

# **Porcupine Caribou Herd Management Report and Plan, Game Management Units 25A, 25B, 25D, and 26C:**

Report Period 1 July 2017–30 June 2022, and  
Plan Period 1 July 2022–30 June 2027

**Mark Nelson**





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Plan Period 1 July 2022–30 June 2027

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Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every 5 years by the area management biologist for game management units in their areas, who also develops a plan for data collection and species management for the next 5 years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's public website.

This species management report and plan was reviewed and approved for publication by Jason Caikoski, Management Coordinator for Region III for the Division of Wildlife Conservation.

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## Purpose of this Report

This report provides a record of survey and inventory management activities for the Porcupine caribou herd (*Rangifer tarandus granti*) in Game Management Units 25A, 25B, 25D, and 26C for the 5 regulatory years 2017–2021 and plans for survey and inventory management activities in the next 5 regulatory years, 2022–2026. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY17 = 1 July 2017–30 June 2018). This report was produced primarily to provide agency staff with data and analysis to help guide and record agency efforts but is also provided to the public to inform it of wildlife management activities. In 2016 the Alaska Department of Fish and Game’s (ADF&G, the department) Division of Wildlife Conservation (DWC) launched this 5-year report to report more efficiently on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the Porcupine caribou herd management report of survey and inventory activities that was previously produced every 3 years.

## I. RY17–RY21 Management Report

### Management Area

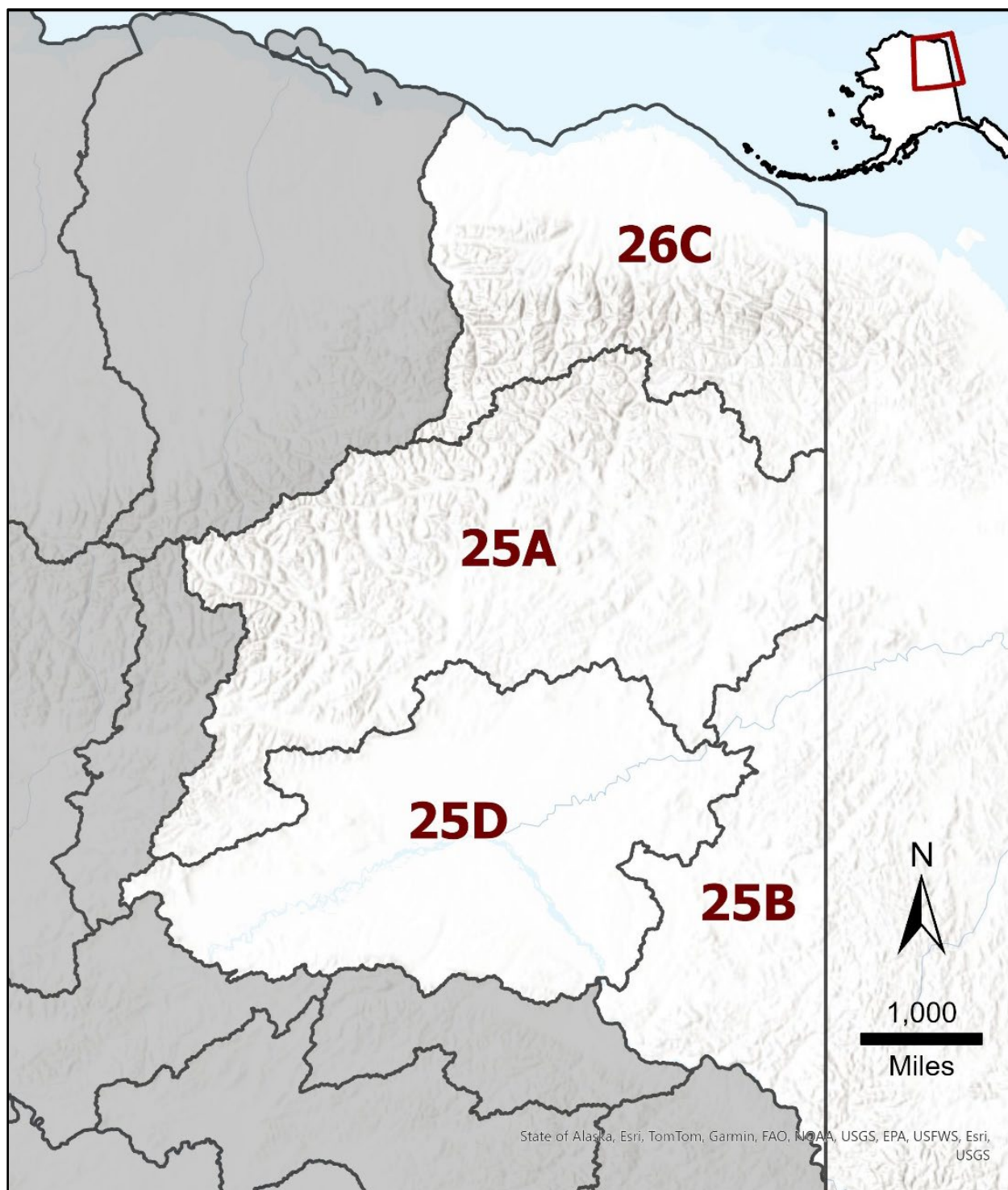
The management area where the Porcupine caribou herd most commonly ranges in northeastern Interior Alaska includes the eastern portions of the Arctic Slope and the Brooks Range, and Game Management Units 25A, 25B, 25D, and 26C (59,400 mi<sup>2</sup>; Fig. 1). The Porcupine caribou herd also ranges into the Yukon and Northwest Territories of Canada; however, this report will focus on management activities within the Alaskan portion of the range.

### Summary of Status, Trend, Management Activities, and History of the Porcupine Caribou Herd in Units 25A, 25B, 25D, and 26C

The Porcupine caribou herd (PCH) migrates between Alaska and Canada, including both the Yukon and Northwest Territories. Most of the herd’s 78,000 mi<sup>2</sup> range is remote, roadless wilderness (Fig. 2). The PCH is an important subsistence resource for people in Alaska and Canada. Additionally, the PCH provides valued hunting and wildlife viewing opportunities for Alaska residents and nonresidents.

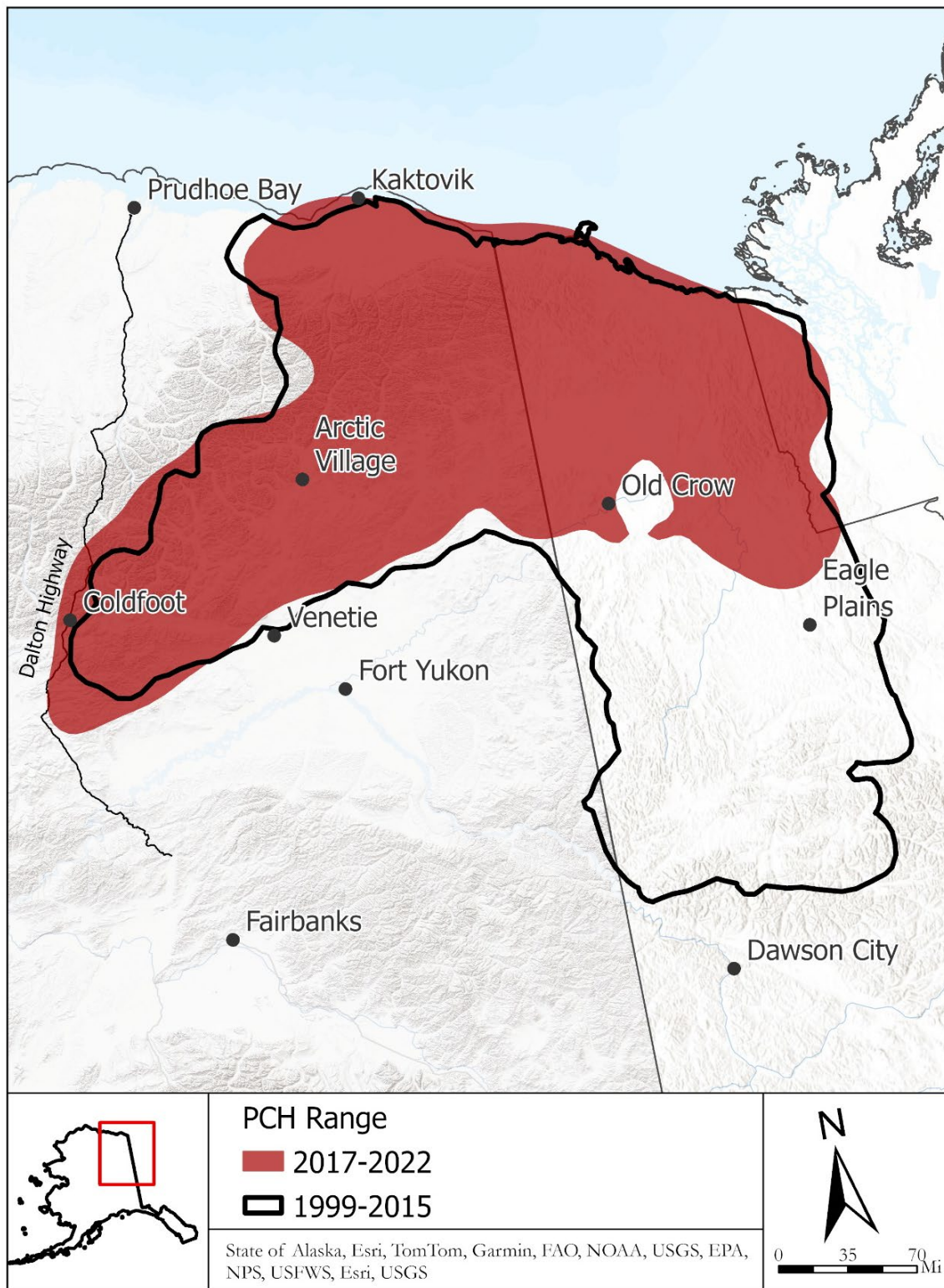
The PCH often calves in promising onshore petroleum prospects in Alaska (Clough et al. 1987), leading various state and federal agencies and their Canadian counterparts to collaborate on baseline ecological studies of the PCH in the 1980s and 1990s (Garner and Reynolds 1986, Whitten and Regelin 1988, Fancy and Whitten 1991, Whitten and Fancy 1991, Whitten et al. 1992, Fancy et al. 1994, Griffith et al. 2002). These studies provide baseline information for development of additional studies, planning, and mitigation should petroleum development occur in the future. Since these studies, research on the PCH has been substantially reduced and efforts have been focused on monitoring population parameters to evaluate management objectives.

In 1987 the United States and Canada established the International Porcupine Caribou Board (IPCB) to coordinate management and research among governments and user groups (Appendix A). The IPCB includes a representative from each of the governments of the United States and Canada, Alaska Department of Fish and Game (ADF&G), Yukon Department of the Environment, and members of communities in Alaska and Canada that utilize the herd.



**Figure 1. Map showing Game Management Units 25A, 25B, 25D, and 26C, northeastern Alaska, regulatory years 2017–2021.**





**Figure 2. Map showing the Porcupine caribou herd (PCH) combined annual range in Alaska and Canada from June 2017 to June 2022 and the range occupied from 1995 to 2015. Locations from VHF and GPS collared individuals were used to create annual utilization distributions (UD). UDs were calculated using the reference bandwidth, normalized, and combined. A 95% isopleth was calculated to represent the herds range over this period.**

ADF&G is a member of the Porcupine Caribou Technical Committee (PCTC), an ad hoc committee operating under the IPCB, with representatives of the various management and research agencies with responsibilities for the PCH. These include the U.S. Fish and Wildlife Service, U.S. Geological Survey, Yukon Department of Environment, Northwest Territories Department of Environment and Natural Resources, Canadian Wildlife Service, and Parks Canada. The Porcupine Caribou Technical Committee meets regularly to coordinate research and management activities and prioritize current and future work.

A variety of factors affect PCH management, including IPCB and PCTC recommendations, advisory boards and committees, biological studies, subsistence harvest, and congressional actions regarding the opening of the Arctic National Wildlife Refuge (ANWR) to petroleum exploration and development.

The PCH remained stable during the 1960s and 1970s at about 100,000 caribou. Based on photocensus minimum counts (Table 1), the population began to increase in the 1980s and grew to 178,000 caribou by 1989. Annual rates of growth averaged 1.03% from 1972 to 1989 (Table 1). The PCH then decreased to a minimum count of 160,000 caribou in 1992, probably in response to lower yearling recruitment after harsh winters (Arthur et al. 2003). The minimum count for the herd continued to decline to an estimated 129,000 caribou in 1998 and 123,000 caribou in 2001. This decline was likely a result of increased adult mortality (Arthur et al. 2003). Estimates of population size could not be obtained during 2002–2009 due to inadequate survey conditions. In 2010, a successful photocensus survey was completed which resulted in a modeled population estimate of 169,000 caribou (standard error [SE]  $\pm 7,384$ ; 95% confidence interval [CI] = 153,493–184,403 caribou). Since 2010, the PCH continued to grow to an estimated 197,000 caribou in 2013 (SE  $\pm 13,772$ ; 95% CI = 168,667–225,789 caribou) and 218,000 caribou in 2017 (SE  $\pm 7,750$ ; 95% CI = 202,106–234,808 caribou). The herd is currently at a historic high since the early 1970s when the first photocensus survey was conducted on the PCH. The estimated average annual growth rate from 2010 to 2018 was 1.04%, which is very similar to that observed from 1972 to 1989.

Historical information on PCH distribution, movements, biological monitoring, and harvest are reported in Whitten (1981, 1987, 1992, 1993a, 1993b, 1995b); Fancy et al. (1989); Golden (1989, 1990); Stephenson (2005); and Caikoski (2011, 2013, 2015, 2020).

**Table 1. Porcupine caribou herd photocensus survey minimum counts, abundance estimates, and herd growth rates, Alaska and Canada, 1972–2017.**

Year	Minimum count	Abundance estimate	95% Confidence interval	Time period	Average annual growth rate (95% CI)
1972	99,959	—	—	—	—
1977	105,000	—	—	1972–1977	1.01
1979	105,683	—	—	1977–1979	1.00
1982	125,174	—	—	1979–1982	1.06
1983	135,284	—	—	1982–1983	1.08
1987	165,000	—	—	1983–1987	1.05
1989	178,000	—	—	1987–1989	1.04
1992	160,000	—	—	1989–1992	0.97
1994	152,000	—	—	1992–1994	0.98
1998	129,000	—	—	1994–1998	0.96
2001	123,000	—	—	1998–2001	0.99
2010	147,268	168,948	153,493–184,403	2001–2010	1.04
2013	141,978	197,228	168,667–225,789	2010–2013	1.05 (0.99–1.11)
2017	198,104	218,457	202,106–234,808	2013–2017	1.03 (0.99–1.07)

## Management Direction

### EXISTING WILDLIFE MANAGEMENT PLANS

The current management plan for regulatory years 2017–2021 for the PCH is found in Caikoski (2020). The plan section of this document will outline the management plan for the PCH for the following 5 regulatory years (RY22–RY26).

### GOALS

Management goals for the PCH are based on objectives listed in the *Agreement between the Government of Canada and the Government of the United States of America on the Conservation of the Porcupine Caribou Herd* (1987; Appendix A).

- G1. Conserve PCH and its habitat through international cooperation and coordination so the risk of irreversible damage or long-term adverse effects as a result of the use of caribou or their habitat is minimized.
- G2. Ensure opportunities for customary and traditional uses of PCH.
- G3. Enable users of PCH to participate in international efforts to conserve PCH and its habitat.
- G4. Encourage cooperation and communication among governments, users of PCH, and others to achieve objectives.

## **CODIFIED OBJECTIVES**

### Amounts Reasonably Necessary for Subsistence Uses

C1. The Porcupine caribou herd has a positive finding for customary and traditional use of caribou in Units 25A, 25B, 25D, 26B, and 26C and an amount reasonably necessary for subsistence uses of 1,250–1,550 caribou.

### Intensive Management

C2. Population objective: 100,000–150,000 caribou.

C3. Harvest objective: 1,500–2,000 caribou.

## **MANAGEMENT OBJECTIVES**

M1. Maintain a minimum population of 135,000 caribou.

## **MANAGEMENT ACTIVITIES**

### 1. Population Status and Trend

ACTIVITY 1.1. Deployment and maintenance of Global Positioning System (GPS) and Very High Frequency (VHF) collars.

#### *Data Needs*

Collars deployed on male and female caribou are used for management activities that monitor the PCH. These activities include photocensus and abundance estimates, annual survival rate estimates, parturition rate estimates, calving and seasonal distribution estimates, and composition surveys.

#### *Methods*

During RY17–RY21, collars were deployed annually on caribou via net-gun capture each March, and occasionally in June, in an effort to maintain a sample size of 80–100 adult females ( $\geq 2$  years of age), 15–20 short yearling females (10-months-old in March), and 15–25 males. Short yearlings and adult females were recollared throughout their life every 3–5 years to maintain a known-age sample of caribou that approximate the age distribution of female caribou in the herd. The annual collaring of short yearling females ensures that all female cohorts are represented in the collared sample.

#### *Results and Discussion*

During the RY17–RY21 reporting period, 359 caribou were captured or recaptured, including 294 cows and 65 bulls.

### RY17

During RY17, 26 short yearling cows, 30 adult cows, and 12 adult bulls were captured.

## R Y18

During RY18, 26 short yearling cows, 16 adult cows, and 16 adult bulls were captured.

## R Y19

During RY19, 20 short yearling cows, 43 adult cows, and 16 adult bulls were captured.

## R Y20

During RY20, 20 short yearling cows, 46 adult cows, and 11 adult bulls were captured.

## R Y21

During RY21, 23 short yearling cows, 44 adult cows, and 10 adult bulls were captured.

### *Recommendations for Activity 1.1*

Continue with one modification. Prior to this reporting period, the decision was made to transition from VHF collars to satellite-linked GPS collars. This transition is functionally complete as of RY21, and moving forward deployment of satellite-linked collars will be the standard practice.

### ACTIVITY 1.2. Photocensus and abundance estimates.

#### *Data Needs*

Abundance estimates are obtained using the photocensus technique, which is the primary method for monitoring the status of the PCH. The abundance estimate is used to evaluate the codified objectives of intensive management (IM) and amount necessary for subsistence (ANS). Advisory committees, Alaska Board of Game, Federal Subsistence Board, other regulatory groups, and nonregulatory groups use the population estimates to make regulatory decisions or recommendations concerning management of the PCH.

#### *Methods*

A photocensus was conducted by using a modified aerial photo-direct count technique (Davis et al. 1979, Valkenburg et al. 1985) and digital photography. Groups of caribou were photographed from a DeHavilland DHC-2 Beaver aircraft with a customized digital aerial camera system composed of 3 medium-format, 100-megapixel cameras, with 2 of the cameras oriented obliquely and 1 at nadir. Target altitude for photography was 1,500 feet above ground level. All cameras were contained within a rigid insert which was attached to a gyro stabilized mount. The system was instrumented with a differential GPS and inertial measurement unit (IMU) to record position and altitude (pitch, roll, and yaw). Customized flight management software controlled the cameras and navigation system and allowed the pilot and camera operator to see footprints of the imagery in real time.

Flight data from the GPS and IMU were postprocessed using differential correction or precise point positioning depending on the proximity to continually operating reference stations. Images were individually inspected and adjusted for exposure before being exported from raw format. Exterior orientation information (position, elevation, and altitude) and imagery were then

processed through photogrammetry software using automated tie point extraction and bundle adjustment to produce digital terrain models which were then used to orthorectify individual images. Once orthorectification was completed, the oblique and nadir orthophotos were mosaicked separately.

Enumeration of caribou from the image mosaics occurred within geographic information system (GIS) software. A customized tool allows users to count and classify adult and calf caribou by placing colored points on the image of each animal. Point data were stored in geodatabases and archived on a local ADF&G server.

Finally, to estimate abundance and a measure of uncertainty, the method described by Rivest et al. (1998) was used. This method is based on a 2-phase sampling design. Phase 1 uses the distribution of collared caribou among groups of known size to estimate the number of caribou in groups without collared caribou. Phase 2 uses a method similar to the Horvitz-Thompson estimator and the proportion of active collars detected is used when the herd size from phase 1 is expanded, to account for caribou represented by collars that were not located during the survey. Rivest et al. (1998) describes three detection models for use in phase 2: 1) a homogeneity model, 2) independence model, and 3) threshold model. Of these three models, the threshold model has proven to be best suited for our purposes and has been used most often (Couturier 1996, Patterson et al. 2004). This model assumes that all active collars are identified in observed groups and that unobserved groups with collared caribou are missed because they are outside of the surveyed area. It is important to note that phase 2 calculations are not necessary if all collars are located and associated groups are counted. The consequences of not meeting the assumptions of phase 2 are greatly mitigated when a high proportion of the active collars are detected, and associated groups counted. This estimator assumes a random distribution of collars among caribou and, therefore, the number of collars in each group is approximately Poisson distributed. A score test to evaluate overdispersion in a Poisson distribution model is provided by Dean and Lawless (1989) to assess this assumption.

## *Results and Discussion*

### R Y17

A successful photocensus was completed on 1 July 2017. The population was estimated at 218,457 (95% CI = 202,106–234,808; Table 1). A detailed description of the methods and results can be found in the previous Species Management Report and Plan (SMRP; Caikoski 2020).

### R Y18

A survey was not conducted due to weather and postcalving caribou distribution.

### R Y19

A survey was not conducted due to weather and postcalving caribou distribution.

### R Y20

A survey was not conducted due to weather and postcalving caribou distribution.

## R21

A survey was not conducted due to weather and postcalving caribou distribution.

### *Recommendations for Activity 1.2*

Continue.

ACTIVITY 1.3. Estimate lambda (growth rate) for the Porcupine caribou herd.

### *Data Needs*

Understanding when the PCH population is increasing or decreasing is important to management biologists for evaluating IM and ANS objectives, and for regulatory and nonregulatory groups to make decisions and recommendations about regulatory actions.

### *Methods*

The growth rate is calculated retroactively following a successful photocensus and subsequent population estimate. Prior to 2010, photocensus surveys only produced a minimum count, therefore the growth rate was calculated between minimum counts. Since 2010 the photocensus methods have become more refined and an actual population estimate with an associated level of precision has been developed. The growth rate between the more recent (2010, 2013, and 2017) photocensus estimates utilizes the population estimate instead of minimum counts.

### *Results and Discussion*

Since 2017, no estimates of abundance have been obtained and therefore, growth rates have not been calculated. The previous SMRP (Caikoski 2020) outlined the estimated growth rates leading up to the 2017 photocensus which is also shown in Table 1.

### *Recommendations for Activity 1.3*

Continue.

ACTIVITY 1.4. Estimate annual survival of adult females, adult males, and yearling female caribou from collar data.

### *Data Needs*

Understanding adult female survival is fundamental to understanding population dynamics. Population models based on PCH demographics suggest that even relatively small but persistent reductions in adult female survival would result in population decline (Walsh et al. 1995, Griffith et al. 2002, Arthur et al. 2003). Adult male and yearling female survival estimates are also useful to better understand population trends, especially when abundance estimates are unavailable.

### *Methods*

Annual survival was obtained by estimating monthly survival using logistic regression with every month treated as a separate factor level and then the product of each month's estimate was used to calculate annual survival. Confidence intervals for these cumulative estimates were

approximated by bootstrapping. Annual survival was estimated for adult males, adult females, and yearling females.

### *Results and Discussion*

Adult female survival remained high at over 90% in most years (Table 2). Adult male and yearling female survival was stable but at lower annual rates, which is typical of most ungulate populations.

**Table 2. Porcupine caribou herd year-specific survival estimates for adult females, adult males, and yearling females, Alaska and Canada, 2016–2022.**

Age/Sex	Year <sup>a</sup>	Annual survival	95% Confidence interval	# Collared <sup>b</sup>
Adult females	2016	0.89	0.79–0.97	61
	2017	0.94	0.87–1.00	63
	2018	0.85	0.76–0.93	71
	2019	0.92	0.84–0.98	73
	2020	0.94	0.87–1.00	56
	2021	0.96	0.91–1.00	65
	2022	0.90	0.83–0.97	66
Adult males	2016	0.69	0.47–0.90	31
	2017	0.74	0.52–0.94	34
	2018 <sup>c</sup>	–	–	30
	2019	0.71	0.44–0.94	32
	2020	0.66	0.46–0.83	35
	2021	0.64	0.46–0.83	35
	2022	0.76	0.59–0.92	31
Yearling females	2016 <sup>c</sup>	–	–	1
	2017	0.94	0.81–1.00	18
	2018	0.82	0.62–1.00	18
	2019	0.88	0.70–1.00	19
	2020	0.80	0.61–0.96	21
	2021	0.72	0.50–0.93	18
	2022	0.83	0.64–1.00	18

<sup>a</sup> Year starts in June and ends in May; for example year 2016 = 1 June 2016 through 31 May 2017.

<sup>b</sup> Number collared represents the total number of collared animals at any point throughout the year. Includes animals that died and collars that were suspect or censored.

<sup>c</sup> Insufficient sample size to calculate survival.

### *Recommendations for Activity 1.4*

Continue.



### ACTIVITY 1.5. Estimate annual parturition rate from collared caribou.

#### *Data Needs*

Estimates of parturition rate provide a direct measure of productivity and may serve as an index to adult female body condition, particularly for 3-year-old caribou (Boertje et al. 2012).

#### *Methods*

Parturition rate was estimated by observing collared females  $\geq 3$  years of age from fixed-wing aircraft during the last week of May through the first week of June. Repeated observations of the same individuals were attempted until a newborn calf was observed. However, weather and caribou distribution did not always allow multiple observations. Caribou observed with calves, hard antlers, or distended udders were classified as parturient (Whitten 1995a).

#### *Results and Discussion*

Parturitions surveys were conducted each May-June during the RY17–RY21 reporting period.

The parturition rate for all adult females ( $\geq 3$  years of age) ranged from 70% in RY21 to 83% in RY20 (Table 3). While the parturition rate of older cows remained stable, the parturition rate of 3-year-old cows appears to be declining (Table 3). This could be an early indicator of nutritional stress in this herd and is something that will be monitored closely in the future.

**Table 3. Porcupine caribou herd parturition rates, June calf survival, and June calf-to-cow ratios during regulatory years 2017–2021, Alaska and Canada.**

Calendar year (May–June)	Parturition rate <sup>a</sup>						Running mean <sup>b</sup>
	≥ 4 yrs ( <i>n</i> )		≥ 3 yrs ( <i>n</i> )		= 3 yr ( <i>n</i> )		
2018	0.88	(41)	0.78	(50)	0.33	(9)	–
2019	0.81	(42)	0.72	(57)	0.47	(15)	–
2020	0.80	(35)	0.79	(42)	0.71	(7)	0.67
2021	0.85	(39)	0.83	(46)	0.71	(7)	0.64
2022	0.76	(34)	0.70	(46)	0.50	(12)	0.52
Mean	0.82		0.76		0.52		–

<sup>a</sup> Parturition rate is calculated as the number of parturient collared cows divided by number of collared cows.

<sup>b</sup> 5-year running mean of the 3-year-old cow parturition rate.

#### *Recommendations for Activity 1.5*

Continue.

ACTIVITY 1.6. Estimate the spatial extent of the annual calving grounds, concentrated calving areas, and aggregate extent across all years.

## Data Needs

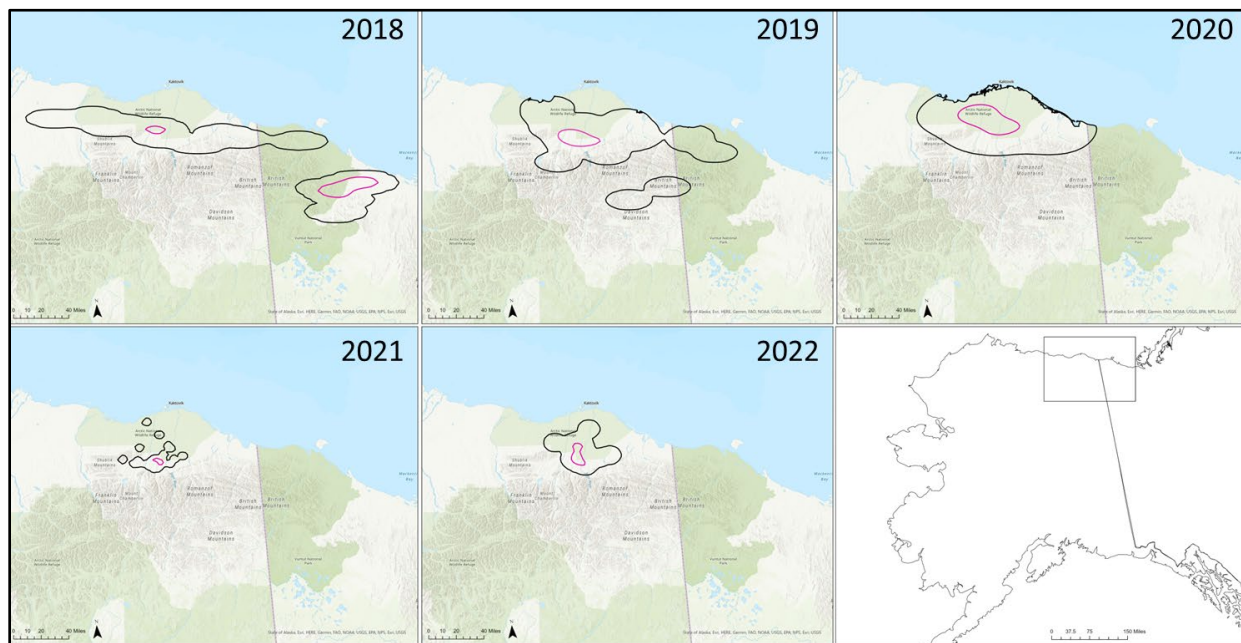
Estimates of annual calving distributions document habitat use that may be important for understanding nutritional requirements of lactating females and newborn calves, as energy and protein requirements are the highest of the year during peak lactation (Parker et al. 1990, White and Luick 1984).

## Methods

Locations of calving female caribou were obtained by conducting radio tracking flights during the calving period. The department recorded locations of cows with newborn calves at heel. The annual calving grounds were estimated from fixed-kernel analyses using Least Squares Cross Validation (Silverman 1986; Seaman et al. 1996, 1998, 1999). The extent of calving is defined as the estimated isopleth encompassing 99% of the fixed kernel utilization distribution of cows observed with a calf. Concentrated calving areas are defined as the kernel contour that included calving sites with greater than average density (Seaman et al. 1998).

## Results and Discussion

The extent of calving and the concentrated calving area were calculated for each year of the RY17–RY21 reporting period. Nearly all calving occurred within Alaska except during 2018 when calving was widespread across the North Slope and into the Yukon (Fig. 3).



**Figure 3. Extent of calving and concentrated calving areas for the Porcupine caribou herd estimated from collared caribou in Alaska and Canada during spring of 2018–2022. The extent of calving (dark line) was estimated by the isopleth encompassing 99% of the fixed kernel utilization distribution of locations with cows observed with a calf. The concentrated calving area (red line) is the area estimated to have greater than average density of caribou cows with calves.**

### *Recommendations for Activity 1.6*

Continue.

### ACTIVITY 1.7. Estimate early summer calf survival and calf-to-cow ratios.

#### *Data Needs*

Estimates of early summer calf survival and calf-to-cow ratios provide an index to recruitment potential in a given year. Poor early summer survival may be a result of poor range conditions, poor adult female body condition, adverse weather conditions, elevated predation, or a combination of these factors (Griffith et al. 2002, Whitten et al. 1992).

#### *Methods*

Early summer calf survival and calf-to-cow ratios were obtained by observing collared females  $\geq 3$  years of age from a fixed-wing aircraft during the third or fourth week of June. This approximates to about three weeks after the peak calving date.

Three metrics are calculated from these surveys:

- 1) Calf survival was estimated as the proportion of collared cows observed with a calf in late June compared to those observed with a calf in early June; this method excludes most perinatal mortality.
- 2) The calf-to-cow ratio is calculated as the number of adult female caribou observed with a calf at heel divided by the total number of adult females observed.
- 3) Calf survival rate is calculated as the calf-to-cow ratio divided by the parturition rate.

#### *Results and Discussion*

Postcalving surveys were flown in every year of the RY17–RY21 reporting period (Table 4). Survey data was compared to the long-term average for calf survival (86%), calf-to-cow ratio (58 calves:100 cows), and calf survival rate (72%), as reported by Caikoski (2020). For each metric, the RY17–RY21 mean was higher than the long-term average.

**Table 4. Porcupine caribou herd 3-week calf survival, calf-to-cow ratios, and calf survival rate during regulatory years 2017–2021, Alaska and Canada.**

Calendar year <sup>a</sup>	3-week postcalving		
	Calf survival <sup>b</sup>	Calf-to-cow ratio <sup>c</sup>	Calf survival rate <sup>d</sup>
2018	0.88	0.64	0.82
2019	0.94	0.56	0.78
2020	0.93	0.57	0.72
2021	0.90	0.63	0.76
2022	0.93	0.68	0.98
Mean	0.92	0.62	0.81

<sup>a</sup> Estimates were based on June surveys. Regulatory years are from 1 July to 30 June. June 2018 is regulatory year 2017, etc.

<sup>b</sup> Calculated as the proportion of collared cows observed with a calf in late June compared to those observed with a calf in early June (excludes most perinatal mortality).

<sup>c</sup> Calculated as the number of calves with collared cows divided by the number of collared cows observed.

<sup>d</sup> Calculated as the late June calf-to-cow ratio divided by parturition rate (assumes correct classification of parturition status and includes perinatal mortality).

### *Recommendations for Activity 1.7*

Continue.

ACTIVITY 1.8. Periodically estimate fall calf-to-cow and bull-to-cow ratios.

### *Data Needs*

Estimates of fall calf-to-cow ratios are an index of summer calf survival. Estimates of fall bull-to-cow ratios provide a measure to evaluate if there are adequate numbers of bulls for breeding and satisfactory numbers for hunter preferences. Furthermore, bull-to-cow ratios may inform appropriate harvest rates when abundance is low and harvestable surplus is near management or codified objectives. These metrics are less important when abundance estimates are regularly obtained, but may help evaluate herd status and trends in periods when a photocensus cannot be conducted. For example, a decline in bull-to-cow ratio has been documented in other Alaska caribou herds such as the Mulchatna and Western Arctic herds, during periods of population decline (Barten 2015, Dau 2015).

### *Methods*

Surveys occur near the peak of rut to take advantage of increased mixing of bulls, cows, and calf caribou. Peak of rut was estimated as the date 228 days (gestation period) prior to the mean calving date of the PCH which is 2 June (2020–2022 mean date of peak calving). Caribou groups were located by radiotracking collared caribou (both bulls and cows) from fixed-wing aircraft. Group location and the number of collars in each group were determined by fixed-wing aircraft and relayed to a helicopter immediately prior to the arrival of the helicopter to each caribou group. The department defined a group as either caribou that were lumped together and spatially separated, or distinguishable from neighboring caribou or caribou groups. The department attempted to locate all collared caribou and sample across the full spatial expanse of the herd.

The number of caribou classified per caribou group was weighted based on the number of collars present in each group. Approximately 200 random caribou were classified by helicopter per collar per caribou group (e.g., if 3 collars were present in a group, 600 caribou were classified). If caribou groups contained less than 200 caribou per collar, all or most of the caribou in those groups were classified. Caribou were classified as small bull, medium bull, large bull, cow, or calf. Group samples were recorded independently. The department did not count or estimate the total number of caribou in each group.

### *Results and Discussion*

During the RY17–RY21 reporting period no composition surveys were attempted. Either weather, caribou aggregation, or location in October of each regulatory year precluded a high probability of success for completing the survey. These surveys are expensive and if there is a low likelihood of success they are not attempted.

### *Recommendations for Activity 1.8*

Continue.

## 2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor reported and estimated harvest in Alaska and Canada.

### *Data Needs*

Estimates of annual caribou harvest are important for evaluating IM objectives and ensuring that the harvest is within sustainable limits compared to the overall population size and trends.

### *Methods*

Reported harvest (primarily nonlocal residents and nonresidents) was obtained from ADF&G's Wildlife Information Network database (WinfoNet).

Harvest reporting was poor for residents of communities within the range of the Porcupine caribou herd in Alaska. Therefore, to estimate annual harvest for those communities, the department used a model developed by Sutherland (2005) to estimate the harvest of Western Arctic caribou by residents of villages within that herd's range. The model estimates annual harvests using household surveys, and accounts for factors including community size, proximity of the herd, difficulty of the terrain, and other challenges inherent to accessing the caribou in that area. Sutherland (2005) provided estimates of caribou harvest for various villages on a per capita basis. Although the department does not have the data necessary to run the model for Arctic Village, Anaktuvuk Pass is a similar sized community, and both communities show a high reliance on caribou. Sutherland (2005) identified Anaktuvuk for consistently having the highest per capita harvest with 2 caribou per person. The department used the estimated per capita harvest by Anaktuvuk residents to estimate the harvest of PCH caribou by Arctic Village residents. The department estimated harvest by Kaktovik residents from household surveys conducted in 1987–1988 (Pedersen 1990) and adjusted per capita harvest rates for the current Kaktovik population size.

Estimates of harvest in Canada are obtained from reports by the Porcupine Caribou Management Board (PCMB). Harvest for communities in Canada are collected through annual subsistence surveys for the communities within the range of the PCH in Yukon and Northwest Territories.

### *Results and Discussion*

#### Harvest by Hunters-Trappers

Reported harvest in Alaska ranged from 84–236 during RY17–RY21 (Table 5). Unreported harvest by rural residents in Alaska was estimated at 400–700 caribou (Table 5). For unreported harvest, the department estimated the harvest of PCH caribou by Arctic Village residents was 200–350 caribou per year and estimated the harvest by Kaktovik residents at 200–250 caribou per year. In some years, caribou were opportunistically harvested by residents of Venetie, Beaver, Fort Yukon, and Chalkyitsik which are on the periphery of the PCH’s range; this combined harvest was estimated to be 0–100 caribou per year.

Harvest in Canada has not been reported in recent years, but has been estimated in the past to be between 1,000 and 4,500 caribou (Caikoski 2020). Based on the abundance estimate of 218,000 caribou, the total harvest rate was at or below 2.5% during RY17–RY21 (Table 5).

**Table 5. Porcupine caribou herd harvest during regulatory years 2017–2021, Alaska and Canada.**

Regulatory year	Reported in Alaska				Estimated		
	Male	Female	Unknown	Total	Alaska	Canada	Total
2017	138	11	0	149	400–700	1,000–4,500	1,400–5,200
2018	78	6	0	84	400–700	1,000–4,500	1,400–5,200
2019	144	12	0	156	400–700	1,000–4,500	1,400–5,200
2020	157	23	0	180	400–700	1,000–4,500	1,400–5,200
2021	186	17	0	203	400–700	1,000–4,500	1,400–5,200

### *Recommendations for Activity 2.1*

Continue to collect and monitor harvest with an emphasis on improving harvest reporting from rural communities.

### 3. Habitat Assessment-Enhancement

No habitat-related activities to benefit caribou occurred during RY17–RY21.

## NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

### Data Recording and Archiving

Harvest data was stored on an internal database (WinfoNet). Electronic copies of data, reports, and memorandums will be stored in WinfoNet | Data archive | Porcupine Caribou Management Program | Project ID: Porcupine Caribou | Primary Region: Region III.

### Agreements

The agreement between Alaska and Yukon, Canada is titled *Agreement between the Government of Canada and the Government of the United States of America on the Conservation of the Porcupine Caribou Herd* (1987; Appendix A).

### Permitting

None.

## Conclusions and Management Recommendations

The objectives for the RY17–RY21 reporting period were assessed as follows:

- C1. The ANS objective of 1,250–1,550 caribou is less than 1% of the most recent photocensus estimate (2017) and is therefore sustainable.
- C2. The most recent population estimate in 2017 of 218,457 (SE  $\pm$  7,750) caribou was above the IM objective of 100,000–150,000 caribou.
- C3. The harvest objective of 1,500–2,000 caribou was not met because less than 1,000 caribou were harvested annually in Alaska during RY17–RY21. However, at the current population estimate, the harvestable surplus for this herd provides for the opportunity to meet this objective.
- M1. Change the management objective from a set minimum population size (135,000 caribou) to an objective to maintain a population of caribou that allows for hunting and viewing opportunities in Alaska.

Overall, the survey and inventory strategy for PCH should remain unchanged in the future. The current system allows an evaluation of herd demography and population trajectory while also evaluating subsistence needs and harvest pressure. These parameters are all useful in making management decisions, conveying information to the public, and understanding population changes.

## II. Project Review and RY22–RY26 Plan

### Review of Management Direction

#### MANAGEMENT DIRECTION

There are no changes in the management direction for the Porcupine caribou herd in Units 25A, 25B, 25D, and 26C from the previous reporting period, RY17–RY21.

#### GOALS

Management goals for the PCH are based on objectives listed in the *Agreement between the Government of Canada and the Government of the United States of America on the Conservation of the Porcupine Caribou Herd* (1987; Appendix A).

- G1. Conserve PCH and its habitat through international cooperation and coordination so the risk of irreversible damage or long-term adverse effects as a result of the use of caribou or their habitat is minimized.
- G2. Ensure opportunities for customary and traditional uses of PCH.
- G3. Enable users of PCH to participate in international efforts to conserve PCH and its habitat.
- G4. Encourage cooperation and communication among governments, users of PCH, and others to achieve objectives.

#### CODIFIED OBJECTIVES

##### Amounts Reasonably Necessary for Subsistence Uses

- C1. The Porcupine caribou herd has a positive finding for customary and traditional use of caribou in Units 25A, 25B, 25D, 26B, and 26C and an amount reasonably necessary for subsistence uses of 1,250–1,550 caribou.

##### Intensive Management

- C2. Population objective: 100,000–150,000 caribou.
- C3. Harvest objective: 1,500–2,000 caribou.

#### MANAGEMENT OBJECTIVES

- M1. Maintain a population of caribou that allows for hunting and viewing opportunities in Alaska.



## REVIEW OF MANAGEMENT ACTIVITIES

### 1. Population Status and Trend

ACTIVITY 1.1. Deployment and maintenance of GPS collars.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.2. Photocensus and abundance estimates

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.3. Estimate lambda (growth rate) for the Porcupine caribou herd.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.4. Estimate annual survival of adult females, adult males, and yearling female caribou from collar data.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.5. Estimate annual parturition rate from collared caribou.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.6. Estimate the spatial extent of the annual calving grounds, concentrated calving areas, and aggregate extent across all years.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.7. Estimate early summer calf survival and calf-to-cow ratios.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

ACTIVITY 1.8. Periodically estimate fall calf-to-cow and bull-to-cow ratios.

*Data Needs*

No changes from RY17–RY21 reporting period.

*Methods*

No changes from RY17–RY21 reporting period.

## 2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor reported and estimated harvest in Alaska and Canada.

*Data Needs*

No changes from RY17–RY21 reporting period.

### *Methods*

No changes from RY17–RY21 reporting period.

### 3. Habitat Assessment-Enhancement

No habitat-related activities to benefit the Porcupine caribou herd are planned for RY22–RY26.

## **NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS**

### Data Recording and Archiving

No changes from RY17–RY21 reporting period.

### Agreements

No changes from RY17–RY21 reporting period.

### Permitting

None.

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**Appendix A. Agreement between the government of Canada and the government of the United States of America on the conservation of the Porcupine caribou herd.**

**Agreement  
Between the Government of Canada  
and the Government of the United States of America on the Conservation of  
the Porcupine Caribou Herd**

*Ottawa, July 17, 1987*

*In force, July 17, 1987*

The Government of Canada and the Government of the United States of America, hereinafter called the “Parties”:

RECOGNIZING that the Porcupine Caribou Herd regularly migrates across the international boundary between Canada and the United States of America and that caribou in their large free-roaming herds comprise a unique and irreplaceable natural resource of great value which each generation should maintain and make use of so as to conserve them for future generations;

ACKNOWLEDGING that there are various human uses of caribou and that for generations certain people of Yukon Territory and the Northwest Territories in Canada have customarily and traditionally harvested Porcupine Caribou to meet their nutritional, cultural and other essential needs and will continue to do so in the future, and that certain rural residents of the State of Alaska in the United States of America have harvested Porcupine Caribou for customary and traditional uses and will continue to do so in the future, and that these people should participate in the conservation of the Porcupine Caribou Herd and its habitat;

RECOGNIZING the importance of conserving the habitat of the Porcupine Caribou herd, including such areas as calving, post-calving, migration, wintering and insect relief habitat;

UNDERSTANDING that the conservation of the Porcupine Caribou Herd and its habitat requires goodwill among landowners, wildlife managers, users of the caribou and other users of the area;

RECOGNIZING that the Porcupine Caribou Herd should be conserved according to ecological principles and that actions for the conservation of the Porcupine Caribou Herd that result in the long-term detriment of other indigenous species of wild fauna and flora should be avoided;

RECOGNIZING that co-operation and co-ordination under the Agreement should not alter domestic authorities regarding management of the Porcupine Caribou Herd and its habitat and should be implemented by existing rather than new management structures;

HAVE AGREED as follows:

1. Definitions

For the purpose of this Agreement only:

- a. “Porcupine Caribou Herd” means those migratory barren ground caribou found north of 64 degrees, 30’ north latitude and north of the Yukon River which usually share common and traditional calving and post-calving aggregation grounds between the Canning River in the State of Alaska and the Babbage River in Yukon Territory and



which historically migrate within the State of Alaska, Yukon Territory, and the Northwest Territories.

- b. “Conservation” means the management and use of the Porcupine Caribou Herd and its habitat utilizing methods and procedures which ensure the long-term productivity and usefulness of the Porcupine Caribou Herd. Such methods and procedures include, but are not limited to, activities associated with scientific resources management such as research, law enforcement, census taking, habitat maintenance, monitoring and public information and education.
- c. “Habitat” means the whole or any part of the ecosystem, including summer, winter and migration range, used by the Porcupine Caribou Herd during the course of its long-term movement patterns, as generally outlined on the map attached as an Annex.

## 2. Objectives

The objectives of the Parties are:

- a. To conserve the Porcupine Caribou Herd and its habitat through international co-operation 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;
- b. To ensure opportunities for customary and traditional uses of the Porcupine Caribou Herd by:
  - (1) in Alaska, rural Alaska residents in accordance with 16 U.S.C. 3113 and 3114, AS 16.05.940(23), (28) and (32), and AS 16.05.258(c); and
  - (2) in Yukon and the Northwest Territories, Native users as defined by sections A8 and A9 of the Porcupine Caribou Management Agreement (signed on October 26, 1985) and those other users identified pursuant to the process described in section E2(e) of the said Agreement;
- c. To enable users of Porcupine Caribou to participate in the international co-ordination of the conservation of the Porcupine Caribou Herd and its habitat;
- d. To encourage co-operation and communication among governments, users of Porcupine Caribou and others to achieve these objectives.

## 3. Conservation

- a. The Parties will take appropriate action to conserve the Porcupine Caribou Herd and its habitat.
- b. The Parties will ensure that the Porcupine Caribou Herd, its habitat and the interests of users of Porcupine Caribou are given effective consideration in evaluating proposed activities within the range of the Herd.
- c. Activities requiring a Party’s approval having a potential impact on the conservation of the Porcupine Caribou Herd or its habitat will be subject to impact assessment and review consistent with domestic laws, regulations and processes.
- d. Where an activity in one country is determined to be likely to cause significant long-term adverse impact on the Porcupine Caribou Herd or its habitat, the other Party will be notified and given an opportunity to consult prior to final decision.
- e. Activities requiring a Party’s approval having a potential significant impact on the conservation or use of the Porcupine Caribou Herd or its habitat may require mitigation.
- f. The Parties should avoid or minimize activities that would significantly disrupt migration or other important behavior patterns of the Porcupine Caribou Herd or that would otherwise lessen the ability of users of Porcupine Caribou to use the Herd.

- g. When evaluating the environmental consequences of a proposed activity, the Parties will consider and analyze potential impacts, including cumulative impacts, to the Porcupine Caribou Herd, its habitat and affected users of Porcupine Caribou.
  - h. The Parties will prohibit the commercial sale of meat from the Porcupine Caribou Herd.
4. International Porcupine Caribou Board
- a. The Parties will establish an advisory Board to be known as the International Porcupine Caribou Board, hereinafter called the Board.
  - b. The Parties will each appoint four members of the Board within a reasonable period following the entry into force of the present Agreement.
  - c. The Board will:
    - (1) adopt rules and procedures for its operation, including those related to the chairmanship of the Board; and
    - (2) give advice or make recommendations to the Parties, subject to concurrence by a majority of each party's appointees.
  - d. The Board, seeking, where appropriate, information available from management agencies, local communities, users of Porcupine Caribou, scientific and other interests, will make recommendations and provide advice on those aspects of the conservation of the Porcupine Caribou Herd and its habitat that require international co-ordination, including but not limited to the following:
    - (1) the sharing of information and consideration of actions to further the objectives of this Agreement at the international level;
    - (2) the actions that are necessary or advisable to conserve the Porcupine Caribou Herd and its habitat;
    - (3) co-operative conservation planning for the Porcupine Caribou Herd throughout its range;
    - (4) when advisable to conserve the Porcupine Caribou Herd, recommendations on overall harvest and appropriate harvest limits for each of Canada and the United States of America taking into account the Board's review of available data, patterns of customary and traditional users and other factors the Board deems appropriate;
    - (5) the identification of sensitive habitat deserving special consideration; and
    - (6) recommendations, where necessary, through the Parties as required, to other boards and agencies in Canada and the United States of America on matters affecting the Porcupine Caribou Herd or its habitat.
  - e. It is understood that the advice and recommendations of the Board are not binding on the Parties; however, by virtue of this Agreement, it has been accepted that the parties will support and participate in the operation of the Board. In particular they will:
    - (1) provide the Board with the information regarding the conservation and use of the Porcupine Caribou Herd and its habitat;
    - (2) promptly notify the Board of proposed activities that could significantly affect the conservation of the Porcupine Caribou Herd or its habitat and provide an opportunity to the Board to make recommendations;
    - (3) consider the advice and respond to the recommendations of the Board; and
    - (4) provide written reasons for the rejection in whole or in part of conservation recommendations made by the Board.

5. International Responsibility

The Parties will consult promptly to consider appropriate action in the event of:

- a. significant damage to the Porcupine Caribou Herd or its habitat for which there is responsibility, if any, under international law; or
- b. significant disruption of migration or other important behavior patterns of the Porcupine Caribou Herd that would significantly lessen the ability of users of Porcupine Caribou to use the Herd.

6. Implementation

Co-operation and co-ordination under and other implementation of this Agreement shall be consistent with the laws, regulations and other national policies of the Parties and is subject to the availability of funding.

7. Interpretation and Application

All questions related to the interpretation or application of the Agreement will be settled by consultation between the Parties.

8. Entry into force; Amendments

- a. This agreement which is authentic in English and French shall enter into force on signature and shall remain in force until terminated by either Party upon twelve months' written notice to the other.
- b. At the request of either Party, consultations will be held with a view to convening a meeting of the representatives of the Parties to amend this Agreement.

IN WITNESS WHEREOF, the undersigned, being duly authorized by their respective Governments, have signed this Agreement.

DONE at Ottawa, in duplicate, this 17th day of July, 1987 in the English and French languages, both texts being equally authentic.

Thomas M. McMillan  
FOR THE GOVERNMENT OF CANADA

Donald Paul Hodel  
FOR THE GOVERNMENT OF THE UNITED STATES OF AMERICA



