PORCUPINE CARIBOU
ANNUAL SUMMARY REPORT

----- 22 Dec 2011-----

Does not include any harvest or Arctic Borderlands Ecological Knowledge Co-op information. This information will be provided at a later date.

Submitted to the Porcupine Caribou Management Board

In preparation for the Porcupine Caribou Annual Harvest Meeting
February 2012
### Indicator Table

**Annual Summary Report for AHM Feb 2012**  
Prepared for the Porcupine Caribou Management Board

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>5 year average</th>
<th>Notes</th>
<th>Assessment</th>
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<td><strong>Population size and trend</strong></td>
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<td>Population size (2001)</td>
<td>169,000 in 2010</td>
<td>---</td>
<td>Declined by 55,000 caribou between 1989 and 2001. Recovered to 169,000 by 2010</td>
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<tr>
<td>Estimated population (2011)</td>
<td>---</td>
<td>---</td>
<td>no model currently available</td>
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<tr>
<td>Population trend</td>
<td>---</td>
<td>---</td>
<td>Unknown current trend, recovered between 2001 and 2010</td>
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<tr>
<td>Adult cow survival</td>
<td>2003 to 2006 study = 0.825</td>
<td>---</td>
<td>Similar to 2001 estimate (herd declining). Lower than when herd was increasing. Annual survival is quite variable.</td>
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<tr>
<td>Calf birth rate</td>
<td>2011 = 0.86</td>
<td>0.83</td>
<td>24-year average = 0.81</td>
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<tr>
<td>Calf survival to 9 months</td>
<td>2006 = 0.39</td>
<td>0.36 (13 years)</td>
<td>We like to see at least 0.30. Missing 2005, 2007 to 2011 due to overlap with other herds.</td>
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<tr>
<td>Peak of calving</td>
<td>2 June</td>
<td>2 June</td>
<td>Within normal range</td>
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<tr>
<td><strong>Harvest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total harvest (2010/11)</td>
<td>---</td>
<td>---</td>
<td>Still missing Inuvialuit</td>
<td></td>
</tr>
<tr>
<td>% females in harvest</td>
<td>---</td>
<td>---</td>
<td>Based on reported harvest</td>
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<td>Hunters’ needs met?</td>
<td>Borderlands data</td>
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<tr>
<td><strong>Body condition</strong></td>
<td></td>
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<tr>
<td>Average backfat</td>
<td>F: [none submitted]</td>
<td>F: 3.2 cm</td>
<td>More than average backfat however should be cautious of small sample sizes.</td>
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<tr>
<td></td>
<td>M: 3.1 cm</td>
<td>M: 1.5 cm</td>
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<tr>
<td>Hunter assessment</td>
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<td>F: 2.2 cm</td>
<td>Better than average condition however should be cautious of small sample sizes.</td>
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<tr>
<td></td>
<td>M: 3.5 cm</td>
<td>M: 3.1 cm</td>
<td></td>
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<td>Condition of caribou</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>Borderlands data</td>
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<td>Value</td>
<td>5 year average</td>
<td>Notes</td>
<td>Assessment</td>
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<td>Human footprint</td>
<td>Cumulative Effects project</td>
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<tr>
<td>Snow conditions, Dempster and Yukon North Slope</td>
<td>Demp 2008 = 63 cm</td>
<td>55 cm</td>
<td>No data yet available from 2010</td>
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<td></td>
<td>North Slope = 51 cm</td>
<td>30 cm</td>
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<td>Snow conditions, range wide</td>
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<td>Wildland fires</td>
<td>2011 data not yet available</td>
<td>2010 = 1,455 sq km (2005-2009)</td>
<td>2010: slightly below the average of the previous 5 years. 2004 and 2005 largest burned area ever. Total of 14% of range affected by fires over the years.</td>
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<tr>
<td>Extreme weather events</td>
<td>Borderlands data</td>
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Introduction

This report

This report was prepared for the Porcupine Caribou Management Board 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.

Herd Background

The Porcupine Caribou Herd’s 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 Porcupine Caribou Herd was the first international caribou herd with its own formal co-management agreements and boards. There are 5 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 faculty members or students from various universities occasionally.

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 (PCMB). 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. The PCTC coordinates research and monitoring activities, optimizes funds and staff time, and provides technical information to co-management boards and agencies.

Harvest management is co-operative among the Parties to the PCMA and is guided by the Harvest Management Plan for the Porcupine Caribou Herd in Canada (HMP) and the accompanying Implementation Plan.


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 – photo census

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.

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 Alaska Department of Fish and Game 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). The next herd size estimate is planned for 2012.
Population size – computer modeling

The revised population models are not yet available therefore this section contains the same information as the 2011 Status Report.

Objective:
To build a computer model that incorporates available biological information to estimate the total herd size.

Methods
The first version of the computer model, called the Caribou Calculator was developed by caribou researchers for a workshop in 2001 to explore the effects of different harvest regimes (Kofinas et al 2002). The Calculator is a Microsoft Excel based model that uses estimates of birth rate, calf survival to late June, March and May, adult cow and bull survival. These measured values were adjusted to best follow the trend in herd size. Values for the harvest of male and female harvest as well as wounding loss rates can then be varied to run scenarios of the relative effect of different harvest patterns on the herd.

Discussion
For the initial workshop in 2007 on the PCH Harvest Management Plan, this model was used to again explore different harvesting regimes. Biological values in the model were held constant at the levels seen in recent years of the herd’s declining phase and the harvest values were set at
what was thought to be reasonable approximation of total herd harvest; 4,000 caribou per year, 40% bulls in the harvest (Figure 2).

With no change in the harvest, the model predicted that the herd would continue to decline at a similar rate seen since 1989. Upon further exploration, the model indicated that a switch from a cow to bull dominated harvest in conjunction with a 50% reduction in total herd harvest could stabilize the herd size. Based on direction given by workshop participants, these model runs were using low adult cow survival (81%).

Between the 2007 workshop and 2009, because we had no information to the contrary, it was assumed that the composition and size of the harvest had not changed. If true, just looking at the graph, the Caribou Calculator indicated that if the herd continued to decline at the current rate, it could number 90,000 to 100,000 caribou in 2009. The HMP (voluntary bull only) and Yukon’s Interim Measures (mandatory bull only) probably did change the composition of the harvest however we have no way of confirming a change at this time.

Caution must be used in discussing the output from this model. From a population modeling standpoint, the model was not designed to take into account any uncertainty surrounding the numbers that are put into the model, nor any uncertainly around the herd size estimate. Because of these technical concerns, the Government of Yukon, on behalf of the PCTC has contracted the original researcher to revise the computer model. The model will be broken into 2 models; one model for use by the PCTC that is more appropriate to use to estimate herd size with an indication of uncertainty. The second model is for the PCMB to use as a tool to explore the effects of different harvest regimes on the herd. These models are still not available.

Figure 2. Results of the Caribou Calculator, as presented in the Harvest Management Plan for the Porcupine Caribou herd in Canada.

“Business as usual” means 4,000 caribou harvested, 40% bulls. Dots are photo census estimates. The line shows the model predications.
Business as usual

Porcupine Caribou Herd Population

Porcupine Caribou Annual Summary Report, 2012
**Adult female survival**

**Objective:**
To document the survival of adult females each year. Last completed 2009/10.

**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. Another interesting and unexpected result from the most recent study is that there appeared that more cows die during the spring and summer months than previously thought.

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.

**Discussion**
For the survival study that we started in 2003, we continue to see a pattern of lower survival as we go from summer to the next spring (Figure 3). More cows die during spring (March to June) than during winter, contrary to what we thought when we started the study.

Estimates of annual survival continue to be lower than the survival rates estimated in the 1980’s when the herd size was increasing and similar to estimates just after the decline started (Figure 4).
Estimates of survival are quite variable from year to year (Figure 4). A sustained change of 2 or 3 percent in survival can make the difference between a herd increasing and decreasing. We would need up to 300 collars deployed on caribou in order to reliably detect such a small change. This is unfeasible.

**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.

**Discussion**
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. 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 5). Population dynamics are most affected 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 5.** Estimated birth rate and calf survival indices
**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.

**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.

Although the date varies by a few days each year, there is no indication that large numbers of cows are giving birth ‘out of sync’ (Table 2). We would start to worry if births were a week or more out of sync.

<table>
<thead>
<tr>
<th>Year</th>
<th>Peak of calving</th>
<th>Note</th>
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<tr>
<td>1999</td>
<td>3-Jun</td>
<td>1 to 5 June</td>
</tr>
<tr>
<td>2000</td>
<td>7-Jun</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>8-Jun</td>
<td>5 to 10 June</td>
</tr>
<tr>
<td>2002</td>
<td>5-Jun</td>
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<td>2003</td>
<td>1-Jun</td>
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<td>2004</td>
<td>3-Jun</td>
<td>3 or 4 June</td>
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<td>2005</td>
<td>2-Jun</td>
<td>1 to 4 June</td>
</tr>
<tr>
<td>2006</td>
<td>2-Jun</td>
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<tr>
<td>2007</td>
<td>30-May</td>
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<td>2008</td>
<td>30-May</td>
<td>29 or 30 May</td>
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<td>2009</td>
<td>2-Jun</td>
<td>Before 2 Jun</td>
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<td>2010</td>
<td>2-Jun</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>2-Jun</td>
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</tr>
<tr>
<td>Average</td>
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</table>
**Short yearling survival to 3 years of age**

**Objective:**
To document the survival of 9 month old calves to 3 years of age. Last completed 2010.

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).

**Methods**
During our March field work, we captured about 10 females that were born the previous spring (9 months old) to put conventional radio collars on them. The data from all years of captures are pooled to estimate overall how many calves survived to breeding age. Because we know exactly how old these caribou are, we recapture them after 3 years or sooner to replace their collars and we will maintain collars on these caribou.

**Discussion**
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 (see previous).

Figure 6. Survival of Porcupine Caribou females from 9 months to 3 years of age.

![Survival Rates of Female Porcupine Caribou](image)

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.

**Adult bull survival**

**Objective:**
To document the survival of adult bull caribou. Last study ended in 2010.

**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.

**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. Between 2003 and 2006, more bulls died during the fall than any other season (see Figure 3).

Bull mortality rate increases dramatically about 5 years after collaring. 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.

![Figure 7. Survival of male Porcupine Caribou](image)

There was no intent to continue this study (i.e. keep collaring bulls year after year) so there is no updated information since 2009.
**Bull ratio**

**Objective:**
To document the ratio of bulls to cows in the herd. Last count 2010, next planned 2012.

**Methods**
The ratio of bulls to cows was estimated first in 1980 (PCMB 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 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 that the pregnancy rate has dropped.

In the Harvest Management Plan for the Porcupine Caribou Herd in Canada, there is provision for bull only harvest regimes to be implemented for different user groups if the herd drops below certain population sizes.

Population modeling showed 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 with certainty what might happen to the herd sex ratio as we take more bulls in the harvest therefore another composition count to get an updated bull ratio was done in 2009 and 2010 (prior to an increase in bulls in the harvest under the HMP).

For that field work conducted during the rut season in early to mid October, we flew by helicopter and classified as many as 200 caribou around each radio collared caribou (bulls, cows, short yearlings). Caribou were classified into cow, bull, and calf. 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.

**Discussion**
For the 2009 count, we counted in the areas around 34 radio collars and results showed about 40 bulls for every 100 cows, lower than was found in 1980. Because the sample size is so small, we have low confidence in this number.

In 2010, because the Alaskans were able to get a photo census, we did another count. This time we were able to sample around 53 radio collars and are more confident in the results from 2010. The 2010 estimate was 57 bulls for every 100 cows, similar to the 1980 estimate.

The PCTC plans to conduct a rut count in every year that a photo census is done in order to feed the sex ratio into the population model. If we had solid harvest data, including the sex ratio of the harvest, we could assess the effect of a bull dominated harvest on the herd sex ratio. This would be quite interesting for managers to see however the PCTC still needs to discuss the technical details regarding how many collars are needed to provide the precision needed to assess the effect of harvest on the herd sex ratio.

The next photo census attempt, and accompanying rut count is scheduled for 2012.
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 nil.

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.

In February 2011, the Porcupine Caribou Management Board hosted the first Annual Harvest Meeting under the HMP. From this meeting, the PCMB recommended that the Canadian Parties adopt the Green harvest management zone. Harvest management in this zone means that there is no restriction on aboriginal harvest and licensed hunters are limited to 2 bulls per year. Hunting regulations were changed and implemented for the fall 2011/12 season.

See Figures 8, 9 and 10 for regulations for all three jurisdictions for the 2011/12 season.
Figure 8. Hunting regulations for PCH subsistence hunters, 2011/12

ALASKA GMU 26B
Central Arctic Herd
10 caribou per day
No cows 1 May to 30 Sep

ALASKA western 25A
Central Arctic Herd
10 caribou total
No cows 16 May to 30 Jun

ALASKA GMU east 25A, 25B, 25D
10 caribou per year
1 Jul to 30 Apr

NWT I/BC/05 and G/BC/01
No restrictions

YUKON PCH subzones
No restrictions

YUKON PCH / Hart overlap
closes 31 Oct unless
PCH is present

SUBSISTENCE HUNTING
Figure 9. Hunting regulations for PCH resident hunters, 2011/12

ALASKA
GMU 26B
Central Arctic Herd
5 caribou
No cows 1 May to 30 Jun

ALASKA
western 25A
Central Arctic Herd
5 caribou
No cows 16 May to 30 Jun

ALASKA
GMU east 25A, 25B, 25D
10 caribou
1 Jul to 30 Apr

ALASKA
western 26C
10 caribou
closed 1 May to 22 Jun
bulls only 23 to 30 Jun
any caribou 1 Jul to 30 Apr

YUKON
PCH subzones
2 bulls
1 Aug to 31 Jan

YUKON
PCH / Hart overlap
closes 31 Oct unless
PCH is present

RESIDENT HUNTING

NW T
I/BC/05 and G/BC/01
2 bulls
15 Aug to 30 Apr
Figure 10. Hunting regulations for PCH non-resident hunters, 2011/12

- **ALASKA GMU 26B**
  - Central Arctic Herd
  - 5 caribou
  - No cows 1 May to 30 Jun

- **ALASKA GMU east 25A, 25B, 25D, 26C**
  - 1 bull
  - 1 Aug to 30 Sep

- **YUKON**
  - Non Yukon Canadians
  - 1 bull
  - 1 Aug to 31 Jan

- **YUKON**
  - Non Canadians
  - 1 bull
  - 1 Aug to 31 Jan

- **YUKON**
  - PCH / Hart overlap closes 31 Oct unless PCH is present

- **NWT**
  - I/BC/05 and G/BC/01
  - Closed
Estimated number of caribou harvested
From community and agency data…

Proportion of females in the harvest
From community and agency data…

Were hunters’ needs met?
From Arctic Borderlands Ecological Knowledge Co-op data – will be requested
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

In 2001, we formally modified the program so that hunters could submit samples from any caribou they harvest. This program is also called CSI, the Caribou Sampling Initiative 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.

Discussion
Overall, caribou condition seems to have improved in recent years although the data seem to be more variable after 2001 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. This improving condition was also seen in the Arctic Borderlands Ecological Knowledge Co-op data (Russell et al 2008, 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 12. Average depth of backfat recorded in Body Condition Monitoring
Error bars are standard errors. Labels indicate # of caribou sampled.

Source: PCH body condition monitoring by YG and GNWT

Abnormalities
From Arctic Borderlands Ecological Knowledge Co-op data – will be requested
HABITAT

*Human Footprint*
From PCMB’s cumulative effects project

*Wildland fires*

2011 season fire map data is not yet publicly available from Alaska, Yukon or NWT. This section of the report contains information current to 2010 (identical to the 2011 Status Report).

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

**Methods**
Fire perimeters are mapped by the fire management sections of the 3 jurisdictions. Although there are many similarities in methods, there are a number of cautionary notes when considering the data presented here. The technology for remotely detecting wildland fires improved only in the 1960’s therefore data prior to that should be viewed with caution. Past fires are continually being digitized from satellite or other remote sensing methods so the dataset will surely change as new data on old fires is added. The Alaskan fire perimeter data starts in 1945, Yukon in 1945 and NWT in 1965. Only the fire information since 1965 that was available as of January 2011 was summarized in this report.

Historical fire perimeter data were 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.

There is much variability in how fires affect caribou however for the Beverly Caribou Herd, researchers found that forests burned by wildfire produced enough lichen forage that they become important to caribou once again as early as 40 or 50 years after the fire (Thomas and Kiliaan 1998). Given that we have solid fire mapping only in the last in past 50 years (since 1960), we can map all the known burned area to get an index of area affected by fires. In addition, caribou tended to avoid burns larger than 10,000 hectares.

There are a number of cautions to keep in mind. Mapping of fire perimeters, especially the older burns is sometimes ‘fuzzy’. Maps show perimeters of fires only and do not reflect any unburned patches or varying fire severity within burned area. Some fires are too small to map and are not included in the map files. Some fires burn areas that were previously burned. The rate of re-growth of caribou forage can be quite variable even within any one burn. It’s generally unknown whether burned areas were actually of use to caribou before the burn or if they would not have used that area regardless if it was burned or not. Given these cautions, the wildland fire information is presented here as an index of changes to winter habitat.

**Discussion**
As of the 2010 season, the total area covered by all fires since 1960 was 35,664 square kilometers or roughly 14% of the herd’s total annual range (Figure 13). Fires in 2010 burned a total of about 1,268 square kilometers, slightly lower than the average area burned (1,455 sq
km) in the previous 5 years. There were no fires in the NWT or Alaskan portion of the range in 2011. There were four in 2011 in the Yukon.

Figure 13. Areas burned within PCH range, 1965 to 2010

The years 2004 and 2007 show the largest number of large fires recorded in recent years (Figure 14). Fires in 2004 and 2005 resulted in record large tracts of area burned (Figure 15).
Figure 14. Total number of fires and number of large fires to 2010

Figure 15. Total area burned by fire, by year to 2010
Snow condition

Updated snow data are not yet publicly available from Alaska, Yukon or NWT. This section of the report is identical to the 2011 Status Report.

Objective:
To gather an index of snow depth and hardness

Methods
Water Resources (when under Environment Canada and now under Yukon Government) has recorded late winter snow depth and snow water equivalent back to the 1970’s in some cases. The Yukon Fish and Wildlife Branch also did late winter snow measurements along the Dempster Highway and Yukon north coast back to 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 and the most recent data we have currently is from 2008. A total of 17 stations were used in this report.

Caribou are not always in the areas where we measure snow but the information can be used as an index of winter conditions.

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. The recent data don’t show any trends or large deviations from long term averages (Figure 16). The red lines delineate snow regions, relevant to caribou (Russell et al 1993).
**Extreme weather events**

From Arctic Borderlands Ecological Knowledge Co-op data – will be requested

Some parties are also collecting this information during the harvest data collections.
Porcupine Caribou Annual Summary Report, 2012

Literature cited


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


Appendix A. Summary of biological parameters

Porcupine Caribou Herd calving ground surveys and population estimates, 1987-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Cows Observed b</th>
<th>Parturition Rate</th>
<th>June Calf Survival c</th>
<th>Post-calving Survival d</th>
<th>July Calf:Cow e</th>
<th>March Calf:Cow f</th>
<th>Population Estimate i</th>
<th>Peak of calving (set year to 2001)</th>
<th>Calving note</th>
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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 or mixing of herds
h  No data due to mixing of herds
i  Population estimate in 2006 modeled by S. Arthur, Alaska Dept of Fish and Game
Yellow shaded cells prior to 1987 are from 'long term' worksheet