data available from 2011-12 to 2009-10. Only last two years of data used.	No apparent trend (2011-12)
Habitat and other considerations				
Snow conditions winter 2012-2013	<u>Snow Depth</u> Eagle = 73.4 cm Ogilvie = 65.6 cm Old Crow = 65.3 cm North Slope = no data Richardson = no data <u>Snow Density</u> Eagle = 0.20 g/cm^3 Ogilvie = 0.18 g/cm^3 Old Crow = 0.16 g/cm^3 Richardson = no data North Slope = no data	<u>Depth</u> 75.4 cm 65.9 cm 67.7 cm no data no data <u>Density</u> 0.19 g/cm^3 0.16 g/cm^3 0.18 g/cm^3 0.16 g/cm^3 no data	A late spring was noted in many areas. April snow depths were actually greater than March in some areas – usually accumulation peaks in March with lower values in April from melt and settling. Late snowfalls in April and delayed melt meant snow was present in many areas into mid-May. Averages presented are for the length of record for each Region and are not 5 year averages.	Slightly lower than average snow depth (2012-13) Slightly higher than average snow density with exception of Old Crow (2012-13)
Wildland fires	2013 data not yet available 2012 = 347 km^2	515 km^2	2004 and 2005 largest burned area ever. Total of 15% of range affected by fires since 1960	Lower area burned than average (2012)
Unusual, extreme and rare weather events	--	---	Data not available for the current report	Unknown (2011-12)

Contents

page

List of tables

INTRODUCTION

This report

This report was prepared for the Porcupine Caribou Management Board (PCMB) to provide information to make an assessment on the status of the herd as part of the *Harvest Management Plan for the Porcupine Caribou Herd in Canada* (HMP). Information within this report was guided by the topics listed in the HMP. As noted in relevant sections, some information is not available or analyzed. Under the HMP, Parties are requested to comment on this report and provide additional information to the PCMB at the Annual Harvest Meeting.

Information for this summary report was provided by members of the Procupine Caribou Technical Committee (PCTC) and the Arctic Borderlands Ecological Knowledge Co-op (ABEKC). ABEKC was formed to monitor and assess ecological change in the range of the Porcupine Caribou herd and adjacent Mackenzie Delta area in NWT, Yukon and Alaska using both science and local traditional knowledge. Community researchers conduct yearly interviews with local experts in each community on important indicators that can be used to track ecosystem change. Note that interviewees are selected by communities and the monitors with the intention of interviewing a select number of land users engaging with a suite of ecological indicators (i.e., this should not be considered a random sample of caribou harvesters and should not be extrapolated to sampled communities). Information from yearly interviews are currently available from 1996-2012 on the new ABEKC data portal. In this report we most often utilized data from 2009-2012 or longer if the datasets were adequate. A prioirty of ABEKC over the next few years is to continue to analyze and process older data in order to improve access and use of all data via the new data portal.

Herd Background

The Porcupine Caribou Herd's (PCH) known range covers about 250,000 square kilometers (100,000 square miles) over areas in Alaska, Yukon, and the Northwest Territories. Within this range there are currently 12 different areas where different agencies have jurisdiction over land and/or wildlife management. Management of the herd must take into consideration:

2 federal governments
3 state or territorial governments
8 native land claim agreements
5 national parks or preserves
1 territorial park
2 special management areas
2 specific ordinances
- Dempster Highway Area Development Ordinance, and
- a federal Order-in-Council Withdrawal (Yukon North Slope)

The PCH was the first international caribou herd with its own formal co-management agreements and boards. There are five main management agencies which work on the herd: Canadian Wildlife Service, U.S. Fish and Wildlife Service, Government of Yukon, Government of the Northwest Territories, and the Alaska Department of Fish and Game. Management and research is coordinated by the informal Porcupine Caribou Technical Committee (PCTC) which consists of biologists from numerous agencies, co-management boards as well as occasional faculty members or students from various universities.

All aboriginal organizations within the Canadian range of the herd have land claim agreements. These agreements solidify the aboriginal right to hunt for food and ensure local participation in

wildlife management through co-management boards. The agreements also created lands that are privately owned and managed by the First Nations or Inuvialuit. Self-governing agreements in Yukon also give the First Nation governments the ability to regulate their citizens and their land.

Management direction and goals

To help coordinate management, two Porcupine Caribou agreements were set up, each creating a co-management board. In 1985, three governments and three native organizations signed the *Porcupine Caribou Management Agreement* (PCMA), creating the within-Canada Porcupine Caribou Management Board. In 1987, Canada and the United States signed an International Conservation Agreement, creating the International Porcupine Caribou Board (IPCB).

Research and monitoring is guided largely by the *Porcupine Caribou Management Plan* (drafted by the PCMB) and the *International Plan for the Conservation of Porcupine Caribou* (1987). The PCTC drafts workplans to coordinate research and monitoring activities, optimize funds and staff time, and provide technical information to co-management boards and agencies.

Harvest management is co-operative among the Parties to the PCMA and is guided by the HMP and the accompanying Implementation Plan.

These goals are taken from the *Porcupine Caribou Herd Management Plan, 2000/2001 to 2002/2003.*

Herd size

- To know whether the herd is increasing, stable, or declining; to know what factors are affecting population growth.
- To be able to predict how climate change may affect the herd.
- To be able to predict how different levels of development and human activity will affect the herd.
- To better understand cumulative impacts of events on the herd (weather, human activity, predation, new species, snow cover, etc.).

Range use

- To obtain full protection for the calving grounds and ensure that human activities on other seasonal ranges do not negatively impact those ranges or caribou.
- To understand how natural events may be affecting the seasonal ranges of the herd.
- To understand the affects, if any, that muskoxen have on the seasonal ranges of caribou.

Harvest

- To ensure that the harvest is known and is managed so that it is sustainable.
- To ensure that harvesting activities along the Dempster Highway do not interrupt the normal migration and range use of caribou.
- To ensure that the Dempster Highway regulations do not cause unnecessary hardships for harvesters.
- To ensure that the Porcupine caribou are not harvested for commercial purposes or wasted.
- To ensure that Alaskan hunters know where they can hunt.
- To support traditional knowledge.

Body condition

- To know the general condition of the herd over the long term will be known.

- To know the levels of disease and parasite will be known.
- To ensure that users and others are kept informed/involved in studies.

Co-management

- To have the user communities and local governments be an integral part of the PCH
- management.
- To increase communication with the users of the herd
- To ensure that the PCMB and the IPCB continue to operate
- To ensure that traditional knowledge is used in decision making
- To have the communities understand and support the role of the co-management groups such as the PCMB

Culture and education

- To produce non-technical information on the herd for the communities and general public use.
- To support user or traditional knowledge.
- To maintain the Johnny Charlie Sr. Scholarships.
- To promote good hunting practices and support hunting regulations on the Dempster Highway.

Tourism and industry

- To obtain protection for the sensitive ranges of the herd.
- To understand the cumulative impacts that tourism, development along with other variables may have on the herd.
- To help the public understand the importance of the herd and its range.

These goals are taken from the objectives listed in the *International Plan for the Conservation of Porcupine Caribou*.

- To conserve the Porcupine caribou herd and its habitat through international cooperation and coordination so that the risk of irreversible damage or long-term adverse effects as a result of use of caribou or their habitat is minimized.
- To ensure opportunities for customary and traditional uses of the Porcupine caribou herd.
- To enable users of Porcupine caribou to participate in the international coordination of the conservation of the Porcupine caribou herd and its habitat.
- To encourage cooperation and communication among governments, users of Porcupine caribou, and others to achieve the objectives of the Agreement.

Alaska Department of Fish and Game list the following as management objectives (Lenart 2007):

- Maintain a minimum population of 135,000 caribou.
  - Conduct censuses every 2-3 years.
  - Estimate parturition rates and late June calf:cow ratios of radio-collared females.
  - Monitor herd movements by periodically relocating radio-collared caribou.
  - Monitor the harvest through field observations, hunter reports and contact with residents.

POPULATION

Population size – photocensus

Objective
To estimate the size of the herd every 2 to 3 years (last completed 2010).

Methods
A technique called an Aerial Photo Direct Count Extrapolation has been used to estimate the herd size since 1972 (Urquhart 1983). Once the insects come out during the warm weather in late June or early July, the caribou gather into very large, tight groups sometimes consisting of tens of thousands of caribou. These large groups are photographed and caribou in the photos are counted. Any caribou that are found outside of the large groups are added and the estimate is rounded to the nearest thousand caribou. This technique is considered an accurate and reliable method to count large barren-ground caribou herds.

Results
Caribou aggregations were sufficient to conduct a photocensus in 2013. The PCH was monitored from late June through mid-July for aggregations conducive for a photocensus. By mid-July the caribou were in two groups, split between the Brooks Range and the Richardson Mountains. Multiple telemetry flights in Alaska by Alaska Department of Fish and Game **(**ADF&G) and in Canada by Yukon Environment confirmed that both groups were suitable to photograph. ADF&G completed the photocensus in Alaska and Yukon, however, several of the collared PCH were mixed with the Central Arctic Herd, and a few collars were not located at all contrary to previous reconnaissance flights. The photographs have come back from the developer, and ADF&G biologists will begin the task of reconstructing the census and counting the photos over the fall and winter months. It is hoped that we will have a new population estimate for the herd by late winter 2014.

Discussion
When the herd was first counted with this technique in 1972, the herd was estimated at about 102,000 caribou (Figure 1). The herd size grew steadily at about 5% each year until it reached 178,000 caribou in 1989. The herd began to decline by 3 to 4% per year from 1989 to 1998, and by 1.5% per year from 1998 to 2001. The census in 2001 showed 123,000 caribou in the herd (Arthur 2001).

Working cooperatively, biologists from Canada and Alaska attempted to photo census the herd each year since 2003 but were unsuccessful. In 2007 photos were taken however they were not good quality. If the herd had continued to decline at the same rate, it was estimated that the herd could have numbered 100,000 or fewer caribou in 2010.

Finally in July 2010, conditions permitted photos to be taken. The ADF&G estimated 169,000 caribou in the herd from that census, the second highest count on record. The high number of caribou showed the herd had obviously recovered from the 12-year decline documented between 1989 and 2001. Because of the length of time between the estimates it is hard to know the current trend for the herd (e.g. still increasing).

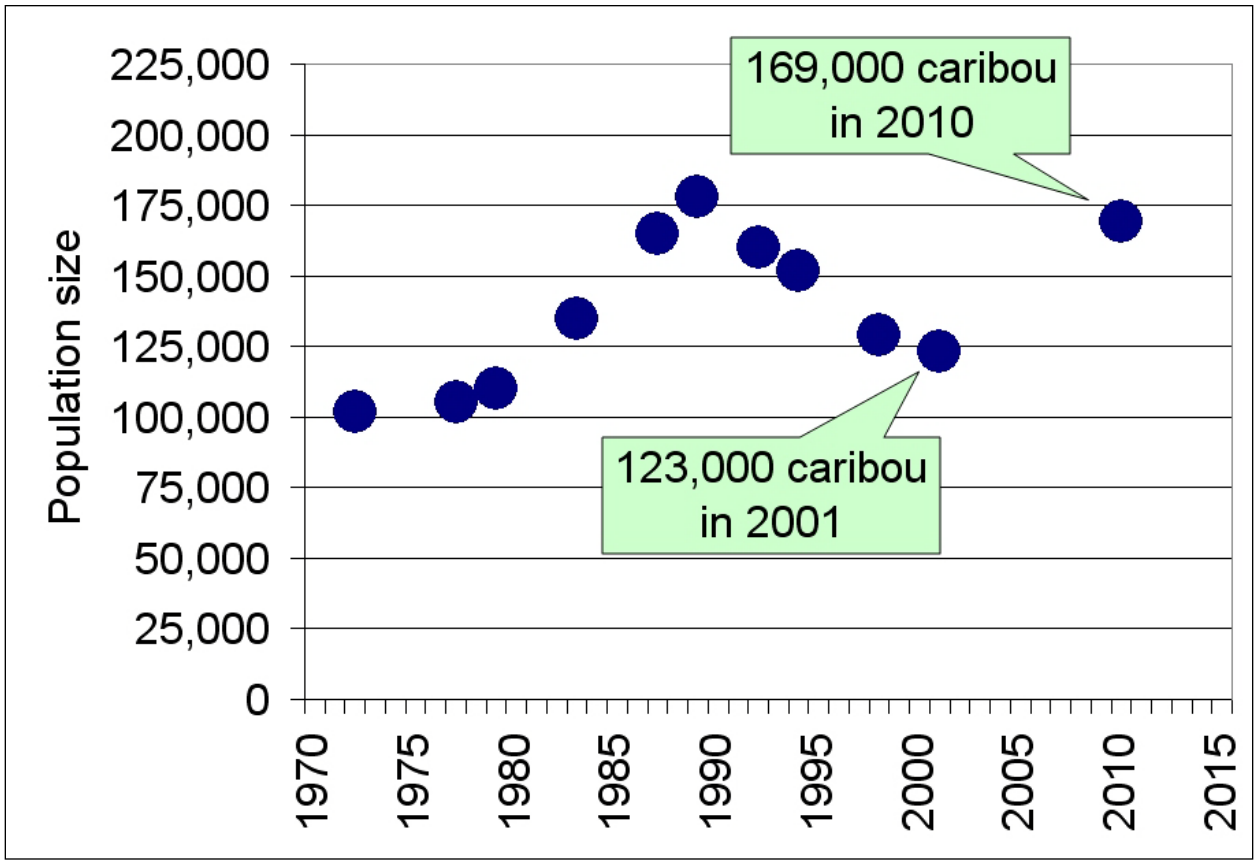


Figure 1. Estimated herd size of the Porcupine caribou herd size by photo census, 1972 to 2012. Blue dots indicate successful survey attempts.

Population size – computer modeling

Objective
To build a computer model (the "Herd Estimator") that incorporates available biological information to estimate the total herd size and a measure of uncertainty surrounding that estimate. This new model updates the previous Caribou Calculator which was initially developed in 2001 and played a significant role in the development of the HMP.

Methods
Given the difficulty with obtaining regular photo census estimates of the herd's size, primarily due to poor weather or a lack of animal aggregation, an accurate tool was required to provide managers with information on the herd's size and confidence of these estimates. This is critical information that managers can use to develop management actions. While the previous Caribou Calculator provided an estimate of the herd's size, there were no measures of uncertainty associated with this estimate which reduced the confidence managers had it. The PCTC hired a contractor to update the original Caribou Calculator so that the model considers the uncertainty inherent in the inputs and provides a measure of uncertainty in the population estimate that it calculates.

The new Herd Estimator substantially reduced the number of input variables to only those deemed key to the population projections. Variables that are now included in the Herd Estimator are previous photo census estimates, adult sex ratio, harvest numbers, cow survival, and calf recruitment. In addition to using annual values for these variables, the variability of these values will also be included in the model to allow for herd size estimates to also have a measure of uncertainty (i.e. confidence interval) associated with it. The variability (i.e. uncertainty) in the model projection is obtained by running the model many times, each time using a different combination of input variable values.

Results

A preliminary version of the Herd Estimator has been provided to YG by the contractor. Additional "fine-tuning" of the parameter values and the incorporation of results from all the 2012 field studies are yet to be included in the final version. Figure 2 provides an illustration of the model's projections to 2012.

Discussion

The main improvement of the new Herd Estimator is that it incorporates the variability surrounding input variables which results in a more biologically realistic model. Decision-makers will now have a measure of confidence in the model outputs to consider when assessing potential management scenarios and recommending management actions.

Figure 2. Projected PCH abundances from the newly developed Herd Estimator. Years in blue indicated years when a photocensus estimate was obtained. The points indicate the range of variability in abundance estimates and thus the spread of those points represents the uncertainty associated with the model's projections. The red dashed box indicates a generalized measure of uncertainty surrounding the photocensus estimate. These boxes are provided solely for descriptive purposes to illustrate how "close" the model's projections come to the photocensus estimates and do not identify true measures of uncertainty.

Adult female survival

Objective
To obtain an annual estimate of survival for adult female Porcupine caribou.

Methods
In response to the continued population decline, researchers started a project in 2003 to get an updated estimate of adult female survival (Wertz et al 2007). As with many populations, the survival of breeding females is very important to the potential growth of the herd. Adult female survival has been estimated twice before; once when the herd was increasing and again when the herd began to decline (Fancy et al 1994, Walsh et al 1995). Information gathered from these earlier studies indicated that most cows died in winter, the harshest season of the year.

Researchers flew monthly over the winter to locate all the radio collared females and determine whether they were alive or not. Results showed that adult females survived at a similar rate as they did from 1989 to 1991 when the herd started to decline. Assuming that female survival was driving the decline, this suggested that the herd had continued its declining trend.

After the 3 year project was done, the number of flights was reduced but we continued to calculate an estimate of adult female survival for each winter. It should be noted that these calculations have low statistical power due to small sample size of collared caribou.

Results

An annual estimate of survival was calculated from June, 2003 to May, 2012 (Figure 3). Survival varied between years with the point estimates for 2004-05 and 2005-06 the lowest (0.739 and 0.807 respectively), and conversely the highest rate was estimated for the caribou year 2010-11 at 0.905. The overall average survival rate during this time period was 0.852. Although variability within years ranged from 0.065 to 0.097 of the point estimates the annual rate indicated a general trend of increased survival.

Discussion

Estimates of survival are variable from year to year (Figure 3). It should be noted that these calculations have low statistical power due to small sample size of collared caribou. A sustained change of 2 or 3 percent in survival can make the difference between a herd increasing and decreasing. We would need approximately 300 collars deployed on caribou in order to statistically detect such a small change. Although this may be unfeasible, monitoring the trend and incorporating the variability of survival estimates into the Herd Estimator model will improve population estimates and help us understand the importance of survival data.

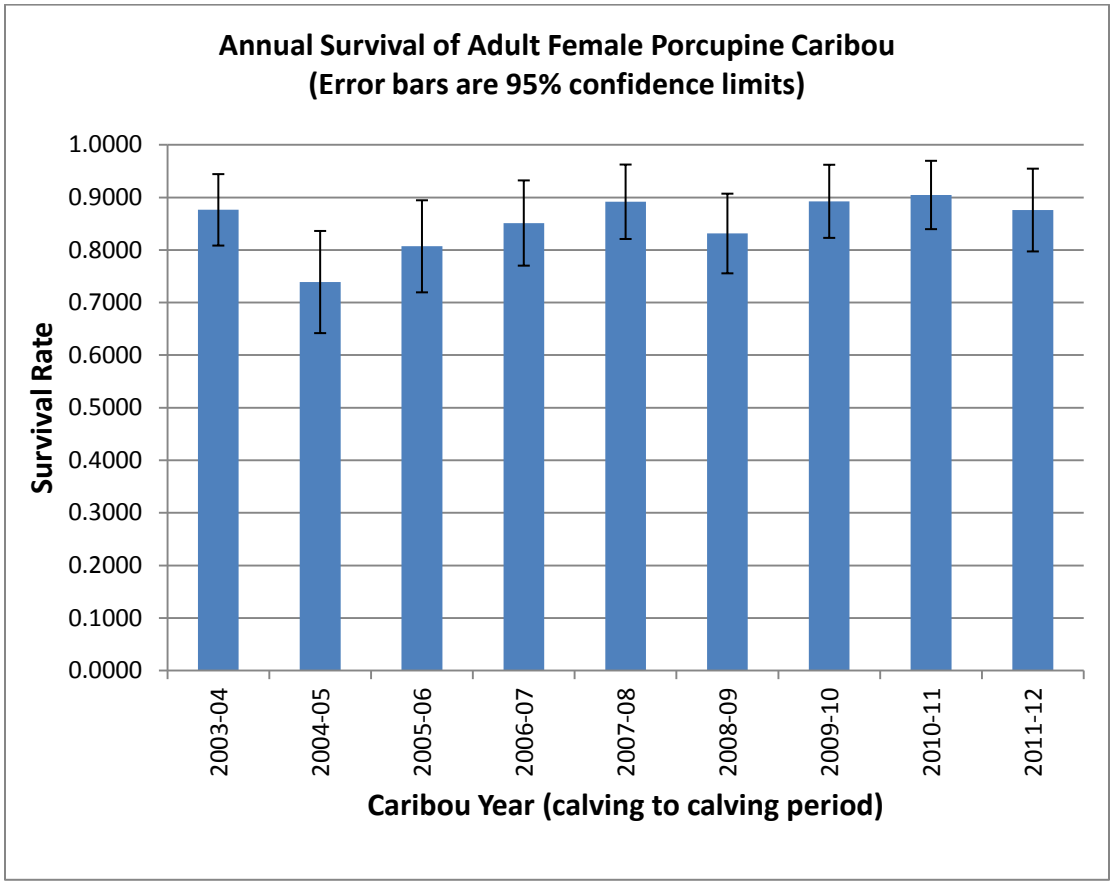


Figure 3. Annual survival estimates for adult female Porcupine Caribou, May 2003 – June 2012. Source: USFWS unpublished data.

Calf birth rate, and calf survival

Objective
To document the annual calf birth rate and survival rate.

Methods
Calving surveys are conducted each year to estimate the birth rate and early survival rate of calves. Collared females are located from a fixed-wing aircraft and are classified as barren, pregnant, or have given birth. They are re-located after about one month to determine whether the calves have survived. Calving success is presented as the percent of cows that had calves. The July calf ratio is based on the proportion of collared females still with calves in late June or early July.

Because the majority of calves will have weaned by March, we do not use the radio collared females in late winter but instead estimate the number of calves for every 100 adult cows, called a calf:cow ratio. In many of the recent years, overlap with other herds on winter range has prevented researchers from conducting the March composition count.

Results
A calving survey was flown between May 31 and June 2nd by ADF&G personnel and Caribou Air Services from Fairbanks. The objective of the calving survey was to straddle the peak of calving – which is defined as the date in which > 50% of parturient cows 4 years of age or older have given birth. It appeared that the peak of calving in June 2013 was slightly later than expected, and that the survey occurred prior to peak. Caribou were also tightly distributed making it difficult to obtain successful observations. However, ADF&G were able to successfully estimate the calf birth rate for 2013 to be 86% (30/35 cows), which is above the long term mean of 81% and within the range observed over the past 25 years (Figure 4).

Radio tracking flights conducted between June 25-27th by ADF&G to estimate post-calving survival of calves and the calf:cow ratio were unsuccessful in 2013. The majority of caribou had by this time reached Alaska moving in very large groups too tight to determine which radio collared cows had calves.

Discussion
Since 1985, birth rates and the proportion of cows with a live calf in late June were similar during the population decline as during the population increase (Figure 4). Therefore, there is no apparent pattern in the estimates. Years of low survival in certain years are linked to deep snow years and / or a late spring melt. Population dynamics are most affected by survival of adult females over the medium and long term but can withstand fairly large annual fluctuations in calf birth rate or calf survival over the short term. If birth rates or calf survival rates are low for several years in a row, population growth is more vulnerable therefore we should keep monitoring calves to ensure that if a large change in productivity does occur, we are able to document it.

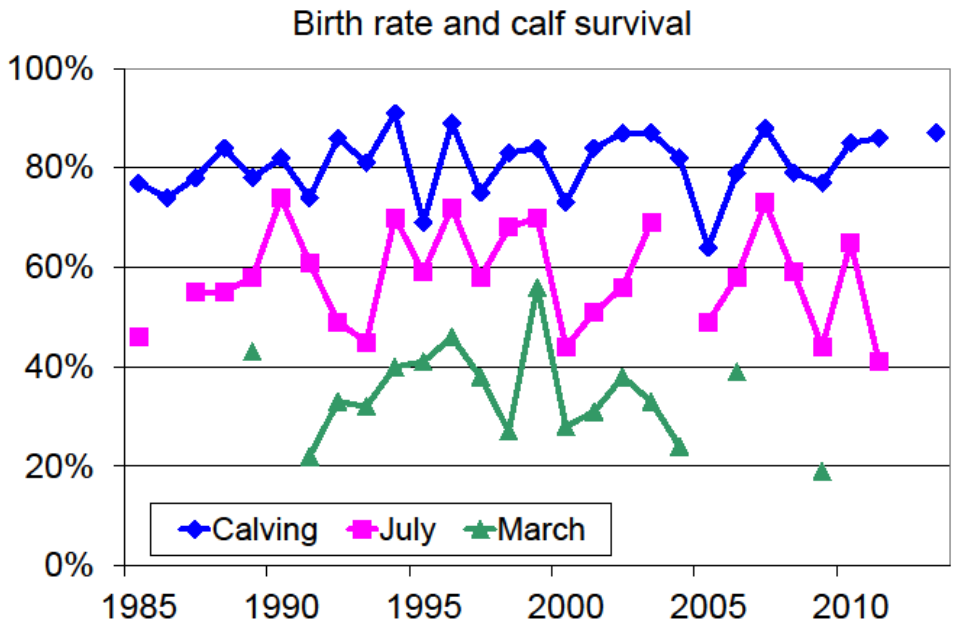


Figure 4. Estimated birth rate and calf survival indices for the Porcupine Caribou herd from 1985-2012. There is no data available for 2012 due to poor weather and poor dispersion of post-calving groups.

Peak of calving

Objective
To estimate the date when half of the collared adult female caribou have given birth each spring.

Methods
During the calving surveys to document the birth rate (see previous), researchers record the date of their flights and how many of the collared cows have given birth. Only adult female caribou aged 3 years or older are used for this indicator. In some cases, the birth date is estimated based on the estimated age of the calf. The researchers then estimate the date when half of the collared adult female caribou have given birth.

Results
Peak of calving was estimated to have been around June 4th, slightly later than expected and after the completion of the calving surveys earlier in June (Table 1).

Discussion
Caribou typically give birth *en masse* with many of the cows giving birth within days of each other. This is thought to be a strategy to reduce the risk of predation on any individual calf.

This means that most of the cows would have been bred within a very short time period therefore peak of calving can be used as an indicator of how the rut went the previous fall. If the calving period is extended, it might mean that the rut was disrupted and cows were bred in a second estrus. This shows up as calves being born over an extended period of time. This is important because calves born late in the season are probably more likely to die from predators and they also may be too small to make the migration south for winter, reducing calf survival. We would start to worry if births were a week or more out of sync. Since 1999, the peak date of calving varies by a few days each year, but there is no indication that large numbers of cows are giving birth 'out of sync' (Table 1).

Table 1. Peak dates of calving for the Porcupine Caribou herd.

Year	Peak of calving	Note
1999	3-Jun	1 to 5 June
2000	7-Jun	
2001	8-Jun	5 to 10 June
2002	5-Jun	
2003	1-Jun	
2004	3-Jun	3 or 4 June
2005	2-Jun	1 to 4 June
2006	2-Jun	
2007	30-May	
2008	30-May	29 or 30 May
2009	2-Jun	Before 2 Jun
2010	2-Jun	
2011	2-Jun	
2012	No data	
2013	4-Jun	3rd or 4th June
Average	1 June	

Short yearling survival to 3 years of age

Objective
To document the survival of 9 month old calves to 3 years of age (2003-2010 only).

Methods
Starting in 2003, we captured about 10 female caribou in March that were born the previous spring (9 months old) and put conventional radio collars on them. The data from all years of captures were pooled to estimate how many calves survived to breeding age. Because we know exactly how old these caribou were, we recapture them after 3 years or sooner and replaced their collars to maintain a collared sample.

Results
The average survival rate of female Porcupine caribou appears to decline as caribou age from 9 months to 3 years but because of the error bars overlap on the estimates we cannot say for certain that there is any change in survival rate as caribou survive to breeding age (Figure 5). The average survival rates of female caribou 9 mo. – 3 yrs of age are similar (87%) to adult female survival rates taken from the same time period (84%). The last year of this seven year study was completed in 2010.

Discussion

In 2003, we started a 7-year study to estimate how well calves survive to 3 years of age when they should enter the breeding portion of the population. This has been estimated only once before in 1983-88 (Fancy et al 1994). We have been assuming that once calves reach one year of age, they survive at the same rate as adults. We are testing this assumption because, as with the survival of adult females, the survival of young females is important to population dynamics. Computer population modeling shows that it would take a decrease of only 6% in adult female survival or a decrease of 50% of calves to cause a decline like we have documented for the Porcupine Caribou Herd between 1989 and 2001 (Arthur et al 2003). Other work has shown that survival of calves in their first year of life is very low. Survival of these young, non-breeding animals is similar to adult females.

Small sample sizes are an issue for this analysis. The estimates are based on data pooled over multiple years of collaring efforts, however the sample size at step one of the analysis is 59 animals. In order to be able to detect small changes in short yearling survival with confidence, we would have to maintain collars on many more young caribou. There are constraints to doing that in terms of funding, availability of free radio frequencies, logistics of flying, and community concerns. Despite these constraints, we decided to continue small numbers collaring short yearling females each year to continue recording survival estimates (low statistical power given the small sample size) but also to ensure the collared sample of caribou is not biased toward older animals.

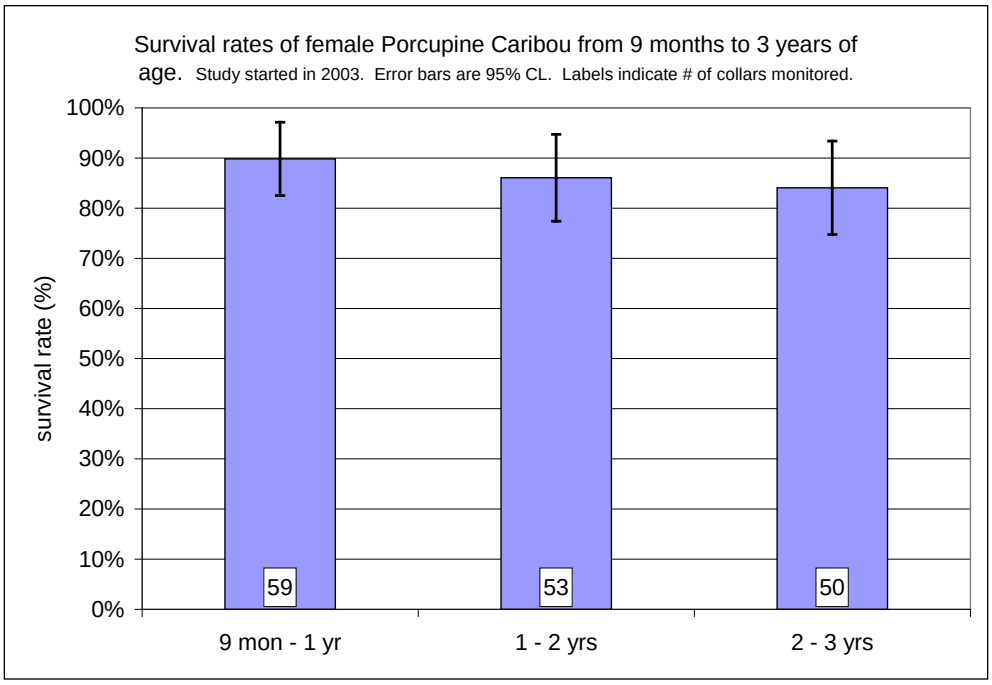


Figure 5. Survival of Porcupine Caribou females from 9 months to 3 years of age from 2003-2010.

Adult bull survival

Objective
To document the survival of adult bull caribou (2003-2010 only).

Methods
Each year before a census attempt, we deploy a number of collars on adult bull caribou so we can locate the bull groups during the census field work. Because we've been preparing for a census each year for 8 years running, we have an unprecedented number of bulls collared. We are able to do an analysis similar to the short yearling analysis. All collared bulls were pooled and we calculated their survival rate in years following capture.

Results
Between 2003 and 2006, more bulls died during the fall than any other season. Bull mortality rate increases dramatically about 5 years after collaring (Figure 6). Assuming bulls were at least 3 years old at the time of capture, bulls start dying at an increased rate at 8 or more years of age. The study on adult bull survival extended from 2003 – 2010. No further collaring of bulls is planned.

Discussion
As expected, we see that bulls seems to survive at a lower rate than adult cows. Bulls are probably more stressed during the rut which contributes to a lower survival rate.

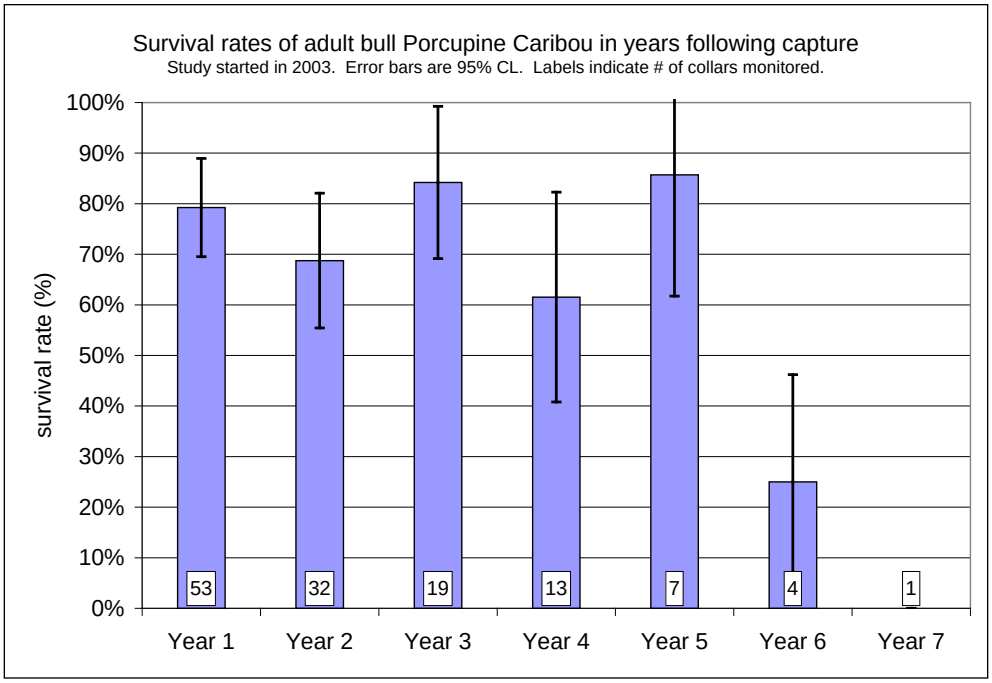


Figure 6. Survival of male Porcupine Caribou from 2003 to 2010.

Bull Ratio

Objective
To document the ratio of bulls to cows in the herd.

Methods
We fly by helicopter during mid-October and classified as many as 200 caribou around each radio-collared caribou (bulls, cows, short yearlings). Caribou were classified into cow, calf, or either small, medium, or large bull. Then the number of bulls relative to the number of cows was calculated by dividing the total number of bulls by the total number of cows.

Results
In 2012, staff from ADF&G and YG attempted a count between October in Alaska and between October on the west edge of the Old Crow Flats. Large aggregations of caribou occurred first near Arctic Village and then moved rapidly east into Yukon allowing for a high number of collars to be sampled by this survey. However post-flight analysis revealed that during the rapid movement east many bulls lagged behind cows resulting in a potentially biased survey result. This combined with the relatively small number of bull collars present on the herd during sampling provided a result that was not reliable.

In 2013 due to the poor result achieved in 2012 and the successful completion of a photo count on the herd, a rut survey was planned. Unfortunately leading up to the survey a large proportion of the herd moved to the western edge of the herd's range, eventually mixing with members of the Central Arctic Herd. Monitoring during the rut showed most caribou remained mixed with the CAH which resulted in the cancellation of the rut count.

Discussion
The ratio of bulls to cows was estimated first in 1980 (Porcupine Caribou Management Plan 1989). That study estimated that there were about 60 bulls for every 100 cows which indicated a healthy herd. Bull survival and the bull ratio were not regularly monitored in following years because as long as the pregnancy rate remained high, there was no reason to believe that there are too few bulls to breed the cows. For some other barren-ground herds, researchers have documented very low sex ratios (less than 20 or even 10:100 cows) but have not seen pregnancy rates drop. Subsequent surveys occurred in 2009 and 2010. Results from the 2010 survey are the most reliable and indicated a ratio of 57:100.

In the Harvest Management Plan for the Porcupine Caribou Herd in Canada (HMP; Porcupine Caribou Management Board 2010), there is a provision for bull only harvest to be implemented for different user groups if the herd drops below a certain population size. In addition, the PCMB continues to promote harvesting of bulls, regardless of population size. Population modeling has shown that if the proportion of bulls in the harvest rose from 30% to 80%, we could see a sex ratio in the herd of about 40 bulls per 100 cows. We don't really know what might happen to the herd sex ratio when we take more bulls during harvesting activities; as a result we completed composition counts to get an updated bull ratio in 2009 and 2010 prior to the projected increase in harvested bulls resulting from the HMP.

The PCTC plans to conduct a rut count every year that a photo count is completed in order to input the sex ratio into the population model (Herd Estimator). Accurate harvest data from all Parties, including the sex ratio of the harvest, is important to assess the effect of a bull dominated harvest on the herd sex ratio. The PCTC still needs to determine how many collars are needed to provide the precision needed to assess the effect of harvest on the herd sex ratio,

however we are aware that a sufficient number of collars are needed on bulls leading up to a rut count to provide confidence in those results as a standalone measure.

HARVEST

Hunt management

On an annual basis, caribou harvest is dependent on the distribution of the herd and whether the herd migrates close to communities. For example, if few caribou use the Alaskan winter ranges, harvest by hunters of the PCH in Arctic Village is minimal.

Hunters from each user community access the herd in different seasons and in different regions of the herd's range. Kaktovik hunters hunt caribou along the north coast in summer once the sea ice melts and they are able to use boats to reach caribou. In summer, caribou can be available to Mackenzie Delta hunters along the coast or in the Richardson Mountains. Caribou can be hunted by Old Crow hunters as they cross the Porcupine River during the fall and spring migrations. In late fall, many hunters from different user groups can access caribou near Arctic Village, in the Richardson Mountains and along the Dempster Highway.

Over the years, we've seen that the Dempster Highway provides very convenient access to the herd from early fall to early spring and most of the reported harvest by Canadian hunters takes place along the highway.

In Alaska, there are laws regulating all users. In Yukon and NWT, non-aboriginal hunters must abide by license, tag and season regulations. In the Yukon, non-resident Canadians must hunt with a Yukon Resident holding a Special Guide license and non-resident aliens must hunt with a registered outfitter. There is currently no non-resident hunting of Porcupine Caribou in the NWT.

Based on PCMB recommendations coming out of the Annual Harvest Meeting in 2011-12, Canadian Parties adopted the Green harvest management zone hunting regulation; no restriction on aboriginal harvest and licensed hunters are limited to 2 bulls per year.

See Figures 7, 8 and 9 for regulations for all three jurisdictions for the 2012/13 season.

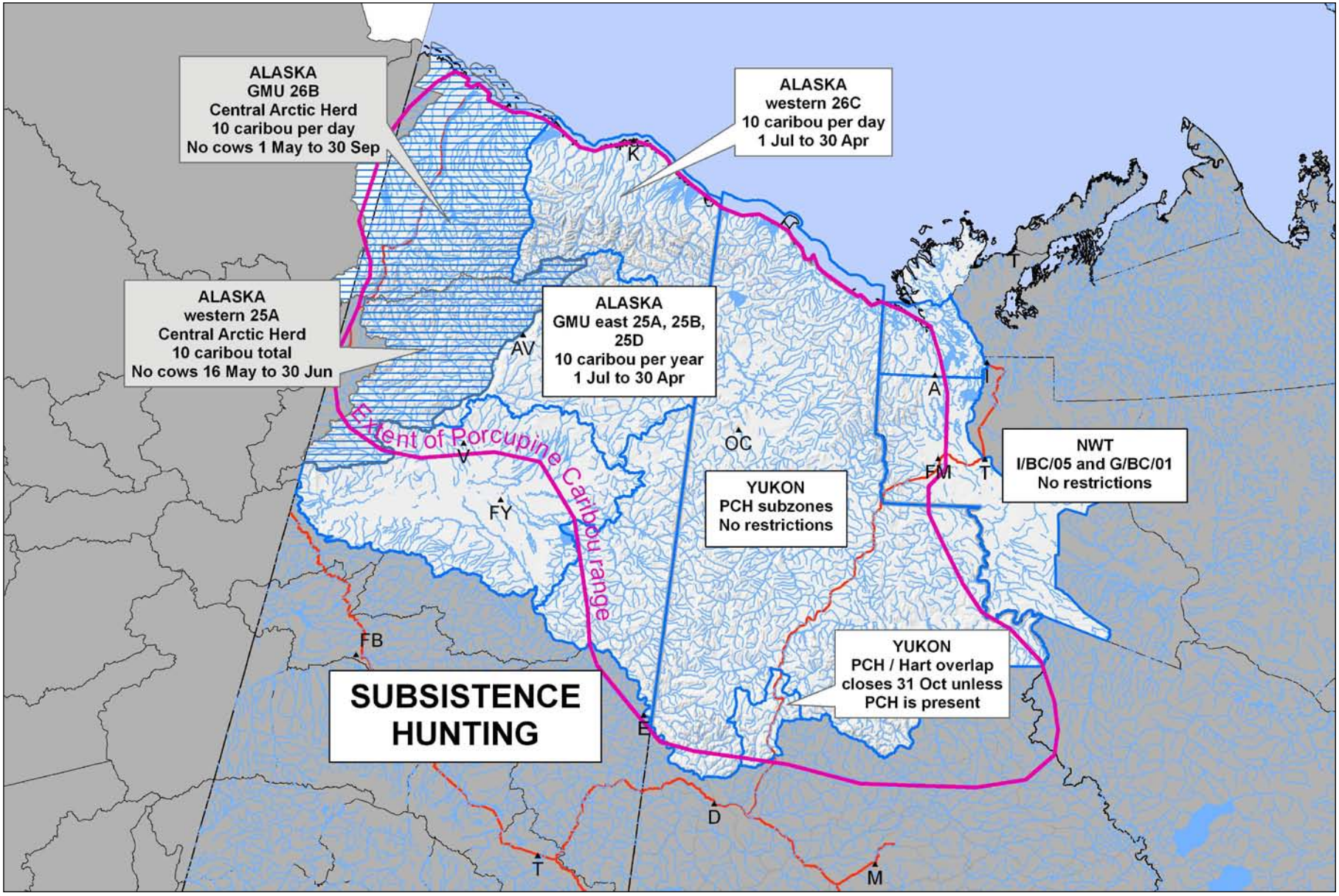


Figure 7. Hunting regulations for PCH subsistence hunters, 2012/13.

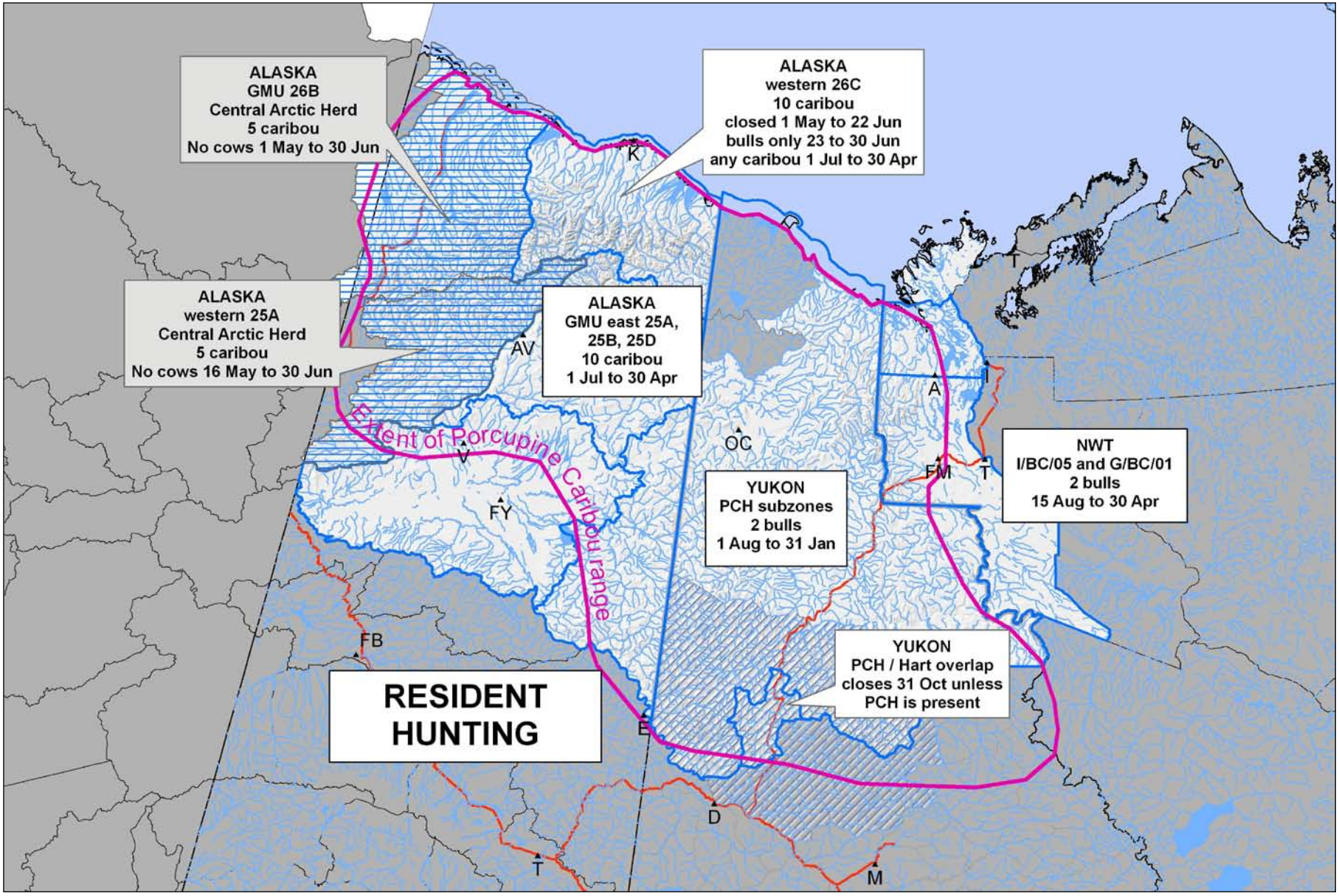


Figure 8. Hunting regulations for PCH resident hunters, 2012/13. Diagonal hatching indicate guide outfitting areas.

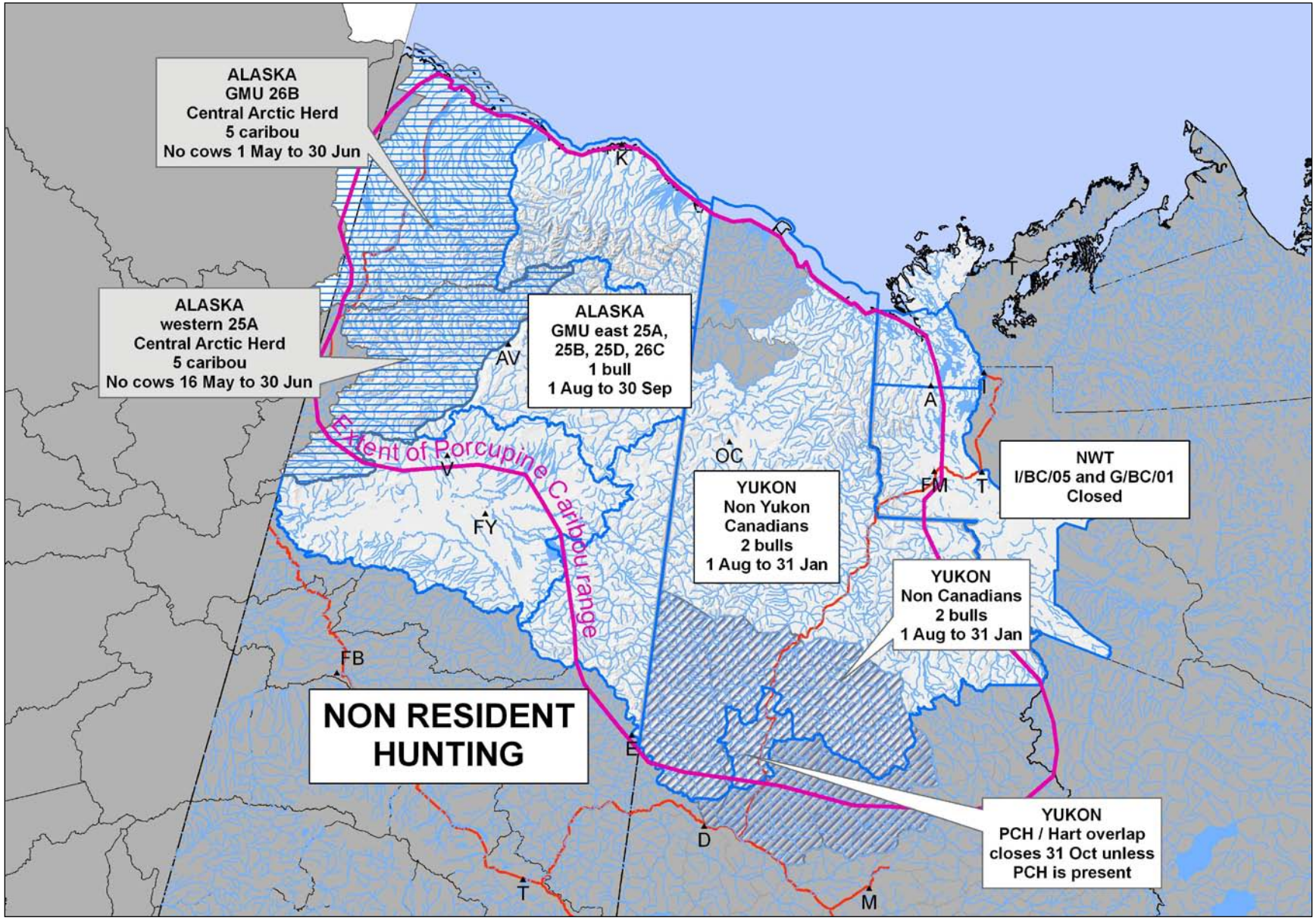


Figure 9. Hunting regulations for PCH non-resident hunters, 2012/13. Diagonal hatching indicate guide outfitting areas.

Estimated number of caribou harvested

This section does not include updated information from 2012/13.

Proportion of females in the harvest

This section does not include updated information from 2012/13.

Were hunters' needs met?

Objective
To determine if hunter's met their needs for caribou that year.

Methods
The ability of hunters to meet their needs for caribou is an important indicator tracked during yearly ABEKC interviews. Data summaries were provided for all seasons from 2011-12 to 2000-01. (ABEKC 2013). Interviewees were asked whether they met their needs for caribou for that years' hunting period with answers of "yes" or "no". Note that interviewees are selected by communities and the monitors with the intention of interviewing a select number of land users engaging with a suite of ecological indicators (i.e. this should not be considered a random sample of caribou harvesters and should not be extrapolated to sampled communities).

Results
The majority of respondents (61%) met their needs for caribou in 2011-2012 (Figure 10). There is a slight decreasing trend in this indicator since 2006-2007 but all years are statistically similar with the exception 2001-02 where only 43% of hunters met their needs. Interviews for 2013 will be completed from January to Feb 2014.

Discussion
An analysis of ABEKC data based on interviews from 2000-2007 was recently completed by Russell et al. (In Press). Researchers found that there was a general increasing trend in meeting needs in both spring and fall hunting periods over time (Russell et al. 2013). From 2005-2007, respondents met their needs on average 70% and 80% during fall and spring, respectively. There was a significant but weak relationship between meeting needs and caribou availability in both seasons during this time period.

The average percentage of respondents that met their needs for caribou from 2011-12 was 18% lower than 2005-2007. If this indicator is correlated with how available caribou are on the landscape then it suggests that caribou availability in 2011-12 was lower than 2005-2007.

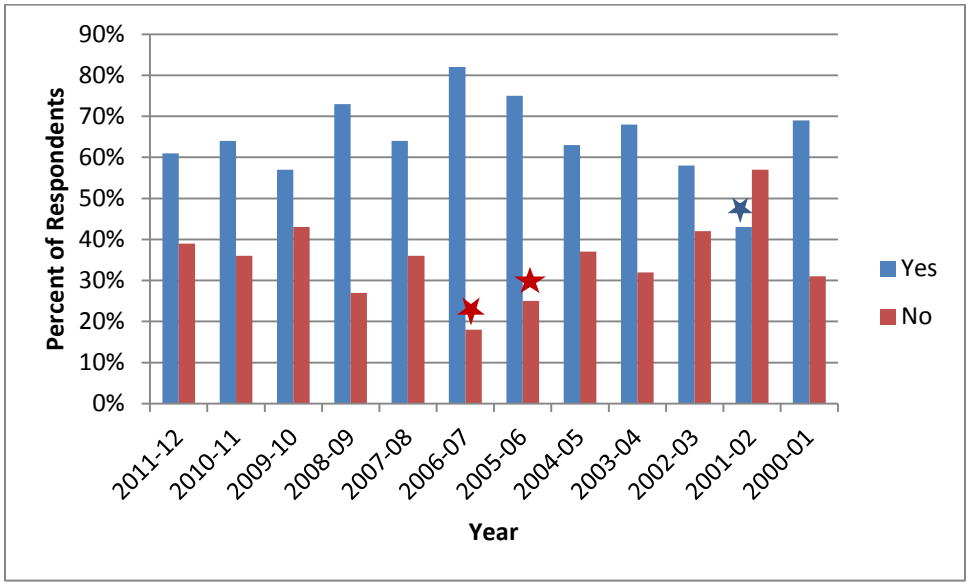


Figure 10. The percentage of respondents that met their needs for caribou from 2011-12 to 2000-01. Stars indicate years that are significantly different.

CARIBOU BODY CONDITION

Hunter assessments and condition indicators

Objective
This long term project uses specific samples from hunter killed caribou to track the fatness of Porcupine Caribou.

Methods
Starting in 1987, Anne Allaye-Chan (a PhD student from University of Alaska Fairbanks) developed equations to estimate the body weight, body fat and body protein for adult cow Porcupine Caribou (Allaye-Chan 1991). Government of Yukon (YTG) did collections from 1989 to 1991 to test these equations and in 1991, started regular monitoring with hunters from Old Crow (Porcupine River in September), Ft. McPherson, Dawson and Mayo (Yukon portion of the Dempster Highway in November and March).

In 2001, we formally modified the program so that hunters could submit samples from any caribou they harvest. This program is also called the Caribou Sampling Initiative (CSI) in the HMP and is also similar to the Circum-Arctic Rangifer Monitoring and Assessment network Level 1 monitoring (Gunn and Nixon 2007). Hunters record a number of variables and rate the condition of their caribou.

Results
Overall, average body condition of harvested male caribou is classified as very good (Figure 11). Data show increased inter-annual variability since 2001 but reduced variability within year as demonstrated by the small error bars associated with measures. Average backfat depth of harvested males shows an increasing trend since 2009-10 (Figure 12). All animals reported for 2012-13 are from the fall of 2012. There is no data for the winter of 2012-13. The current year averages are for males only due to the focus on harvesting bulls.

Discussion
Data collected from bulls during the fall of 2012 appear to suggest that bull condition continues to improve and in fact may be at an all-time high. Both hunter-judged condition and body fat measures indicate caribou were in very good condition.

Variability in body condition estimates since 2001 corresponds to when hunters began rating their harvested caribou compared to when they were working with the biologists on the collection. This could also be a seasonal effect; caribou collections in the early 1990's were done 3 times (Sept, Nov and March) whereas the current system allows hunters to submit samples all winter long. However, most data recorded by biologists and turned in by hunters in recent years have corresponded with September bull harvest. As a result, variation within year remains small. This improving condition was also seen in the Arctic Borderlands Ecological Knowledge Co-op data (Russell et al 2008; Russell 2011).

We should also keep in mind that hunters can be very selective when harvesting. This indicator gives an index of harvested caribou, not an index of the entire herd. Also, data are pooled over each winter but sample sizes remain small. With regulation changes that discourage or prohibit the harvest of cows, the program will document trends over time for bulls rather than using the equations to try and determine productivity of cows.

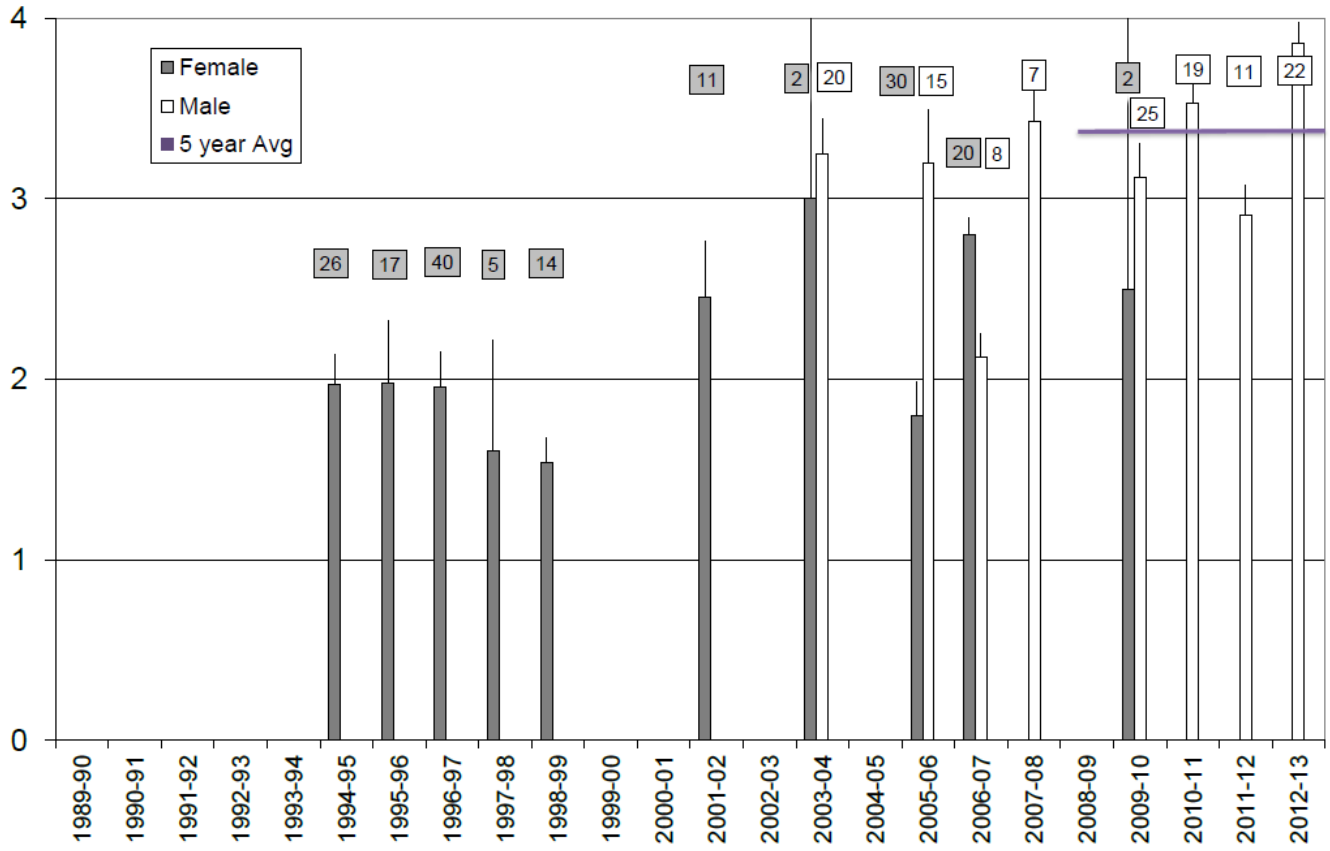


Figure 11. Average condition of harvested Porcupine caribou recorded by hunters. 1=poor 2=fair 3=good 4=very good. Error bars are standard errors. Labels indicate # of caribou sampled.

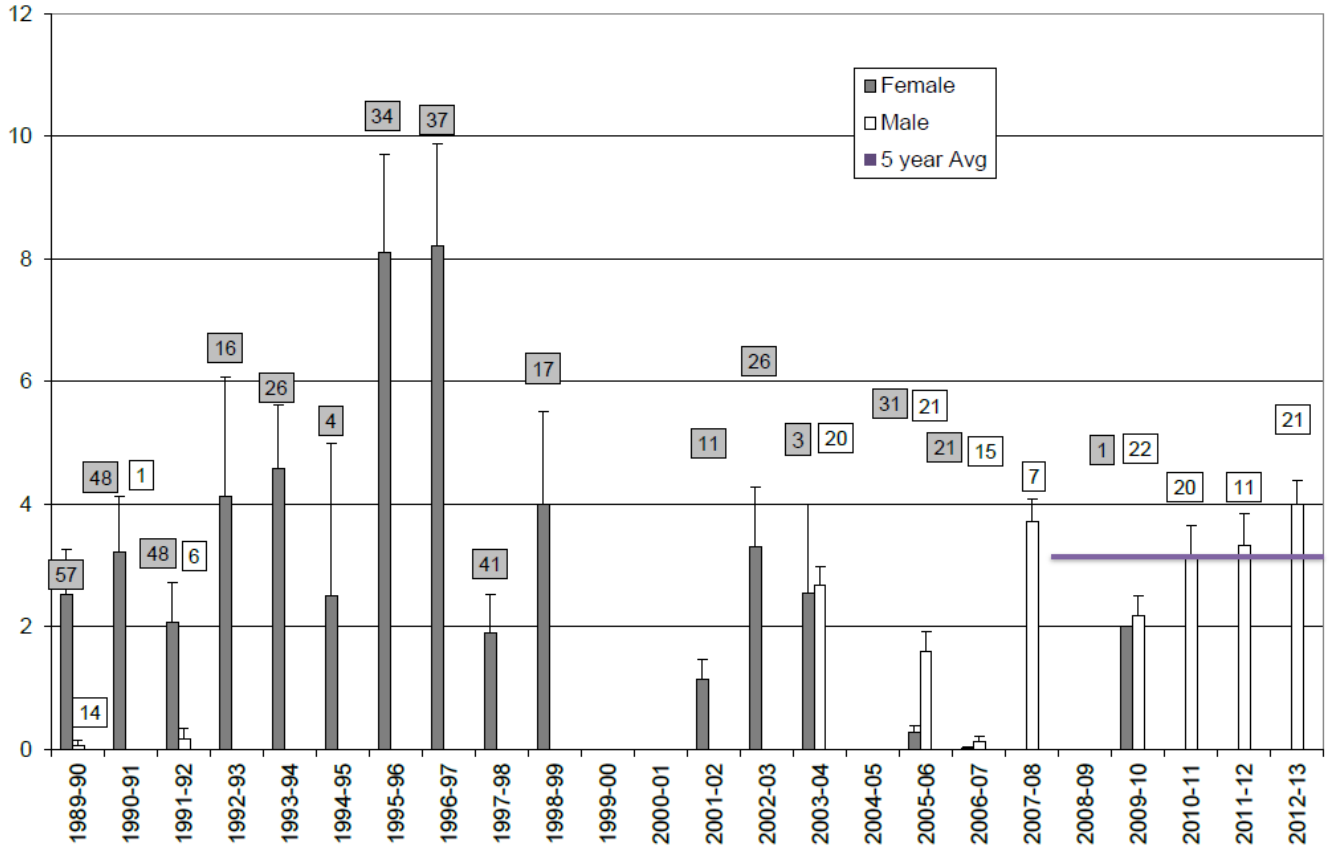


Figure 12. Average depth of backfat (cm) recorded in Body Condition Monitoring. Error bars are standard errors. Labels indicate # of caribou sampled.

Observed Body Condition and Health of Caribou

Objective
To determine trends in body condition of Porcupine caribou between years and seasons.

Methods
Body condition and health of caribou are important indicators tracked during their yearly ABEKC interviews. Data summaries were provided for all seasons from 2009 to 2012. A longer dataset is available for the spring and fall seasons that extends back to 2000-01 (ABEKC 2013). Interviewees were asked to about the condition of caribou they observed each season over the past year. There are six possible responses to this question; Don't Know, Excellent, Good, Fair, Mixed and Poor. Note that interviewees are selected by communities and the monitors with the intention of interviewing a select number of land users engaging with a suite of ecological indicators (i.e. this should not be considered a random sample of caribou harvesters and should not be extrapolated to sampled communities). Interviews for 2013 will be completed from January to Feb 2014.

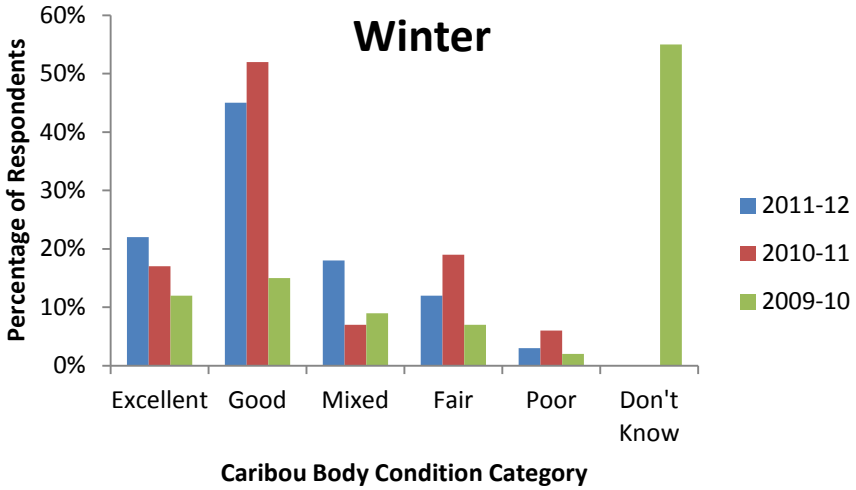
Results
Respondents observed caribou most often in good condition across all seasons in 2011-12, similar to 2010-11 (Figure 13). The percentage of repondents reporting caribou in good condition over the last

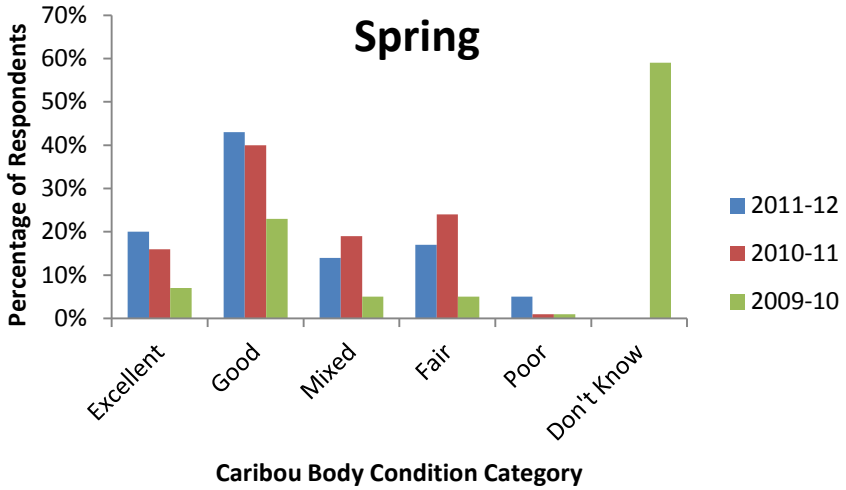
two years (2011-12 and 2010-11) was was significantly higher than 2009-10 across all seasons. This result may be confounded by the large percentage of respondents reporting that they “Don’t Know” on the survey in 2009-10. There were on average 4% and 7% more caribou in poor condition in the spring and summer 2011-12 than previous years although this is not statistically significant (Figure 13).

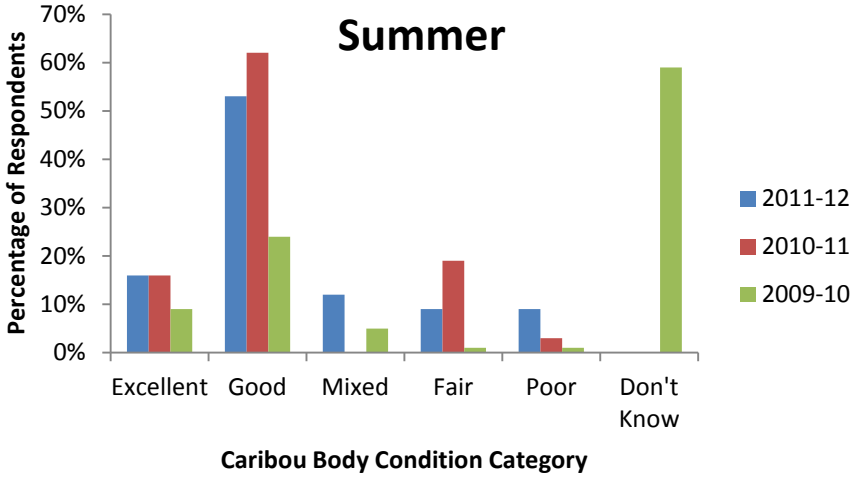
There is a longer dataset available for the spring and fall than includes data from 2000 to 2012. In the spring, the percent of caribou in good condition show an increasing trend since 2001-02 (Figure 14). 2001-02 had a significantly lower percentage of caribou reported in good condition than all years with the exception of another low year in 2005-06. Conversely, the percentage of caribou in poor condition was significantly higher during 2004-05 to 2000-01 when compared to the last two years (2011-12 to 2010-11). In the fall, the percentage of caribou in good body condition was signifcantly higher from 2008-09 to 2002-03 compared to the 2010-11 (Figure 14). There was a significant increase in caribou with poor body condition in the fall of 2003-04.

Discussion

The ABEKC data is useful because provides additional body condition information on the entire herd that might not be captured with the body condition monitoring of harvested caribou only (e.g. males only in some management regimes). Preliminary data from interviewees suggest that the overall body body condition in all seasons of Porcupine caribou was good in 2011-12. There is a slight increasing trend of caribou in poor body condition in 2011-12 but the numbers of these observations remain small. Based on long-term data, trends in body condition can differ between seasons with spring showing a larger percentage of caribou in poor, fair and mixed conditions than the fall.







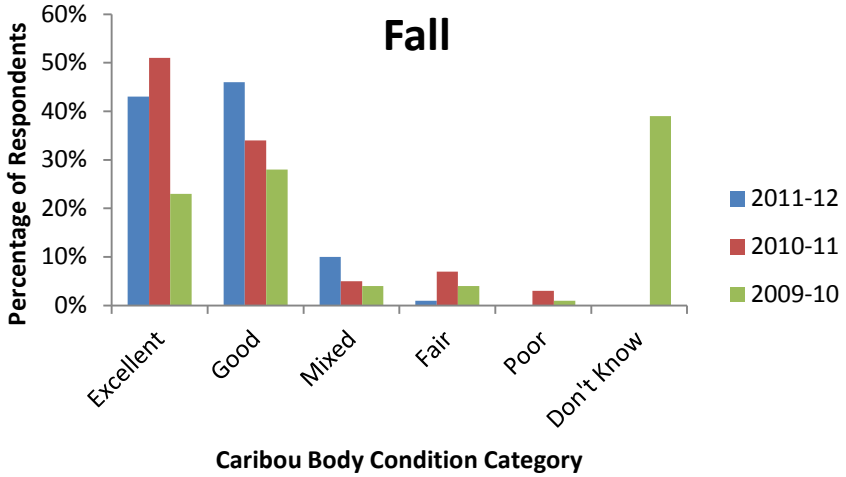


Figure 13. A summary of Arctic Borderlands Ecological Knowledge Coop interview results from 2009-2012. Respondents were asked about the overall condition of Porcupine caribou that they observed in each of the four seasons.

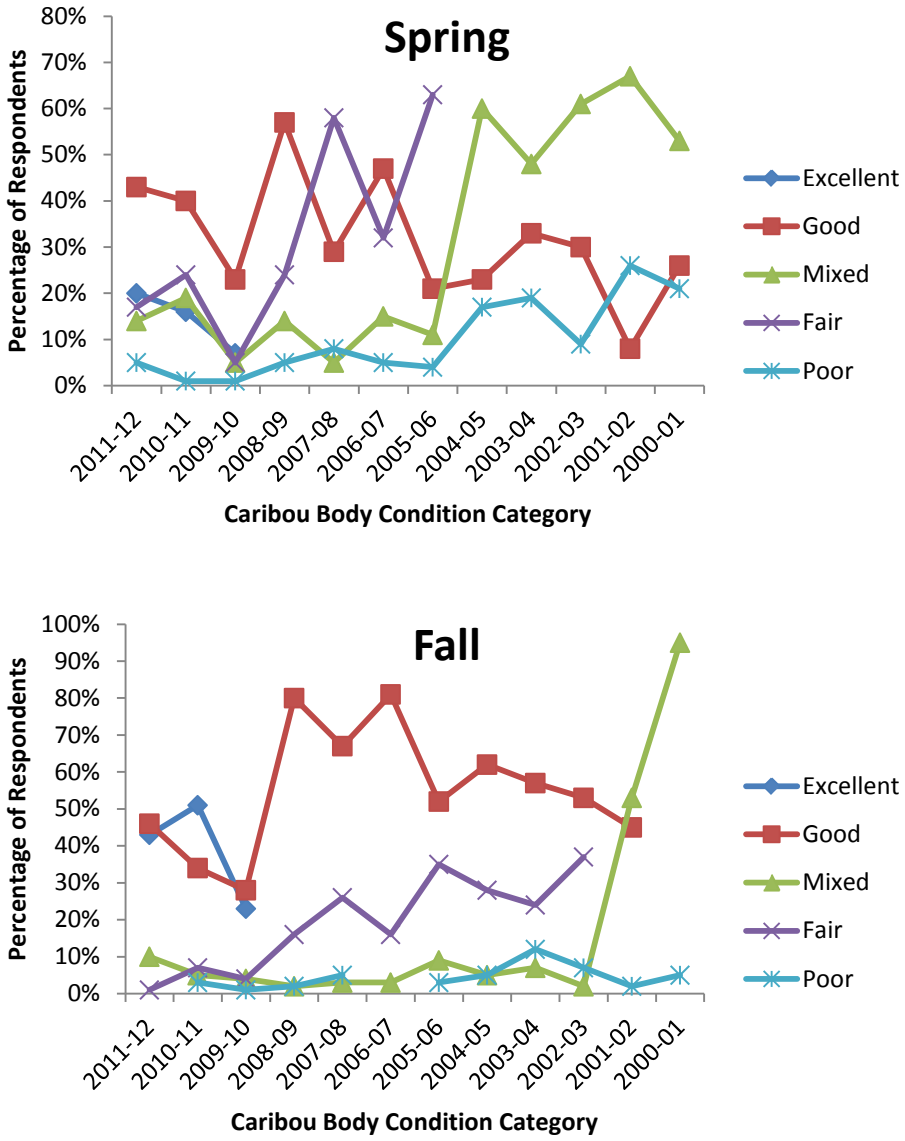


Figure 14. A summary of Arctic Borderlands Ecological Knowledge Coop interview results from 2000-2012. Respondents were asked about the overall condition of Porcupine caribou that they observed in the spring and fall.

Abnormalities

Objective
To determine trends and types of abnormalities observed on Porcupine Caribou across all seasons.

Methods
Body condition and health of caribou are important indicators tracked during their yearly ABEKC interviews. Data summaries were provided for all seasons for 2010 and 2011 (ABEKC 2013). Interviewees were asked to identify caribou physical abnormalities on the caribou that they observed in each season over the past year. Respondents could select one or a number of categories for this question; 1) Bad Liver 2) Cysts and white spots 3) Don't Know 4) None 5) Sores and pus 6) swollen joints, testes glands, or 7) wounded and limping. Not all fields were reported in all seasons. Respondents that stated "Don't Know" were not included in the analysis. Note that interviewees are selected by communities and the monitors with the intention of interviewing a select number of land users engaging with a suite of ecological indicators (i.e. this should not be considered a random sample of caribou harvesters and should not be extrapolated to sampled communities). Interviews for 2013 will be completed from January to Feb 2014.

Results
The types and prevalency of abnormalities observed by respondents vary between seasons and years (Figure 15). However, the percentage of cysts, white spots are consistent between seasons and years at approximately 30% of the observations. The prevalence of swollen joints, testes and glands seem to be higher in the winter. Observations of wounded, limping caribou increase by approximately 3 times in the summer and fall. However, there are are only 4 observations in the summer season so these results may be misleading. There are no long-term trends available due to the short time this indicator has been gathered by ABEKC.

Discussion
This indicator may be useful to track overall health, parasite load, and the influence of disease on the herd. Increases in these trends could be used to initiate additional disease sampling programs.

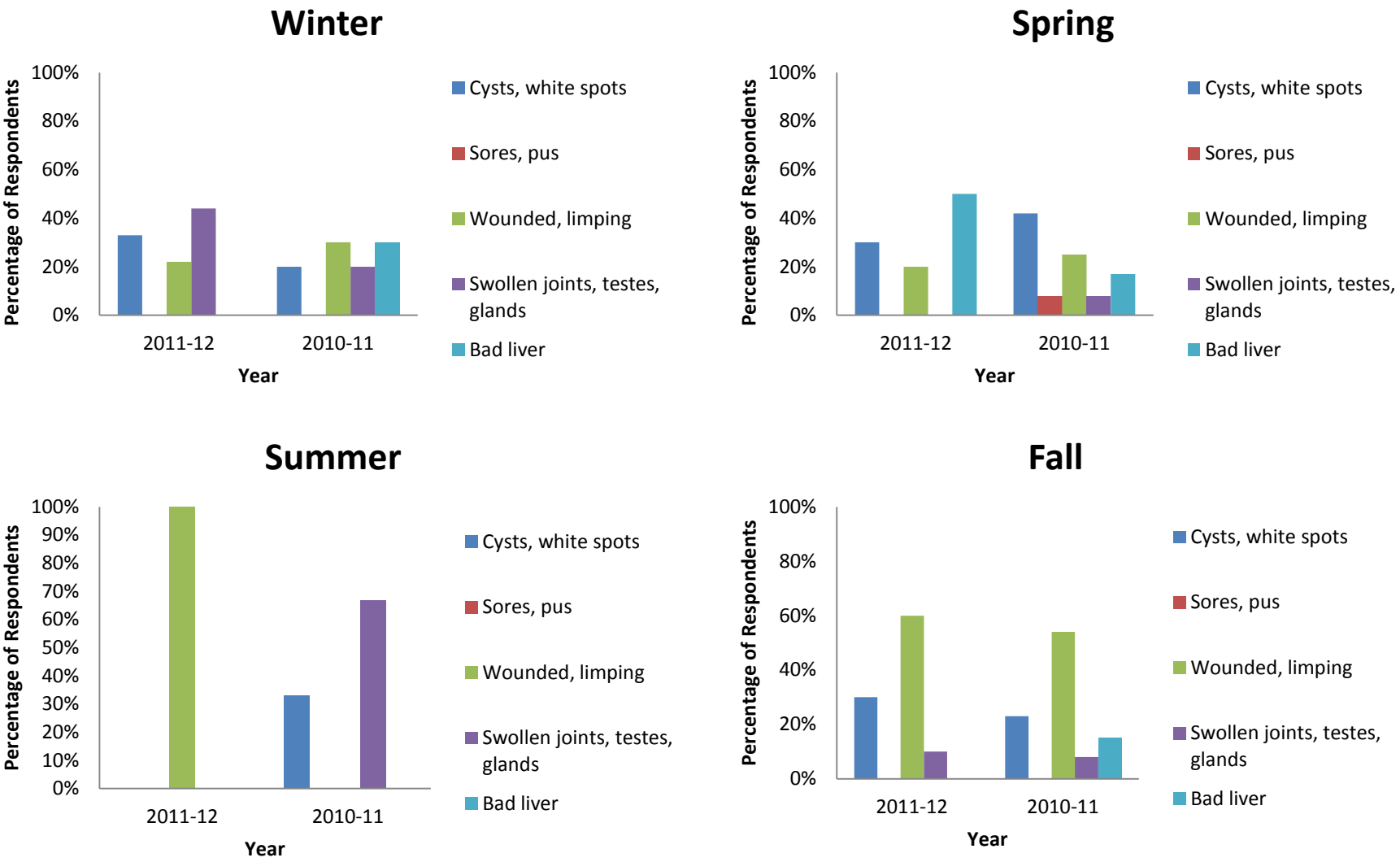


Figure 15. A summary of the Arctic Borderlands Ecological Knowledge Coop interview results from 2010 to 2012. Respondents were asked what abnormalities they observed in caribou in the winter, spring, summer and fall. Data is collected on a yearly basis.

HABITAT

Wildland fires

2013 season fire map data is not yet publicly available from Yukon or NWT. This section of the report contains information current to 2012 (identical to previous Status Reports).

Objective
To monitor the amount of Porcupine Caribou range burned as an index of range condition.

Methods
Historical fire perimeter data was downloaded from the respective agencies websites. Some judgments were made to delete what we thought were duplicate fires and merge incompletely mapped fires along the borders between jurisdictions. Fire polygons were clipped to the extent of PCH range and total area burned was summed for each year. The Alaskan fire perimeter data starts in 1945, Yukon in 1945 and NWT in 1965, therefore only fire information since 1960-2012 was summarized in this report.

Results
As of the 2012 season, the total area burned by fires since 1960 is 38,126.9 square kilometers or roughly 15% of the herd's total annual range (Figure 15). Fires in 2012 burned a total of about 347 square kilometers, lower than the average area burned (515 sq km) in the previous 5 years and significantly less area than the largest fire years in the 2000's (e.g., area burned in 2004 was 10,213 km^2 and in 2005 was 5691 km^2). In 2012 there were 27 fires in the Yukon, the largest of which was ~ 89 km^2, 2 fires in Alaska, and only one within the NWT portion of the PCH range. The years 2004 and 2007 show the largest number of large fires recorded in recent years (Figure 17). Fires in 2004 and 2005 resulted in record large tracts of area burned (Figure 18).

Discussion
Fire perimeters are mapped by the fire management sections of the 3 jurisdictions. Although there are many similarities in methods, there are five cautionary notes when considering the data presented here. Firstly, the technology for remotely detecting wildland fires improved only in the 1960's therefore data prior to that should be viewed with caution. Secondly, past fires are continually being digitized from satellite or other remote sensing methods so the dataset will change as new data on old fires is added. Thirdly, maps show perimeters of fires only and do not reflect any unburned patches or varying fire severity within burned area. Fourthly, some fires are too small to map and are not included in the map files and finally some fires burn areas that were previously burned.

There is much variability in how fires affect caribou; however, research completed on the Beverly Caribou Herd found that forests burned by wildfire produced enough lichen forage as early as 40 or 50 years after the fire that they once again become important to caribou (Thomas and Kiliaan 1998). Caribou also tended to avoid burns larger than 10,000 hectares (100 km^2). The rate of re-growth of caribou forage can be quite variable and caribou use of burns is generally unknown, therefore wildland fire information presented here should be considered as an index of changes to winter habitat.

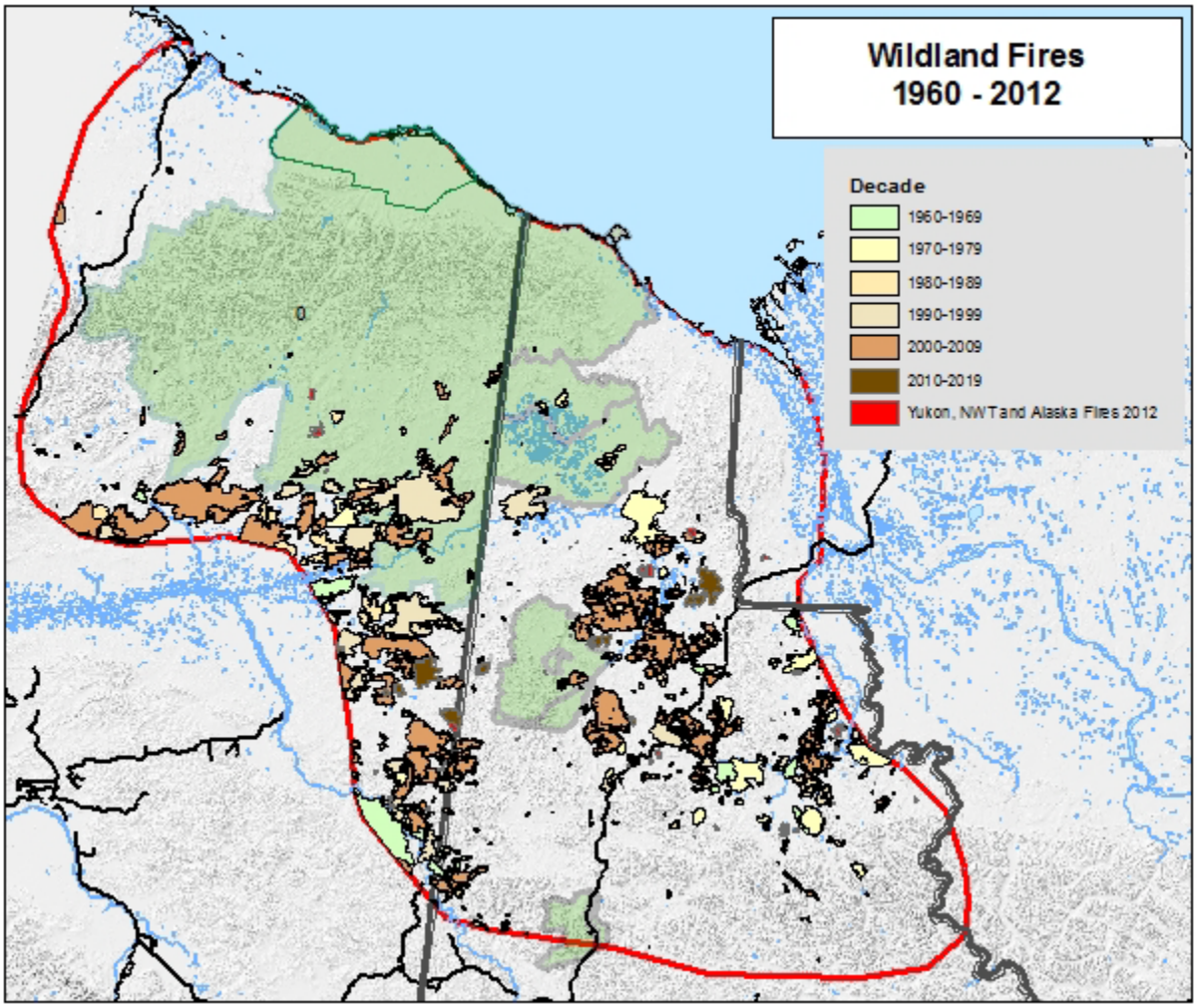


Figure 16. Areas burned within range of the Porcupine Caribou Herd in Alaska, Yukon and Northwest Territories from 1960 to 2012. The darker green areas surrounded by a grey border represent protected areas.

Includes NWT fire data (© 2002-12). Alaska and Yukon fire data 1960 to 2012.

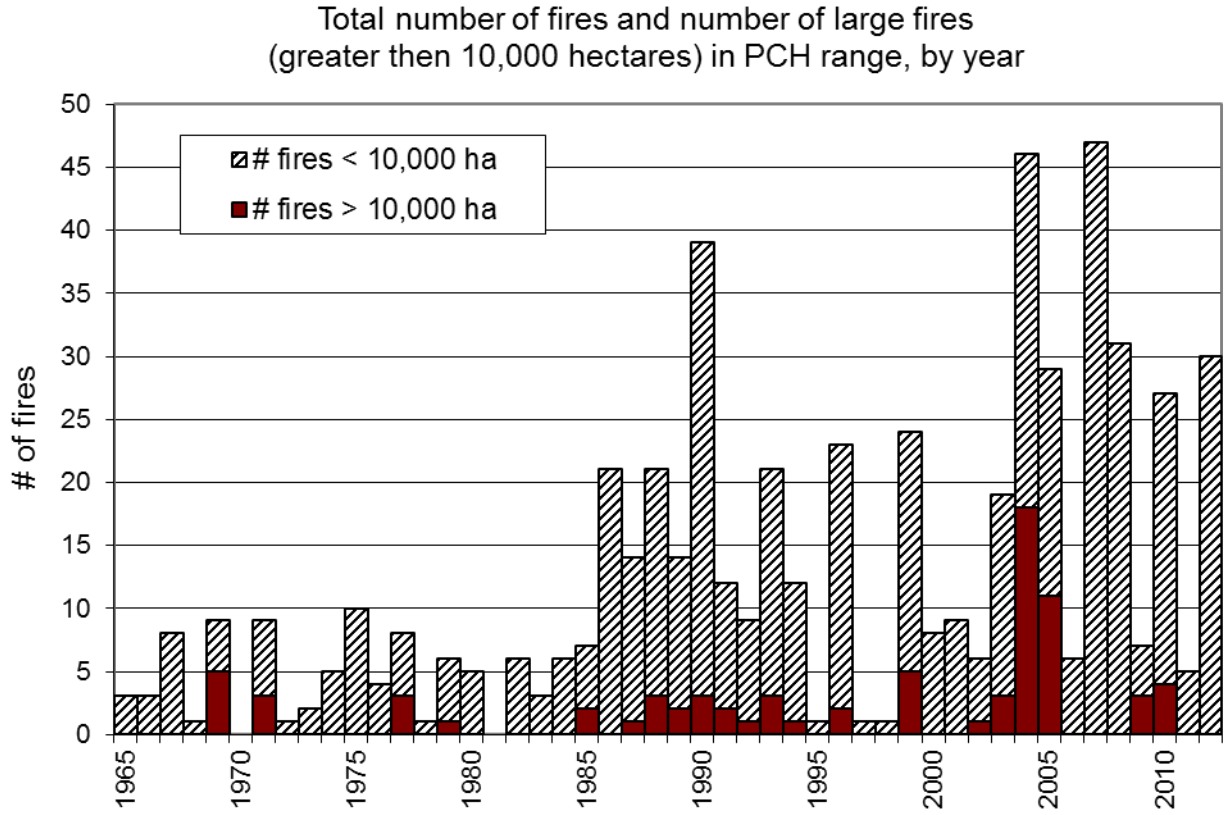


Figure 17. Total number of fires and number of large fires to 2011 within the within the range of the Porcupine Caribou Herd in Alaska, Yukon and Northwest Territories.

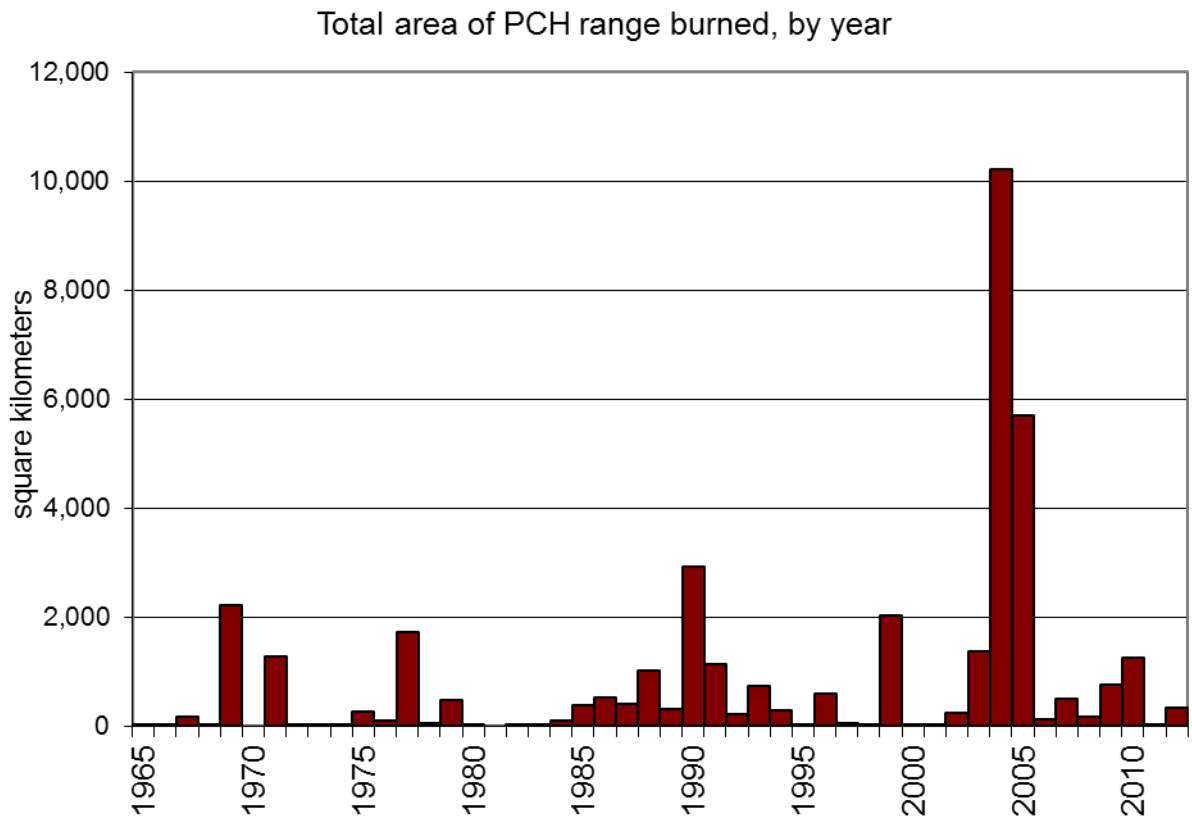


Figure 18. Total area burned by fire, by year to 2012 within the range of the Porcupine Caribou Herd in Alaska, Yukon and Northwest Territories.

Snow Condition

Objective
To gather an index of snow depth and hardness.

Methods
Water Resources (when under Environment Canada and now under Yukon Government) recorded late winter snow depth and snow water equivalent back to the 1970's. The Yukon Fish and Wildlife Branch also did late winter snow measurements along the Dempster Highway and Yukon north coast since the 1990's.

At specified permanent locations, a series of measurements are made, usually 10 repeated measures and depth and either snow density or snow water equivalent (SWE) is recorded. Where necessary, SWE is converted to density by dividing SWE by the depth of snow. Not all stations were measured in all years. Data presented in this report represents results from 17 stations from the Yukon since 2013. Data from other jurisdictions were not available in a compatible format for this report. For example the GNWT records SWE and not depth so snow density measurements cannot be calculated and do not appear on Figure 19; however a large proportion of herd wintered in Yukon or within proximity to Old Crow within Alaska during 2012-2013.

Results
Snow depth and densities in the Ogilvie Region were about average for 2012-2013 while depths were average for the Old Crow Region but densities lower than usual (Figure 19). The Eagle Plains Region experienced deeper snow than average, consistent with the last six years though densities were near the average. Recent data doesn't show any significant trends or large deviations from long term averages.

Discussion
When snow is deep or hardened by wind, caribou expend more energy digging through the snow which can potentially affect their body condition, and reproductive capability. Caribou are not always in the areas where we measure snow but this information can be used as an index of winter conditions affecting caribou.

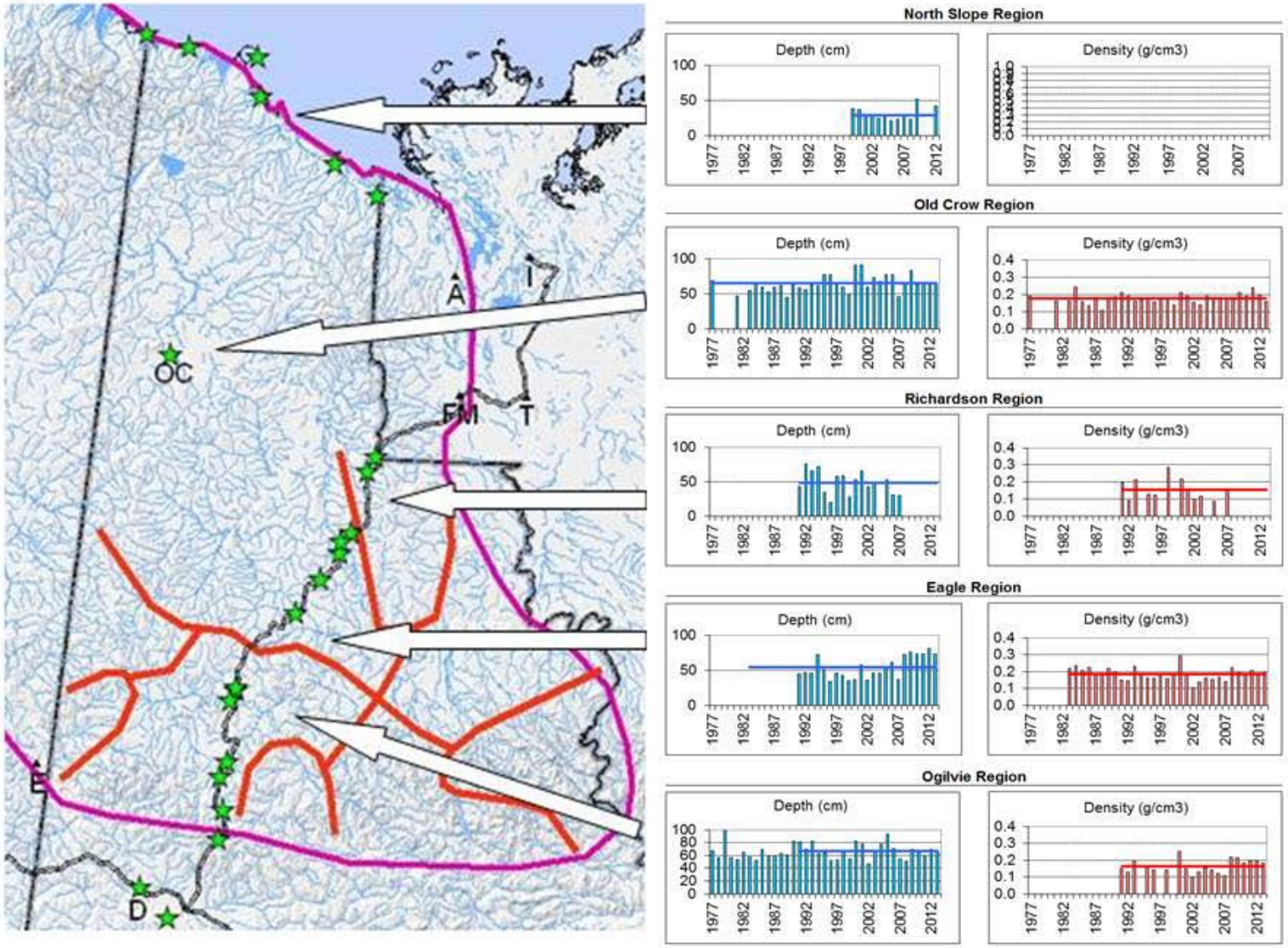


Figure 19. Summary of snow depth and density by snow region from permanent stations (indicated by green stars) for the Yukon portion of the Porcupine Caribou Herd range. Red lines on the map delineate snow regions relevant to caribou (Russell et al 1993).

Extreme weather events

Data was not received in time to be included in the report for 2012/13 but will be provided before the Annual Harvest Meeting in Feb. 2014.

LITERATURE CITED

Allaye-Chan, A.C. 1991. Physiological and ecological determinants of nutrient partitioning in caribou and reindeer. Ph.D. Thesis. University of Alaska Fairbanks, AK. 125 pp.

Arctic Borderlands Ecological Knowledge Co-op (ABEKC), 2013. 2013 Annual Community Data Summary Report. www.taiga.net/coop.

Arthur, S. Alaska Department of Fish and Game memo dated 13 November 2001

Arthur, S. M., K. R. Whitten, F. J. Mauer and D. Cooley. 2003. Modeling the decline of the Porcupine Caribou Herd, 1989-1998: the importance of survival vs. recruitment. Rangifer. Special Issue 14:123-130.

Fancy, S. G., K. R. Whitten and D. E. Russell. 1994. Demography of the Porcupine caribou herd, 1983-1992. Canadian Journal of Zoology. 72:840-846.

Gunn, A. and W. Nixon. 2007. Rangifer Health & Body Condition Monitoring Manual. Circum Arctic Rangifer Monitoring and Assessment (CARMA) Network. July 2007.

International Plan for the Conservation of Porcupine Caribou. *1987.*.

Johnson, C. and D.E. Russell. 2012. Long-term Distribution Responses of the Porcupine Caribou Herd to Human Disturbance. Prepared for: Porcupine Caribou Management Board. Whitehorse, Yukon.

Lenart, E.A. 2007. Game Management Units 25A, 25B, 25D and 26C. Pages 232 – 248. In P. Harper, editor. Caribou management report of survey-inventory activities, 1 July 2004 to 30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

Porcupine Caribou Management Board. 1989. Annual report.

Porcupine Caribou Management Board. 2010. Harvest Management Plan for the Porcupine Caribou Herd in Canada. March 2010. 45 pp.

Russell, D.E., A.M. Martell and W.A.C. Nixon. 1993. Range ecology of the Porcupine Caribou Herd in Canada. Rangifer Special Issue No 8. 168 pp.

Russell, D.E., J. Folliot, M. Svoboda. 2008. Monitoring the condition, availability and harvest of the Porcupine Caribou Herd 2000-2007: an analysis based on community interviews. Arctic Borderlands Ecological Knowledge Coop report. 14 pp.

Russell, D.E. 2011. Presentation prepared for the Arctic Borderlands Ecological Knowledge Co-op Annual Gathering, 2011.

Russell, D.E. 2012. Porcupine Caribou and Cumulative Effects: Climate. Prepared for: Porcupine Caribou Management Board. Whitehorse, Yukon.

D. E. Russell, Svoboda M.Y. , Arokium J. ,Cooley D. (2013) Arctic Borderlands Ecological Knowledge Cooperative: can local knowledge inform caribou management? Rangifer (33) Special Issue No 21 71-78

Thomas, D. C. and H. P.L. Kiliaan. 1998. Fire-caribou relationships: (IV) Recover of habitat after fire on the winter range of the Beverly Herd. Technical Report Series No. 312. Canadian Wildlife Service, Environment Canada, Prairie and Northern Region.

Tyler, N.J.C. 2010. Climate, snow, ice, crashes and declines in populations of reindeer and caribou (*Rangifer tarandus L.).* Ecological Monographs, 80(2): 197-219.

Urquhart, D. R. 1983. The Status and Life History of the Porcupine Caribou Herd (1983). Yukon Department of Renewable Resources. 78 pp.

Walsh, N. E., B. Griffith and T. R. McCabe. 1995. Evaluating growth of the Porcupine Caribou Herd using a stochastic model. Journal of Wildlife Management. 59(2):262-272.

Wertz, T.L., S.M. Arthur, D. Cooley, B. Griffith, and M. Kienzler. 2007. Seasonal Survival Of The Porcupine Caribou Herd In Alaska And Northern Yukon Territory, 2003-2006. Project report to the Porcupine Caribou Management Board.

Appendix A. Summary of biological parameters

Year	Cows Observed[b]	Parturition Rate	June Calf Survival[c]	Post-calving Survival[d]	July Calf:Cow[e]	March Calf:Cow[f]	Population Estimate	Peak of calving	Calving note
1985		0.77			0.46				
1986		0.74							
1987	51	0.78	0.71		0.55		165,000		
1988	91	0.84	0.65		0.55				
1989	74	0.78	0.74		0.58	0.43	178,000		
1990	74	0.82	0.90		0.74				
1991	77	0.74	0.82		0.61	0.22			
1992	78	0.86	0.57		0.49	0.33	160,000		
1993	63	0.81	0.56	0.83	0.45	0.32			
1994	98	0.91	0.77	0.93	0.70	0.40	152,000		
1995	95	0.69	0.85	0.92	0.59	0.41			
1996	74	0.89	0.81	0.91	0.72	0.46			
1997	48	0.75	0.77	0.90	0.58	0.38			
1998	58	0.83	0.82	0.94	0.68	0.27	129,000		
1999	39	0.84	0.83	0.86	0.70	0.56		3-Jun	1-5 June
2000	44	0.73	0.61	0.82	0.44	0.28		7-Jun	
2001	70	0.84	0.61	0.79	0.51	0.31	123,000	8-Jun	5-10 June
2002	68	0.87	0.65	0.85	0.56	0.38		5-Jun	
2003	70	0.87	0.79	0.85	0.69	0.33		1-Jun	
2004	74	0.82	g	g	g	0.24		3-Jun	3-4 June
2005	55	0.64	0.77	0.88	0.49	h		2-Jun	1 - 4 June
2006	66	0.79	0.73	0.86	0.58	0.39		2-Jun	
2007	67	0.88	0.83	0.90	0.73	h		30-May	
2008	63	0.79	0.73	0.92	0.59	h		30-May	29 or 30 May
2009	65	0.77	0.57	0.75	0.44	0.19		2-Jun	
2010	41	0.85	0.76	0.87	0.65	h	169,000	1-Jun	prior to 2 Jun

Year	Cows Observed[b]	Parturition Rate	June Calf Survival[c]	Post-calving Survival[d]	July Calf:Cow[e]	March Calf:Cow[f]	Population Estimate	Peak of calving	Calving note
2011	59	0.86	0.48	0.59	0.41	h		30-May	prior to 1 Jun
2012	g	g	g	g	g			30-May	prior to 1 Jun
2013	35	0.86	h	h	h			04-Jun	3-4 June
Mean	65.27	0.81	0.72	0.85	0.58	0.35		2-Jun-13	
5 yr mean	50.00	0.84	0.60	0.74	0.50	0.19		1-Jun-13	

[a] 1987-2003 data are from Fancy et al. (1994, Can. J. Zool. 72:840–846), Alaska Department of Fish and Game, and Yukon Department of Environment.

[b] Number of radiocollared adult cows for which parturition status was determined.

[c] Estimated as (July calf:cow ratio)/(parturition rate).

[d] Includes only calves observed during early June whose mothers were observed in late June (i.e., does not include most perinatal mortality).

[e] Includes only radiocollared cows >3 years old.

[f] As of March of the year following birth of each cohort; includes all cows >1 year old.

[g] No data due to adverse weather conditions, logistically difficulties or mixing of herds

[h] No data due to mixing of herds or logistical challenges