Caribou
Management Report
of survey-inventory activities
1 July 2006–30 June 2008

Patricia Harper, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation

Photo by Geoff Carroll, ADF&G

Funded through
Federal Aid in Wildlife Restoration
Grants W-33-5, and W-33-6
2009 Set

STATE OF ALASKA
Sean Parnell, Governor

DEPARTMENT OF FISH AND GAME
Denby Lloyd, Commissioner

DIVISION OF WILDLIFE CONSERVATION
Corey Rossi, Director

For a hard copy of this report please direct requests to our publications specialist:

Publications Specialist
ADF&G, Wildlife Conservation
P.O. Box 115526
Juneau, AK 99811-5526
(907) 465-4176
dfg.dwc.publications@alaska.gov

Please note that population and harvest data in this report are estimates and may be refined at a later date.

Cover Photo: Caribou of the Western Arctic herd gather in an area in northwestern Alaska that provides some relief from insects. Biologists conduct photo censuses of the herd during these times by using airplanes to radiotrack and photograph the groups of caribou using a large format film camera and then count the number of caribou in pictures to estimate herd population. ADF&G's area management biologist for the western North Slope, Geoff Carroll, took this picture with his digital camera as he and pilot Jim Dau, an ADF&G research biologist studying the herd, flew over the group during the 2009 photo census. *Photo by Geoff Carroll, ADF&G*

Caribou
Management Report
of survey-inventory activities
1 July 2006–30 June 2008

Patricia Harper, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation

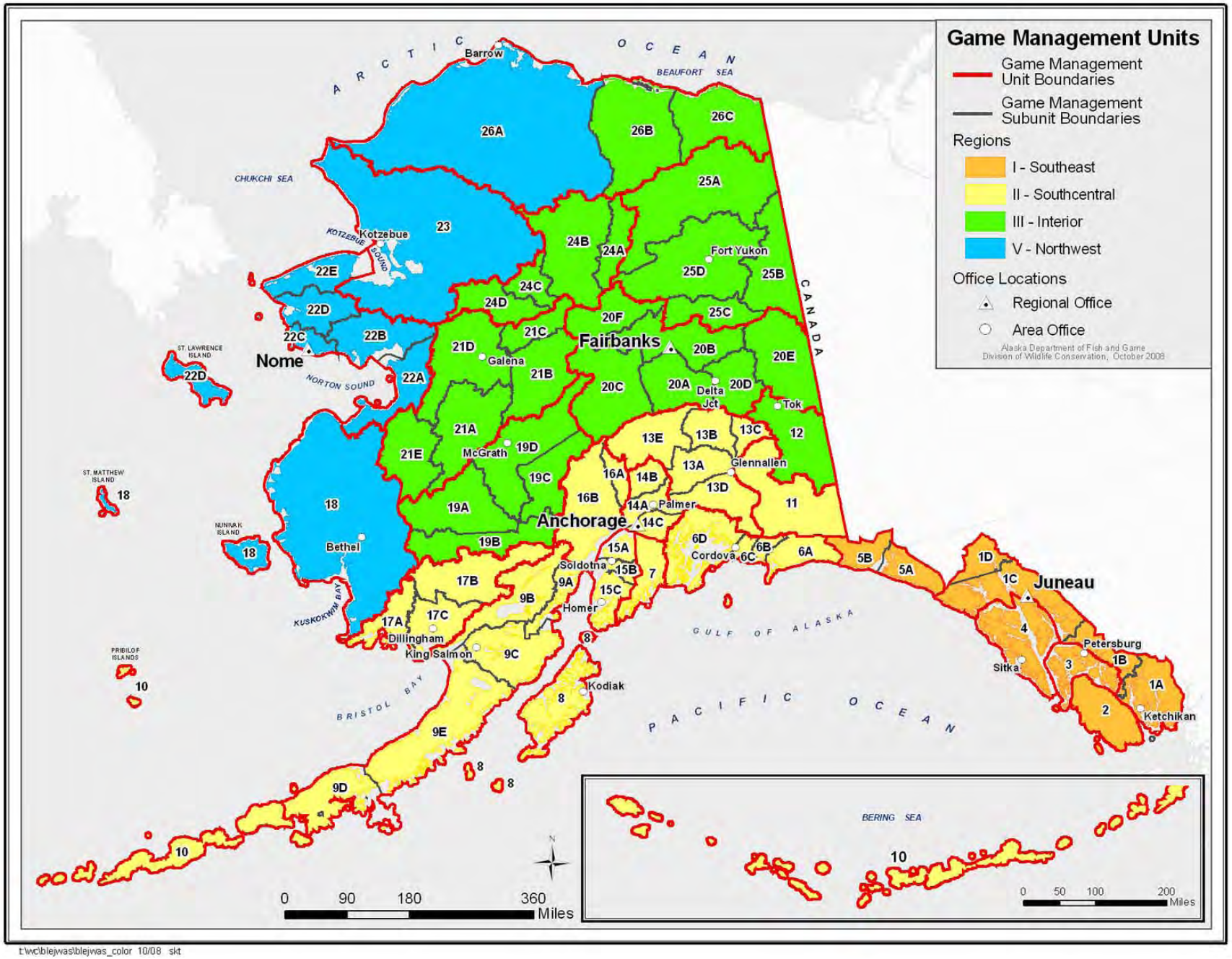
Funded through
Federal Aid in Wildlife Restoration
Grants W-33-5, and W-33-6
2009 Set

If this report is used in its entirety, please reference as: Alaska Department of Fish and Game. 2009. Caribou management report of survey-inventory activities 1 July 2006–30 June 2008. P. Harper, editor. Juneau, Alaska.

Please note that this report was released as a complete set in 2010, but is part of the 2009 set of species management reports. We encourage citing of this report as a 2009 report to maintain understanding of when reports were written and ease of locating this particular set of reports.

CARIBOU MANAGEMENT REPORT
TABLE OF CONTENTS

From: 1 July 2006
To: 30 June 2008



t:\wc\blejwas\blejwas_color 10/08 skt

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 P.O. BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

LOCATION

GAME MANAGEMENT UNITS: 7 and 15 (8397 mi^2)

HERDS: Kenai Mountains, Kenai Lowlands, Killey River and Fox River

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

Historical reports say caribou were abundant on the Kenai Peninsula before a series of large fires in the late 1800s, including a massive fire in 1883 (Sherwood 1974). This large-scale disturbance may have destroyed much of the lichen forage used by caribou and, due to long regeneration times for this important winter forage, may have influenced their population decline. Allen (1901) reported that the Andrew Stone expedition of 1900 collected caribou from the Kenai Peninsula for the American Museum of Natural History and reported that caribou were very scarce and soon would be exterminated by hunters who sold antlers of moose and caribou "at good prices for shipment to San Francisco." It is likely that large-scale fire coupled with unregulated hunting caused caribou to be extirpated from the Kenai Peninsula by the early 20th century. Currently there are four recognized herds on the peninsula, which were recently established through reintroduction efforts. Reintroductions in 1965 and 1966 established the Kenai Mountain (KM) and Kenai Lowlands (KL) herds. Additional reintroductions in 1985 and 1986 established the Killey River (KR) and Fox River (FR) herds.

The KM herd in Unit 7 currently numbers more than 300 animals and ranges over 1400 km^2 in the drainages of Chickaloon River, Big Indian Creek, and Resurrection Creek. The herd grew to more than 200 animals 7 years after the 1965 reintroduction and numbered more than 400 by the mid 1980s. The population declined twice after it exceeded 400 animals. The herd has been hunted since 1972. From 1972 to 1976, the department issued an unlimited number of registration permits, and the season was closed by emergency order when the harvest exceeded sustainable limits. In 1977, a limited drawing permit system was implemented and remains in place. Past fluctuations in population size suggest the carrying capacity for this herd is 300-400 caribou, due to limited winter range.

The KL herd summers in Subunit 15A north of the Kenai airport to the Swanson River and in the extreme western portion of 15B. The population winters on the lower Moose River to the outlet of

Skilak Lake and in the area around Browns Lake. Its range encompasses around 1200 km^2 in and around the communities of Soldotna, Kenai, and Sterling. This herd has shown the slowest growth compared to the other Kenai herds. Numbers slowly increased to more than 100 caribou 20 years after their reintroduction in 1966. The herd presently numbers about 100–120 individuals. Growth in this population has been limited by predation rather than by habitat. Free-ranging domestic dogs and coyotes kill calves in summer and wolves prey on all age classes during winter. In addition to natural mortality, highway vehicles typically kill several caribou annually. Hunts were held in 1981, 1989, 1990, 1991, and 1992, but no permits have been issued since.

The KR herd inhabits over 600 km^2 including the upper drainages of Funny and Killey Rivers and north to the Skilak River in Subunit 15B. For management purposes, the KR herd now includes the group of caribou formerly identified as the Twin Lakes caribou herd, which occupies the area drained by Benjamin Creek. The KR herd now numbers around 300 individuals. This herd grew steadily to more than 700 animals until 2001, when avalanches in subsequent winters killed almost 200 caribou. Due to the nature of the habitat, avalanches may be a significant limiting factor for KR caribou and caribou may compete with an abundant population of Dall sheep for winter range. The KR herd has been hunted since 1994.

The FR herd has the smallest range of all Kenai herds at about 120 km^2 south of the Tustumena Glacier between upper Fox River and Truli Creek in Subunit 15C. The FR herd peaked in 1998 at nearly 100 caribou and now appears to be much lower and could possibly no longer be a viable herd. Very limited hunting occurred on his herd from 1995–2003.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Kenai Mountains caribou: to maintain a posthunt population of 300–400 animals.

Kenai Lowlands caribou: to increase the herd to a minimum of 150. Hunting will be allowed once this objective is reached.

Killey River and Fox River caribou: to maintain viable caribou populations throughout suitable habitat and to provide for opportunities to hunt these herds when deemed sustainable.

METHODS

When funds were available, we flew aerial surveys in fixed winged aircraft to determine the number, distribution, and composition of caribou herds. We also capture animals from the separate herds periodically to maintain a sample of collared animals to assist with our management efforts. The department collected harvest data through a mandatory reporting requirement of the drawing permit hunts.

POPULATION STATUS AND TREND

Population Size and Composition

Kenai Mountains: The herd currently numbers around 325 animals (Table 1). No composition counts have been conducted during the reporting period.

Kenai Lowlands: The current population size is about 100–120 caribou; 23% calves were tallied during the last two surveys (Table 2).

Killey River: The population was estimated at about 250 caribou following a survey in the fall of 2006 (Table 3).

Fox River Caribou. No surveys were conducted during the reporting period but a flight in 2004 counted 29 caribou on an icefield south of Truli Creek. The population likely numbers under 50 animals and may be dispersing westward (Table 4).

MORTALITY

Harvest

Season and Bag Limits.

Kenai Mountains: The season for resident and nonresident hunters in Unit 7 north of the Sterling Highway and west of the Seward Highway has been 10 August–31 December since 1999. The bag limit was one caribou by drawing permit (DC001) with 250 permits issued each year since 1996 (Table 5).

Kenai Lowlands: The season has been closed since 1993.

Killey River: The season for resident and nonresident hunters in Subunits 15B south and west of Killey River in the Kenai National Wildlife Refuge was 10 Augugust–20 September. Since 2004, the bag limit has been one bull by drawing permit (DC608) with 25 permits issued (Table 6).

Fox River: The season has been closed since 2004.

Board of Game Actions and Emergency Orders

There were no Board of Game actions regarding Kenai Peninsula caribou during this report period.

Hunter Residency and Success

Residency and success rates for the KM and KR caribou hunts are shown in Tables 7 and 8.

Harvest Chronology

Harvest chronologies for the KM and KR caribou hunts are shown in Tables 9 and 10.

Transport Methods

Transport methods for the KM and KR caribou hunts are shown in Tables 11 and 12. Caribou in these populations are well off the road system and in areas with restricted access methods. Therefore, access to the hunting grounds requires long hikes, horseback trips, or access via float plane on limited lakes.

HABITAT

Habitat has been assessed indirectly through measurements of 10-month-old calf weights. The KM caribou had calf weights decreasing each year from 1996 through 2002, but were still generally above the weights of Nelchina calves (Bruce Dale, ADF&G wildlife biologist, personal communication). It is not known if the decline in weights was due to decreasing summer or winter forage quality, a series of deep snow winters, or other factors. Winter range is limited to windswept ridges and restricts the expansion of this herd. The KR caribou calf weights decreased in the late 1990s but were still heavier than KM caribou. The notable decrease in caribou numbers from avalanches may reduce any density-dependent effects in the short-term. Mean adult female weights on the KL herd (130 kg) were significantly greater than KM caribou (108 kg) measured in April of 1991 ($t = 4.7$, $P < 0.01$). High body weights and high calf counts directly after parturition indicate the KL caribou are not limited by range. More intensive collaring of FR caribou could reveal whether animals are dispersing into other available range south of the Fox River, west toward Seward, or if their growth is limited by other factors. Caribou have been recently reported east of the Harding ice field near Seward, which may be dispersing FR or KL individuals. Although caribou inhabited the Seward area more than 100 years ago (Porter 1893), it is unknown if the small number of dispersing caribou is enough to establish a population. The current small number of FR caribou puts the population at risk of extirpation.

Department and Kenai National Wildlife Refuge biologists conducted preliminary habitat assessments for the Killey and Fox River herds before reintroduction in the mid 1980s. These results, published in the Kenai Peninsula Caribou Management Plan (1994), indicated the KR caribou winter range (516 km^2) should sustain a herd of 400–500 caribou, and the FR caribou winter range (85 km^2) could sustain approximately 80 animals. Calf recruitment for these herds has been moderately low, and habitat may now be limiting the growth of the Killey River, Fox River and Kenai Mountains herds.

CONCLUSIONS AND RECOMMENDATIONS

Caribou studies on the Kenai have been conducted through cooperative efforts of the Alaska Department of Fish & Game, Kenai National Wildlife Refuge, and the U.S. Forest Service. Each herd has unique limiting factors impacting its growth. Future monitoring and research is greatly limited by a decline in funding. Basic monitoring and research would include traditional counts and collaring efforts, assessing seasonal movements and dispersal into new range using Global Positioning System (GPS) collars, monitoring calf condition in the spring and fall as an index of winter and summer habitat quality, and assessing predation pressure by monitoring adult and calf survival.

LITERATURE CITED

ALLEN, J. A. 1901. Description of a new caribou from Kenai Peninsula, Alaska. Bulletin of the American Museum of Natural History. Volume 14, Article 10, pp. 143-148.

PORTER, R.P. 1893. Report on population and resources of Alaska at the Eleventh Census: 1890. U.S. Dept. of Interior. Census Office.

SHERWOOD, M. 1974. The Cook Inlet collection, two hundred years of selected Alaskan history. Alaska Northwest Publishing Company, Anchorage, Alaska.

PREPARED BY:
Jeff Selinger
Wildlife Biologist

SUBMITTED BY:
Gino Del Frate
Management Coordinator

Please cite any information taken from this section, and reference as:

SELINGER, J. 2009. Units 7 & 15 caribou management report. Pages 1–10 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 Kenai Mountains caribou composition counts and estimated population size, 2003–2007

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2003–04		-no surveys conducted-			
2004–05		-no surveys conducted-			
2005–06				295	325
2006–07		-no surveys conducted-			
2007–08		-no surveys conducted-			

TABLE 2 Kenai Lowlands caribou composition counts and estimated population size, 2003–2007

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2003–04			28	88	135
2004–05			19	83	135
2005–06			23	100	135
2006–07		-no surveys conducted-			
2007–08			23	98	120

TABLE 3 Killey River caribou composition counts and estimated population size, 2003–2007

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2003–04		-no surveys conducted-			
2004–05		-no surveys conducted-			
2005–06		-no surveys conducted-			
2006–07				216	250
2007–08		-no surveys conducted-			

TABLE 4 Fox River caribou fall composition counts and estimated population size, 2003–2007

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2003–04		-no surveys conducted-			
2004–05				29	29
2005–06		-no surveys conducted-			
2006–07		-no surveys conducted-			
2007–08		-no surveys conducted-			

TABLE 5 Kenai Mountains caribou harvest (DC001), 2003–2007

Regulatory year	Permits issued	Permitees that hunted	Harvest			Total harvest
			bulls	cows	unknown	
2003–04	250	124	14	7	1	22
2004–05	250	109	10	7		17
2005–06	250	99	16	5		21
2006–07	250	99	10	7		17
2007–08	250	99	9	9	1	19

TABLE 6 Killey River caribou harvest (DC608), 2003–2007

Regulatory year	Permits issued	Permitees that hunted	Harvest			Total harvest
			bulls	cows	unknown	
2003–04	75	32	10	6	0	16
2004–05	25	12	11	0	0	11
2005–06	25	10	3	0	0	3
2006–07	25	8	6	0	0	6
2007–08	25	12	4	0	0	4

TABLE 7 Kenai Mountains caribou, hunter residency and success (DC001), 2003–2007

Regulatory year	Successful					Unsuccessful				Total hunters
	Local [a] resident	Nonlocal resident	Non-resident	Total	Percent success	Local [a] resident	Nonlocal resident	Non-resident	Total	
2003–04	0	22	0	22	18	5	96	1	102	124
2004–05	1	13	3	17	16	2	87	3	92	109
2005–06	2	18	1	21	21	3	75	0	78	99
2006–07	0	17	0	17	17	10	66	6	82	99
2007–08	2	16	1	19	19	7	71	2	80	99

[a] Local = residents of Unit 7.

TABLE 8 Killey River caribou, hunter residency and success (DC608), 2003–2007

Regulatory year	Successful					Unsuccessful				Total hunters
	Local [a] resident	Nonlocal resident	Non-resident	Total	Percent success	Local [a] resident	Nonlocal resident	Non-resident	Total	
2003–04	11	4	1	16	18	35	33	5	73	89
2004–05	7	3	1	11	92	0	1	0	1	12
2005–06	2	1	0	3	30	2	5	0	7	10
2006–07	3	1	2	6	75	0	2	0	2	8
2007–08	3	0	1	4	33	2	4	2	8	12

[a] Local = residents of Unit 15.

TABLE 9 Kenai Mountains caribou, harvest chronology (DC001), 2003–2007

Regulatory year	Harvest Periods				Harvest
	8/10–8/31	9/01–9/30	10/01–10/31	11/01–12/31	
2003–04	12	4	4	2	22
2004–05	7	7	3	0	17
2005–06	11	7	2	1	21
2006–07	4	10	3	0	17
2007–08	11	5	3	0	19

TABLE 10 Killey River caribou, harvest chronology (DC608), 2003–2007

Regulatory year	Harvest Periods				Harvest
	8/10–8/15	8/16–8/31	9/01–9/15	9/16–9/30	
2003–04	2	6	5	3	16
2004–05	2	2	6	1	11
2005–06	2	1	0	0	3
2006–07	0	0	6	0	6
2007–08	2	2	0	0	4

TABLE 11 Kenai Mountains caribou, harvest (DC001) by transport method, 2003–2007

Regulatory year	Airplane	Horse	Boat	3/4 wheel-ATV-ORV	Highway vehicle	Snow-machine	Other-Unknown	Harvest
2003–04	2	4	0	0	12	0	4	22
2004–05	1	5	0	0	10	0	1	17
2005–06	0	2	0	0	17	0	2	21
2006–07	1	6	0	0	9	0	1	17
2007–08	0	0	0	0	15	0	4	19

TABLE 12 Killey River caribou, harvest (DC608) by transport method, 2003–2007

Regulatory year	Airplane	Horse	Boat	3/4 wheel-ATV-ORV	Highway vehicle	Snow-machine	Other-Unknown	Harvest
2003–04	1	13	1	0	0	0	1	16
2004–05	2	6	2	0	0	0	1	11
2005–06	1	1	0	0	0	1	0	3
2006–07	4	2	0	0	0	0	0	6
2007–08	2	0	2	0	0	0	0	4

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 P.O. BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

LOCATION

GAME MANAGEMENT UNITS: 9B, 17, 18 south, 19A and 19B (60,000 mi^2)

HERD: Mulchatna

GEOGRAPHIC DESCRIPTION: Drainages into northern Bristol Bay and Kuskokwim River

BACKGROUND

There was little objective information available on the Mulchatna caribou herd (MCH) before 1973. The first historical accounts of caribou in the area are contained in the journals of agents of the Russian-American Fur Company (Van Stone 1988). In 1818, while traveling through areas now included in Game Management Units 17A and 17C, Petr Korsakovskiy noted that caribou were "plentiful" along Nushagak Bay, and there were "considerable" numbers of caribou in the Togiak Valley. Another agent, Ivan Vasilev, wrote that his hunters brought "plenty of caribou" throughout his journey up the Nushagak River and into the Tikchik Basin in 1829. Skoog (1968) hypothesized that the caribou population at that time extended from Bristol Bay to Norton Sound, including the lower Yukon and Kuskokwim drainages as far inland as the Innoko River and the Taylor Mountains. This herd apparently reached peak numbers in the 1860s and began declining in the 1870s. By the 1880s, the large migrations of caribou across the Lower Kuskokwim and Yukon Rivers had ceased.

Caribou numbers in the Mulchatna River area began to increase again in the early 1930s (Alaska Game Commission Reports, 1925–39), then began declining in the late 1930s (Skoog 1968); however, no substantive information was collected between 1940 and 1950 to support this theory.

Reindeer were brought into the northern Bristol Bay area early in the 20th century to supplement the local economy and food resources. Documentation of the numbers and fate of these animals is scarce, but local residents remember a thriving, widespread reindeer industry before the 1940s. Herds ranged from the Togiak to the Mulchatna River drainages, with individual herders following small groups throughout the year. Suspected reasons for the demise of the reindeer herds include wolf predation and the expansion of the commercial fishing industry, which increased dependence upon a cash-based local economy and decreased interest in herding reindeer. Local residents also suggest many reindeer interbred with Mulchatna caribou and eventually joined the herd.

Aerial surveys of the MCH range were first conducted in 1949, when the population was estimated at 1,000 caribou (ADF&G files 1974). The population increased to approximately 5,000 by 1965 (Skoog 1968). In 1966 and 1972 relatively small migrations across the Kvichak River were recorded; however, no major movements of this herd were observed until the mid 1990s. An estimated 6,030 caribou were observed during a survey in June 1973. In June 1974 a major effort was made to accurately census this herd. That census yielded 13,079 caribou, providing a basis for an October estimate in 1974 of 14,231 caribou.

We used photo censuses to monitor the herd as it declined through the 1970s. Seasons and bag limits were reduced continuously during that decade. Locating caribou during surveys was difficult, and biologists often underestimated the herd size. Twenty radio transmitters were attached to MCH caribou in 1981, providing assistance in finding postcalving aggregations. During a photo census in June 1981, 18,599 caribou were counted, providing an extrapolated estimate of 20,618 caribou. Photo-census estimates of the MCH since then have been used to document population size. The aerial photo census in July 2006 provided a minimum estimate of 45,000 caribou in the MCH.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

- To maintain a population of 100,000–150,000 with a minimum bull:cow ratio of 35:100.

Additional objectives include:

- Manage the MCH for maximum opportunity to hunt caribou.

METHODS

We conducted a photo census of the MCH during the postcalving aggregation period in late June or early July in most years from 1980 to 1992. From 1993 through 2003 the censuses were scheduled on alternate years. Since then, censuses have been planned for each year, with the realization a successful census would likely occur about 2 out of 3 years. The last photo censuses were conducted at the beginning of this reporting period, in July 2006, and just after the end of this reporting period, in July 2008. Alaska Department of Fish and Game (ADF&G) coordinates censuses out of the Dillingham area office in cooperation with staff from the Bethel, McGrath, Palmer, and Fairbanks ADF&G offices; and personnel from Togiak National Wildlife Refuge (TNWR), Yukon Delta National Wildlife Refuge (YDNWR) and Lake Clark National Park and Preserve (LCNPP); with additional funding provided by the Bureau of Land Management (BLM). Biologists, using fixed-wing aircraft, radiotrack and survey the herd's range, estimate the number of caribou observed, and photograph discrete groups. Since 1994 we have photographed large aggregations with an aerial mapping camera mounted in a DeHavilland Beaver (DH-2) aircraft flown by ADF&G staff. We estimate herd size by adding 1) the number of caribou counted in photographs; 2) the number of caribou observed but not photographed; and, 3) the estimated number of caribou represented by radiocollared caribou not located during the census.

We conducted aerial surveys to estimate the sex and age composition of the herd with a Cessna 185 and Robinson R-44 helicopter each October. Groups of caribou are located by radiotracking with the Cessna. Then the helicopter is used to herd small groups while the number of caribou in each of the following classifications is tallied: calves, cows, small bulls, medium bulls, and large bulls. Classification of bulls is subjective and based on antler and body size.

We captured and radiocollared MCH caribou in most years from 1980 to 1992. Beginning in 1992, collaring programs were scheduled for alternating years, occurring in even years. Beginning in 1997, capture and radiocollaring efforts have occurred when funding is available. Caribou are captured using a helicopter and drug-filled darts fired from a CO_2-powered pistol. These are usually cooperative efforts between ADF&G, TNWR and YDNWR.

In April 2007, 76 caribou were radiocollared: ten 10 month-old male calves were captured and radiocollared in Game Management Unit (Unit) 17C near Portage Creek; eight 10 month-old male calves, four 10 month-old female calves, and one adult female were captured and radiocollared in Unit 19A near Tundra Lake; ten 10 month-old male calves and six 10 month-old females calves were captured and radiocollared in Unit 18 near Eek Lake; thirty 10 month-old male calves, one 22 month-old male yearling, and six 10 month-old female calves were captured and radiocollared in Unit 17B in the lower Mulchatna River area. In October 2007, 15 caribou were radiocollared: nine 5-month-old male calves and six adult females were captured and radiocollared in Unit 17B. In April 2008, 68 caribou were radiocollared: four 10 month-old males calves, twenty four 22 month-old male yearlings, and twelve 10 month-old female calves were captured and radiocollared in Units 9B and 17C, between the lower Nushagak and lower Kvichak rivers; eleven 10 month-old males calves, seven 22 month-old male yearlings, seven 10 month-old female calves, and three adult females were captured and radiocollared in Unit 18, between the Eek and Tuluksak rivers. All adult females captured were radiocollared with transmitters capable of being tracked by satellite.

Beginning in May 2000, intensive radiotracking surveys during calving were flown to determine the proportion of adult females calving. A fixed-winged aircraft was used to find calving concentrations and locate individual radiocollared adult females. Daily flights to relocate these individuals occurred until we could determine whether the individual collared cows were accompanied by a calf or had hard antlers. Presence of hard antlers prior to calving is generally considered evidence the adult cow is pregnant. These flights continued until all collared cows were observed or until so late in the calving period that absence of a calf could possibly be attributed to predation or other loss.

We conducted periodic radiotracking flights throughout this reporting period to continue the demographics study begun in 1981. Supplemental funding from the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), and LCNPP contributed to these flights. Staff from BLM and USFWS enter radiotracking data from these flights into a statewide interagency geographic information system (GIS) database.

We monitored the harvest from data collected from statewide harvest reports. Hunter "overlay" information prior to the 1998–99 season has not been entered into the statewide harvest

information system. Beginning with the 1998–99 regulatory year, reminder letters have been sent to hunters who failed to report their caribou hunting activity.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Between 1981 and 1996, the MCH increased at an annual rate averaging 17%. From 1992 to 1994, the annual rate of increase appeared to be 28%, but this was probably an artifact of more precise survey techniques. The dramatic growth of the herd is attributed to a succession of mild winters, movements onto previously unused range, relatively low predation rates and an estimated annual harvest rate of less than 5% of the population since the late 1970s. The summer 1999 photo census indicated the herd had declined from the peak, which probably occurred in 1996 or 1997. Subsequent photo censuses indicate the herd has continued to decline.

Population Size

We conducted a photo census of the MCH just at the beginning of this reporting period, on 1 July 2006, and another on 7 July 2008, just after the end of this reporting period. Based on results of these surveys, the minimum population estimate for the MCH for summer 2006 was 45,000 and 30,000 for summer 2008 (Table 1). The MCH has declined, as indicated by the summer estimates, but at the same time caribou distribution during the summer and fall has become more widespread. Some caribou were observed through the summers in Units 17A and 18; however, surveys indicated these were mostly bulls.

Population Composition

We conducted sex and age composition surveys in the middle and upper Nushagak River drainage (GMU 17B&C) on 13–14 October 2006, and in the Eek and Tuluksak River drainages (GMU 18) on 27 October 2007. In 2007 composition surveys were conducted in the middle and upper Nushagak River drainages (Units 17B&C) on 7–8 October and in the Kisaralik and Kwethluk River drainages (Unit 18) on 11 October.

During the fall 2006 surveys, only 13.3 bulls:100 cows were observed in the sample of 1,975 caribou in Unit 17, and 18.1 bulls:100 cows were counted in the sample of 996 caribou in Unit 18. Because of the great deal of mixing of the herd throughout the rest of the year, composition data for the 2006 survey were pooled for an overall bull:cow ratio of 14.9 bulls:100 cows (Table 2).

During the fall 2007 surveys, 21.7 bulls:100 cows were observed in the sample of 2,792 caribou in Unit 17, and 26.3 bulls:100 cows were counted in the sample of 1,151 caribou in Unit 18. Composition data for the 2007 surveys were pooled for an overall bull:cow ratio of 23.0 bulls:100 cows (Table 2).

The fall calf:cow ratio observed on 13–14 October 2006 in Unit 17 was 25.2 calves:100 cows and in Unit 18 on 22 October was 26 calves:100 cows. Pooled counts for both areas gave a calf:cow ratio of 25.5 calves:100 cows in fall 2006 (Table 2). The fall calf:cow ratio observed on 7–8 October 2007 in Unit 17 was 14.4 calves:100 cows; on 11 October in Unit 18 it was 19.4

calves:100 cows. Pooled counts from both areas gave a calf:cow ratio of 15.8 calves:100 cows for the Mulchatna herd in fall 2007 (Table 2).

Productivity Surveys

Productivity surveys were flown in May 2007 and 2008. A total of 31 radiocollared female caribou of calf-bearing age were located in May 2007: ten 2-year-olds (collared as 10-month- old calves in spring 2006); five 3-year-olds (collared as 10-month-old calves in spring 2005); one 4-year-old (collared as 10-month-old calves in spring 2004); and fifteen 5 years old or older. Of the 31 caribou, 13 were accompanied by calves or had hard antlers. None of the 2-year-old or 3-year-old females were accompanied by calves or had hard antlers. The one 4-year-old had hard antlers indicating it was pregnant, and 12 of the 15 cows 5 years or older were accompanied by calves or had hard antlers. (Table 3)

A total of 43 radiocollared female caribou of calf-bearing age were located in May 2008: ten 2-year-olds (collared as 10-month-old calves in spring 2007); ten 3-years olds (collared as 10-month old calves spring 2006); nine 4-year-olds (collared as calves in spring 2005); and fourteen 5 years old or older. Of the 43 caribou, 23 were accompanied by calves or had hard antlers. One of the 2-year-old females was accompanied by a calf, the first collared 2-year-old seen with a calf since beginning these surveys in 2000. Four of the 3-year olds, seven of the 4-year olds, and 11 cows 5 years old or older were accompanied by calves or had hard antlers. (Table 3)

Distribution and Movements

The MCH continued to increase its range even after its apparent population peak in 1996. To follow the movements of the herd, we had 73 caribou with active radio collars in June 2006. These included collars deployed in the range used by the Kilbuck caribou herd when large numbers of Mulchatna caribou were in that area.

Wintering Areas. The most significant wintering area for the MCH during the 1980s and early 1990s was along the north and west side of Iliamna Lake, north of the Kvichak River. While there, MCH animals appeared to intermingle with caribou from the Northern Alaska Peninsula caribou herd (NAPCH). Analysis of radiotelemetry data indicated the MCH had been moving its winter range to the south and west during most of the late 1980s and early 1990s (Van Daele and Boudreau 1992). Starting in the mid 1990s, caribou from the MCH began wintering in Unit 18 south of the Kuskokwim River and southwestern Unit 19B in increasing numbers.

The MCH did not move into the above-described traditional wintering areas en masse during this reporting period. During fall 2006 and again in fall 2007, approximately half of the Mulchatna caribou traveled through northern Unit 17 and southwestern Unit 19B, into the Kuskokwim Mountains, and eventually into Unit 18 south of the Kuskokwim River. The remainder of the caribou during those same falls traveled through the Nushagak drainage

During the winter of 2006–07, a large part of the herd wintered in Unit 18, south of the Kuskokwim River, with the remainder of the herd in the lower Nushagak and in the Kvichak drainage. Movement into these wintering areas probably has decreased pressure on the forage supply in the formerly used wintering areas. Winter distribution during 2007–08 was about the

same as the previous winter, with large numbers moving into snow-free areas near the lower Kvichak River and Alagnak River in February.

Calving Areas. There has been considerable change in the area used by the MCH for calving in recent years. Taylor (1988) noted the main calving area for the MCH included the upper reaches of the Mulchatna River and the Bonanza Hills. Small groups also were observed in the Jack Rabbit and Koktuli Hills, Mosquito River, and Kilbuck Mountains.

In 1992 only 10,000–15,000 adult female caribou were found along the upper Mulchatna River and fewer than 1,000 were in the Bonanza Hills. During that year, the Mosquito River drainages contained about 20,000 calving females, and an estimated 20,000 adult females were located near Harris Creek, north of the village of Koliganek.

In 1994 most of the MCH females started using the area between the upper Nushagak River and upper Tikchik Lakes for calving. In May 1996, 1997, and 1998, most of the cows from the MCH calved in the drainages of the King Salmon River and Klutuspak Creek of the upper Nushagak River.

In May 1999 the drainages of the King Salmon River and Klutuspak Creek were still covered with snow, and the caribou continued to move south to the edge of the snow, between Klutuspak Creek and the Nuyakuk River, where many of them calved. Calving during the springs of 2000, 2001, and 2002 occurred in two distinct areas: the lower Nushagak River, and the headwaters of the South Fork of the Hoholitna River. In May 2003 calving also occurred in two distinct areas, with a large part of the herd between Kemuk Mountain and the Nushagak River and another large part of the herd in the northeastern Nushagak Hills and the South Fork of the Hoholitna River.

Calving in May 2004 was very different from what had been observed in the past. Calving caribou were spread through a vast area from just outside of Dillingham, north to the confluence of the Holitna and Hoholitna rivers. There were no large aggregations of calving caribou, but rather caribou scattered throughout that area. In addition, numerous cow caribou with young calves were observed scattered through southern Unit 18 in late May and early June.

Calving in May 2005 and 2006 was similar to previous years, in that a large part of the herd calved between Kemuk Mountain and the Nushagak River, with most of the rest of the caribou calving to the north between the Stoney River and Hoholitna River. The greatest concentration of these northern animals in 2005 was in the Stink River drainage, an area included within the GMU 19A predator control program. Calving in May 2007 and 2008 was similar to the previous two years, with the caribou split between the Kemuk Mountain area and Tundra Lake/Stink River area.

Seasonal Movements. The MCH generally does not move en masse as a distinct herd, nor do individuals move to predictable places at predictable times. However, during recent years the herd basically splits, with part of the herd moving to the eastern side of its range during the summer and the rest of the herd traveling to the western side; caribou then aggregate for the fall rut and winter in these respective areas. In late winter/early spring the caribou travel back to the middle and northern part of the herd's range for calving. After calving, most of the caribou move

into the Nushagak and Mulchatna River drainages, then either go east or west for the post-calving aggregations, after which the caribou again disperse and become widely scattered throughout their range. In the fall, the caribou again begin forming into large groups in the east or west part of their range, which is generally the areas where they will spend the winter.

Postcalving aggregations during summer 2006 were again scattered, with large groups of caribou south of the Stuyahok Hills, north of the upper Tikchik Lakes, and north and west of Kisaralik Lake. By late July, the caribou were moving from the aggregation areas used earlier in the month and they scattered throughout Units 9B, 17B, and southwestern 19B. Large numbers of caribou were scattered throughout the Nushagak and Mulchatna drainages by late September, and some had moved westward into Unit 18.

During fall 2006 and winter of 2006–07, many Mulchatna caribou were scattered throughout Unit 18 south of the Kuskokwim River, with an additional 10,000–20,000 moving around from the lower Mulchatna River drainage to the area between the lower Nushagak and Kvichak Rivers. For part of that winter, caribou traveled southeast in Unit 9C to the Naknek, milled around in that area for a while, then moved northwest to the area between the Nushagak and Kvichak rivers.

In May 2007 the caribou returned from being scattered throughout their range to calve in the middle Nushagak River/Kemuk Mountain area and also the Tundra Lake/Lime Village area south of the Stoney River. Of note, that part of Unit 19A was within a predator control area.

Throughout June 2007, most of the herd moved into the upper Nushagak River and Mulchatna River area. By late June, the herd had again split, with part of the herd moving through the lower Mulchatna River area and the remainder of the herd traveling northwest into the upper Kwethluk and Kisaralik drainages. By the first week of July, the caribou that had traveled northwest formed postcalving aggregations in the upper Kwethluk and Kisaralik drainages. Those that had remained in the eastern part of the herd's range formed postcalving aggregations in the lower Mulchatna River area.

During fall 2007 and winter of 2007–08 Mulchatna caribou were again scattered throughout Unit 18 south of the Kuskokwim River, as well as the area between the lower Nushagak and Kvichak rivers. By late April 2008, Mulchatna caribou started moving toward the general vicinities of calving areas used the previous two years. Postcalving aggregations during summer 2008 were again widely scattered, occurring between the Mulchatna River and Lake Clark, and in the upper Kwethluk and Kisaralik drainages. Though the aggregations were widely scattered, a photo census was accomplished just after the end of this reporting period.

In the past, several large peripheral groups appeared to be independent from the main MCH. A group of about 1,300 caribou resided between Portage Creek and Etolin Point until about 1999. Caribou in the Kilbuck Mountains (Seavoy 2001) and the upper Stuyahok and Koktuli River drainages (Van Daele and Boudreau 1992, Van Daele 1994) seemed distinct from the MCH until the mid 1990s. These sub-herds periodically intermingled with the main herd but remained within their traditional ranges. As the MCH grew in size and seasonally moved through the areas

used by these groups, they eventually ceased to exist as discrete groups of caribou (Hinkes, et. al. 2005).

MORTALITY

Harvest

Season and Bag Limit	Resident Open Season	Nonresident Open Season
Unit 9A, 9B, and that portion of 9C within the Alagnak River drainage.		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters: 1 caribou		1 Sep–15 Sep
Unit 9C, that portion north of the Naknek River and south of the Alagnak River drainage.		
Resident Hunters: 1 caribou by permit	Season may be announced	
Nonresident Hunters		No open season
Unit 17A, all drainages east of Right Hand Point.		
Resident Hunters: up to 5 caribou	Season may be announced	
Nonresident Hunters:		No open season
Remainder of Unit 17A		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters:		No open season

Season and Bag Limit	Resident Open Season	Nonresident Open Season
Unit 17B, that portion within the Unit 17B Nonresident Closed Area.		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters:		No open season
Remainder Unit 17B and a portion of 17C east of the Wood River and Wood River Lakes.		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters: 1 caribou		1 Sep–15 Sep
Remainder of Unit 17C		
Resident Hunters: up to 5 caribou	Season may be announced	
Nonresident Hunters:		No open season
Unit 18		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters: 1 caribou		1 Sep–15 Sep
Unit 19A and 19B, within the Nonresident Closed Area		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters:		No open season
Remainder of Unit 19A and Unit 19B.		
Resident Hunters: 2 caribou, no more than 1 bull, no more than 1 caribou taken 1 Aug–31 Jan.	1 Aug–15 Mar	
Nonresident Hunters: 1 caribou		1 Sep–15 Sep

Board of Game Actions and Emergency Orders.

During its spring 2006 meeting, the Alaska Board of Game changed the ending date of the hunting season to 15 March, and reduced the bag limit from 5 to 3 caribou, with only one caribou 1 August–30 November throughout the range of the Mulchatna herd. The nonresident season was changed to 1 August–30 September in those areas with a nonresident caribou hunting season. During its spring 2007 meeting, the Alaska Board of Game changed the bag limit for resident hunters throughout the range of the herd to 2 caribou, of which no more than one can be a bull, and no more than one caribou may be taken 1 August–31 January. The board also closed the same-day-airborne season for caribou in Units 9B, 17B, and 17C. The nonresident hunting season dates were also changed to 1–15 September. An emergency order opening for hunting caribou in Unit 9C was issued during winter 2007–08.

Hunter Harvest. The reported harvest from the MCH was 921 caribou during the 2006–07 hunting season and 767 during 2007–08 (Table 4). These totals and the number of hunters reporting hunting Mulchatna caribou continue to decline from previous years. While males have made up most of the harvest in previous years, , males and females composed about equal parts of the reported harvest during the past 2 regulatory years (Table 4).

The unreported harvest has been estimated at an additional 1,500 to 2,500 caribou during past years. This number should be viewed with some caution. Changes in distribution from year to year and snow cover adequate for winter travel can greatly affect the number of caribou killed. Caribou distribution during some winters has resulted in increased hunting effort by village residents of Unit 18, who might be less likely to use harvest cards. Most of the unreported harvest was attributed to local and other Alaska residents. Subsistence Division household surveys conducted in local villages from 1983 to 1989 indicated an estimated annual harvest of 1,318 caribou (P. Coiley, ADF&G-Subsistence, Dillingham, pers. comm.). However, during that time hunting for caribou from some of those villages was from herds other than the Mulchatna. The number of caribou harvested by local residents undoubtedly has changed since the subsistence surveys because of changes in the size and range of the herd, as well as increases in the number of people living within the range of the herd. Unreported harvest by other Alaska residents is even more difficult to quantify.

From the early 1980s through 1999, the number of people reporting hunting for Mulchatna caribou increased steadily, yet reported harvest levels remained less than 5% of the total population. Harvests did not appear to be limiting herd growth or range expansion. In the mid to late 1990s, unpredictable caribou distribution led to hunting effort being spread more throughout the range of the herd than had traditionally occurred. As the size and range of the herd increased, commercial operators providing transportation to hunters expanded into areas previously not hunted, as well as based their hunts from additional communities located throughout the range of this herd. With the continued decline in size of the herd during recent years, a decline in the number of hunters traveling out to the Mulchatna herd area has been noted.

Hunter Residency and Success. Local Alaska residents (living within the range of the Mulchatna herd) made up 30% of the reporting hunters during the 2006–07 season and 48% of the hunters during 2007–08. Nonlocal Alaska residents accounted for 32% of the reporting hunters during

the 2006–07 season and 29% during 2007–08. Nonresidents made up 38% of the reporting hunters during the 2006–07 season and 21% of the reporting hunters during 2007–08. Of the reporting hunters, 53% successfully harvested at least one caribou in 2006–07; in 2007–08, 58% were successful (Table 5).

Harvest Chronology. Most (51%) of the reported harvest in 2006–07 occurred during August and September. However, during 2007–08 the percentage of the annual harvest during those fall months had declined to 29%. Harvests reported from February and March have been increasing in recent years, accounting for 31% of the reported harvest in 2006-07 and increasing to 54% in 2007-08. A large portion of any local unreported harvest probably also occurred in February and March.These data indicate an increase in the proportion of caribou taken during late winter as compared to the harvest chronology reported for previous years (Table 6).

Transport Methods. Aircraft were traditionally the most common means of transportation for hunters in the Mulchatna herd, but have been replaced in recent years by snowmachines. During the 2006–07 hunting seasons, 61% of the hunters reported using aircraft, which declined to 27% for the 2007-08 season. Snowmachines were used by 27% of the hunters reporting in 2006-07, which increased to 58% by the 2007-08 season (Table 7). This increasing use of snowmachines is reasonable considering the change in reported harvest chronology to the late winter months.

Other Mortality

There were several observations and reports of wolf and brown bear predation on caribou during this reporting period. Predation rates on MCH were traditionally low, but increased as the herd grew and provided a more stable food source for wolves. Many local residents report increasing wolf numbers. A growing number of hunters throughout the area used by the MCH report having encounters with brown bears, including bears on fresh kills, on hunter-killed carcasses, and on raids in hunting camps. It is likely that individual bears learned to capitalize on this newly abundant food supply.

HABITAT

Assessment

We have not objectively assessed the condition of the MCH winter range. Taylor (1989) reported the carrying capacity of traditional wintering areas had been surpassed by 1986–87, and it was necessary for the MCH to use other winter range to continue its growth. The herd has been using different areas at an increasing rate since that time.

Portions of the range are showing signs of heavy use. Extensive trailing is evident along travel routes. Some of the summer/fall range in the Nushagak Hills and elsewhere is trampled and heavily grazed. Traditional winter range on the north and west sides of Iliamna Lake also shows signs of heavy use, even though few caribou are now present in that area through the winter. Many of the areas that the MCH started using in the mid 1990s had not been used by appreciable numbers of caribou for more than 100 years, or reindeer for 50 years. While these areas appear to have vast quantities of essentially virgin lichen communities, whether those areas will continue to be used by many caribou remains to be seen.

CONCLUSIONS AND RECOMMENDATIONS

The minimum postcalving population estimates increased from 18,599 in 1981 to 200,000 in 1996 and declined to a minimum of 30,000 by summer 2008. Distribution of this herd continued to be widespread throughout this period. Fall composition counts in recent years have varied, but present proportions of calves and bulls are generally less than during the period of rapid herd growth.

The total reported harvest and the number of hunters afield steadily increased until the late 1990s; since then, both have declined. Despite efforts to increase reporting of harvest, reported hunting effort during this reporting period indicates harvests remain at less than 5% of the herd. However, a better assessment of unreported harvest will be important if the herd continues to decline. The MCH has been an important source of meat and recreation for hunters throughout southcentral and southwest Alaska. Establishment of the 5 caribou bag limit, coupled with the reputation for large antler and body sizes, made this herd popular with hunters. However, as the herd declined, adjustments to the season and bag limit were warranted.

During the past 25 years, the MCH has made dramatic changes in its range. In the early 1980s, the herd spent most of the year east of the Mulchatna River between the Bonanza Hills and Iliamna Lake. Its range now encompasses more than 60,000 square miles, and large portions of the herd pioneered winter and summer ranges in what was considered good to excellent caribou habitat. There is evidence of overuse of habitat in some portions of the range. Whether areas previously underused will prove to be important to the herd remains to be seen.

The tremendous growth rate of this herd continued to at least 1996, and then the population declined. Possible signs of stress in this herd include an outbreak of foot rot in 1998 and low calf:cow ratios in fall 1999 (Woolington 2001). Caribou in the adjacent NAPCH had a high incidence of lungworms in 1995 and 1996. Six of 10 calves examined in October 2000 showed evidence of bacterial pneumonia, and one of six fecal samples from the calves revealed lungworm larvae (Woolington 2003). The degree to which disease and parasitism might be affecting herd dynamics is unknown; however, we should continue to monitor the herd closely to watch for indications of what might contribute to continued population decline.

The MCH continues to present new management challenges as its size and range change. Since the main portion of the herd is migratory and uses areas from the western slopes of the Alaska Range to the Kuskokwim River, it seasonally occupies ranges used by smaller resident caribou herds. These sub-herds, and new ones that establish themselves, may be the key to a quicker recovery from any future crash of the MCH. The MCH also overlaps with other established herds as they move into the southern fringes of the Western Arctic caribou herd range and the northern portion of the NAPCH range. We should strive to recognize the impacts on these potentially unique demographic components when setting management objectives and proposing regulatory formulas.

Recommended management actions for the next few years include:

1. Conduct an annual photo census during postcalving aggregations.

2. Conduct annual October composition surveys in at least two distinct areas.

3. Conduct calving surveys in May of each year.

4. Monitor movements by locating radiocollared caribou periodically throughout the year.

5. Attempt to maintain at least one active radio collar per 2,000 caribou.

6. Develop an improved method of collecting harvest data, including unreported harvest.

7. Continue to work with other land and resource management agencies and landowners.

8. Work with local advisory committees and the state and federal boards to coordinate hunting regulations for adjacent herds and develop contingency plans for managing the herd if the population declines to low levels.

LITERATURE CITED

ALASKA GAME COMMISSION. 1925–1939. Annual reports of the Alaska Game Commission to the Secretary of the Interior. U.S. Fish and Wildlife Service. Juneau, Alaska.

HINKES, M. T., G. H. COLLINS, L. J. VAN DAELE, S. D. KOVACH, A. A. ADERMAN, J. D. WOOLINGTON, R. SEAVOY. 2005. Influence of population growth on caribou herd identity, calving ground fidelity, and behavior. Journal of Wildlife Management 69(3):1147-1162.

SEAVOY, R. 2001. Kilbuck Mountain and Mulchatna management report. Pages 106–113 in C. Healy, editor. Caribou management report of survey and inventory activities 1 July 1998–30 June 2000. ADF&G. Federal Aid in Wildlife Restoration Grants W-27-2, W-27-3. Proj. 3.0 Juneau, Alaska.

SKOOG, R.O. 1968. Ecology of the Caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. Thesis. University of California, Berkeley. 699pp.

TAYLOR, K.P. 1988. Mulchatna caribou survey and inventory report. Pages 3–6 in S. Morgan, ed. Annual report of survey-inventory activities. Vol. XVIII. Part XI. Progress Report, Project W-22-6. Job 3.0. ADF&G. Juneau. 73pp.

———. 1989. Mulchatna caribou survey and inventory report. Pages 8–16 in S. Morgan, Ed. Annual report of survey-inventory activities. Vol. XIX. Part XI. Progress Report, Project W-23-1. Job 3.0. ADF&G Juneau. 173pp.

VAN DAELE, L.J. 1994. Status and seasonal movements of caribou near the Cominco Pebble Copper Mine Site, southwest Alaska, 1992–1993. Unpublished report to Cominco Exploration-Alaska by ADF&G. Dillingham. 36pp.

——— AND BOUDREAU, T. 1992. Caribou use of the proposed Cominco Pebble Copper Mine Site, Iliamna Lake, Alaska. Unpublished report to Cominco Exploration-Alaska by ADF&G. Dillingham. 19pp.

VAN STONE, J.W. 1988. Russian exploration in southwest Alaska: The travel journals of Petr Korsakovskiy (1818) and Ivan Ya. Vasilev (1829). The Rasmuson Library Historical Translation Series. Volume IV. Univ. Alaska Press. Fairbanks. 120pp.

WOOLINGTON, J.D. 2001. Mulchatna management report. Pages 23–38 in C. Healy, editor. Caribou management report of survey and inventory activities 1 July 1998–30 June 2000. ADF&G. Federal Aid in Wildlife Restoration Grants W-27-2, W-27-3. Proj. 3.0 Juneau, Alaska.

WOOLINGTON, J.D. 2003. Mulchatna management report. Pages 23–42 in C. Healy, editor. Caribou management report of survey and inventory activities 1 July 1998–30 June 2000. ADF&G. Juneau, Alaska.

PREPARED BY:
James D. Woolington
Wildlife Biologist

SUBMITTED BY:
Gino Del Frate
Management Coordinator

Please cite any information taken from this section, and reference as:

WOOLINGTON, J.D. 2009. Mulchatna caribou management report, Units 9B, 17, 18 south, 19A & 19B. Pages 11–31 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 Mulchatna caribou herd estimated population size, regulatory years 1991–2008

Regulatory Year	Date	Preliminary estimate[a]	Minimum Estimate[b]	Extrapolated estimate[c]
1991–1992	2 Jul 1991	60,851	--	90,000
1992–1993	7–8 Jul 1992	90,550	110,073	115,000
1993–1994	--	--	--	150,000
1994–1995	28–29 Jun 1994	150,000	168,351	180,000
1995–1996	--	--	--	190,000
1996–1997	28 Jun–3 Jul 1996	200,000	192,818	200,000
1997–1998	--	--	--	--
1998–1999	--	--	--	--
1999–2000	8 Jul 1999	160,000–180,000	147,012	175,000
2000–2001	--	--	--	--
2001-2002	30 June 2002	--	121,680	147,000
2002–2003	--	--	--	--
2003–2004	--	--	--	--
2004–2005	7 Jul 2004	--	77,303	85,000
2005-2006	--	--	--	--
2006-2007	11 July 2006	--	40,766	45,000
2007-2008	--	--	--	--
2008-2009	July 7, 2008	--	20,545	30,000

[a] Based on estimated herd sizes observed during the aerial census.

[b] Data derived from photo-counts and observations during the aerial census.

[c] Estimate based on observations during census and subjective estimates of the number of caribou in areas not surveyed and interpolation between year's photocensus was not conducted

TABLE 2 Mulchatna caribou fall composition counts and estimated population size, regulatory years 1991–2007

Regulatory Year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Small Bulls (% of Bulls)	Medium bulls (% of bulls)	Large bulls (% of bulls)	Total bulls (%)	Composition sample size	Estimate of herd size[a]
1991–1992	---	---	---	---	---	---	---	---	---	90,000
1992–1993	---	---	---	---	---	---	---	---	---	115,000
1993–1994	42.1	44.1	23.7%	53.7%	---	---	---	22.6%	5907	150,000
1994–1995	---	---	---	---	---	---	---	---	---	180,000
1995–1996	---	---	---	---	---	---	---	---	---	190,000
1996–1997	42.4	34.4	19.5	56.6	49.8	28.5	21.7	24.0	1727	200,000
1997–1998	---	---	---	---	---	---	---	---	---	--
1998–1999	40.6	33.6	19.3	57.4	27.8	43.7	28.5	23.3	3086	--
1999–2000	30.3	14.1	9.8	69.3	59.9	26.3	13.8	21.0	4731	175,000
2000–2001	37.6	24.3	15.0	61.8	46.6	32.9	20.4	23.2	3894	--
2001–2002	25.2	19.9	13.7	68.9	31.7	50.1	18.3	17.7	5728	--
2002–2003	25.7	28.1	18.3	65.0	57.8	29.7	12.5	16.7	5734	147,000
2003–2004	17.4	25.6	17.9	69.9	36.2	45.3	18.5	12.2	7821	--
2004-2005	21.0	20.0	14.2	71.0	64.2	28.9	6.9	14.9	4608	85,000
2005-2006	13.9	18.1	13.7	75.8	55.3	33.3	11.5	10.6	5211	--
2006-2007	14.9	25.5	18.1	71.3	57.5	33.7	8.9	10.6	2971	45,000
2007-2008	23.0	15.8	11.4	72.1	52.7	36.0	11.3	16.6	3943	--

[a] Estimate derived from photo-counts, corrected estimates, subjective estimate of the number of caribou in areas not surveyed and interpolation between years when census not conducted.

TABLE 3 Mulchatna caribou calving surveys, 2000–2008

Year (May)	2-yr-old		3-yr-old		4-yr-old		5+ yrs old		Total caribou located
	No. Radios [a]	No. Pregnant	No. Radios [a]	No. Pregnant	No. Radios [a]	No. Pregnant	No. Radios [a]	No. Pregnant	
2000	5	0	0	0	0	0	22	21	27
2001	6	0	4	3	0	0	11	8	21
2002 [b]	4	0	7	4	1	0	5	2	17
2003	4	0	8	2	6	5	9	9	27
2004	9	0	2	0	3	3	13	12	27
2005	4	0	5	2	8	6	13	11	30
2006	7	0	0	0	3	2	14	12	24
2007	10	0	5	0	1	1	15	12	31
2008	10	1	10	4	9	7	14	11	43

[a] Number of radiocollared female caribou of that age found and observed during survey.

[b] Survey incomplete because of weather.

TABLE 4 Mulchatna caribou reported harvest, regulatory years 1991– 2007

Regulatory Year	Reported Hunter Harvest			
	M (%)	F(%)	Unk.	Total[a]
1991–1992	86%	13%	1.1%	1573
1992–1993	74%	9%	17%	1602
1993–1994	80%	20%	0.4%	2804
1994–1995	78%	21%	0.7%	3301
1995–1996	75%	24%	0.6%	4449
1996–1997	78%	21%	1.0%	2366
1997–1998	84%	15%	0.6%	2704
1998–1999[b]	82%	17%	1.0%	4770
1999–2000	76%	23%	1.0%	4467
2000–2001	81%	19%	0.8%	4,096
2001–2002	72%	27%	0.4%	3830
2002–2003	74%	25%	0.5%	2537
2003–2004	64%	35%	0.9%	3182
2004–2005	55%	44%	0.7%	2236
2005–2006	48%	51%	0.6%	2175
2006–2007	55%	44%	0.1%	921
2007–2008	53%	46%	0.1%	767

[a] Includes only reported harvest from harvest cards.
[b] First year that reminder letters were sent to caribou hunters.

TABLE 5 Mulchatna caribou annual hunter residency and success, regulatory years 1991–2007

Regulatory Year	Successful				Unsuccessful				Total hunters[b]
	Local resident[a]	Nonlocal resident	Nonresident	Total (%)	Local resident[a]	Nonlocal Resident	Nonresident	Total (%)	
1991–1992	89	562	599	85%	9	136	69	15%	1464
1992–1993	82	542	651	91%	12	82	26	9%	1391
1993–1994	47	718	725	85%	5	171	77	15%	2394
1994–1995	61	812	896	83%	11	227	124	17%	2954
1995–1996	52	1035	928	87%	15	188	86	13%	3127
1996–1997	56	647	824	85%	25	139	101	15%	1822
1997–1998	85	564	1277	84%	33	178	152	16%	2301
1998–1999	178	1130	1877	78%	142	320	414	22%	4131
1999–2000	174	1024	1697	72%	120	453	553	28%	4039
2000–2001	188	817	1713	68%	148	427	691	32%	3989
2001–2002	270	843	1377	74%	159	351	368	26%	3406
2002–2003	169	556	1028	63%	210	383	450	37%	2831
2003–2004	312	762	1111	71%	181	352	378	29%	3129
2004–2005	256	573	764	62%	133	357	501	38%	2634
2005–2006	418	427	485	56%	229	322	497	44%	2405
2006–2007	207	208	273	53%	182	207	226	47%	1312
2007–2008	334	148	125	58%	184	163	105	42%	1084

[a] Includes residents of communities within the range of the Mulchatna Caribou Herd.
[b] Includes hunters of unknown residency and hunters who reported harvesting more than one caribou.

TABLE 6 Mulchatna caribou annual harvest chronology percent by month, regulatory years 1991– 2007

Regulatory Year	Harvest Periods										
	July	August	September	October	November	December	January	February	March	April	Total[b]
1991–1992		29%	43%	6%	0.4%	2%	1%	4%	12%	0%	1573
1992–1993		30%	54%	5%	1%	0.3%	0.2%	1%	8%	0%	1602
1993–1994		36%	50%	5%	0.4%	1%	1%	1%	5%	2%	2804
1994–1995		35%	50%	5%	0.4%	1%	1%	1%	5%	2%	3301
1995–1996		33%	50%	6%	1%	2%	1%	1%	5%	2%	4449
1996–1997		25%	52%	5%	1%	1%	1%	2%	11%	2%	2366
1997–1998		33%	53%	4%	0.3%	0.4%	1%	3%	4%	0.3%	2704
1998–1999		25%	55%	6%	0.6%	0.6%	2%	2%	7%	1%	4770
1999–2000	0.1%	24%	52%	5%	0.5%	1%	3%	5%	8%	2%	4467
2000–2001	0.2%	27%	55%	6%	0.3%	0.3%	2%	3%	4%	1%	4096
2001–2002	0.2%	23%	49%	3%	1%	2%	2%	4%	9%	5%	3830
2002–2003	0.2%	23%	55%	4%	0.6%	1%	3%	2%	6%	2%	2537
2003–2004	0.2%	19%	45%	4%	0.5%	4%	5%	5%	12%	2%	3182
2004-2005	0.2%	20%	46%	2%	1%	2%	2%	2%	10%	9%	2236
2005-2006	0.2%	15%	32%	2%	4%	2%	3%	6%	25%	7%	2175
2006-2007		13%	38%	1%	3%	5%	4%	10%	21%	1%	921
2007-2008		3%	26%	2%	2%	6%	7%	28%	26%	1%	767

[a] July opening date for Unit 9B established starting 1 Jul 1999.

[b] Includes unknown harvest date

TABLE 7 Mulchatna caribou harvest percent by transport method, regulatory years 1991–2007

Regulatory Year	Percent of reported harvest								Total caribou[a]
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1991–1992	81%	0.2%	9%	1%	9%	0.1%	0.2%	2%	1573
1992–1993	88%	0.2%	8%	3%	3%	0.1%	0.1%	0%	1602
1993–1994	86%	1%	10%	1%	2%	0.3%	1%	0%	2804
1994–1995	85%	0.2%	12%	1%	2%	0%	0.2%	0.2%	3301
1995–1996	88%	0.2%	9%	1%	2%	0.1%	0.1%	0%	4449
1996–1997	82%	0.4%	10%	2%	3%	0.3%	0.7%	1%	2366
1997–1998	86%	0.4%	8%	1%	2%	0.1%	0.2%	2%	2704
1998–1999	82%	0.1%	10%	2%	3%	0.1%	1%	1%	4770
1999–2000	85%	0.3%	6%	2%	5%	0.2%	0.7%	1%	4467
2000–2001	87%	0.2%	6%	1%	5%	0.1%	0.1%	0.6%	4096
2001–2002	79%	0.1%	7%	2%	11%	0.2%	0.2%	0.8%	3830
2002–2003	82%	0.2%	8%	3%	5%	0%	0%	0.2%	2537
2003–2004	73%	0%	6%	2%	19%	0.1%	0%	0.7%	3182
2004–2005	74%	0%	7%	1%	17%	0%	0%	0.9%	2336
2005–2006	55%	0.4%	6%	3%	34%	0.2%	0.3%	1%	2175
2006–2007	61%	0.4%	7%	4%	27%	0.2%	0.3%	0.5%	921
2007–2008	27%	0.1%	4%	9%	58%	0.5%	1%	0.6%	767

[a] Includes harvest by unknown transport method.

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 P.O. BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

GAME MANAGEMENT UNITS: 9C and 9E (19,560 mi^2)

HERD: Northern Alaska Peninsula

GEOGRAPHIC DESCRIPTION: Alaska Peninsula

BACKGROUND

The Northern Alaska Peninsula Caribou Herd (NAP) ranges throughout Subunits 9C and 9E. Historically, the population has fluctuated widely, reaching peaks at the turn of this century and again in the early 1940s (i.e., 20,000 caribou). The last population low was during the late 1940s (2,000). By 1963 the herd had increased to more than 10,000 animals (Skoog 1968). The first radio-telemetry-aided census in 1981 estimated 16,000; by 1984 the herd had increased to 20,000.

During the next several years, the noticeable depletion of lichens and movements across the Naknek River were evidence the traditional wintering area was overgrazed. In 1986 significant numbers of NAP animals began wintering between the Naknek River and Lake Iliamna, and there was reason to believe that excellent forage conditions in this region would sustain the NAP within the population objective of 15,000–20,000. However, up to 50,000 Mulchatna caribou also began using this area at about the same time, as the herds intermingled near Naknek and King Salmon. Given this change in winter distribution of both herds, and the increasing competition for winter forage, by the late 1980s it was decided that the NAP should be maintained at the lower end of the management objective (i.e., 15,000). During 1993–94, the record harvest of 1,345 caribou and natural mortality estimated at >30% combined to reduce the NAPCH to 12,500 by June 1994. In response to increasing concern, the Board of Game evaluated intensive management options for this population in 1999 and concluded no viable solutions existed to alter the status of this herd. A Tier II hunting program was instituted the same year to manage human harvest. The herd has continued to decline to the present year and has experience extremely poor recruitment since 2003 as a result of poor calf production and survival. Predation has become increasingly important in the status of this herd, but indications of nutritional limitations are also still evident.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Based on the history of this herd and the long-term objective of trying to maintain the NAP at a

relatively stable level, we recommend a population objective of 12,000–15,000 caribou with an October sex ratio of at least 25 bulls:100 cows.

METHODS

Population Size

Fixed-winged aircraft were used to conduct radiotelemetry-aided aerial photo censuses on post-calving concentrations. Oblique 35mm photos of large groups were taken to allow accurate enumeration. Calf percentages were calculated from direct enumeration of caribou in close-up photos of larger herds. Results were weighted by herd size to estimate total productivity.

Population Composition

Sex and age composition surveys were conducted during the month of October between the Naknek River and Port Moller. Caribou were classified from a helicopter as calves, cows, small bulls, medium bulls, and large bulls.

Parturition Surveys

From late May through early June a helicopter was used to classify caribou on the calving grounds as parturient cow (with calf, hard antlers or distended udder), nonparturient cow, yearling, or bull (Whitten 1995). We also observed radiocollared females to document age-specific pregnancy rates.

Radiotelemetry Data

We scheduled capture operations in cooperation with the U.S. Fish and Wildlife Service (FWS) to maintain 25–30 functioning radio collars and to deploy satellite collars. During each capture we recorded standardized measurements and took blood samples when feasible. We periodically conducted radiotelemetry flights to monitor herd movement and survival rates of collared caribou.

Mortality

The harvest was monitored by use of state Tier II and federal subsistence permits beginning in 1999. Survival rates of radiocollared females were estimated with the Kaplan-Meier method (Pollock et al. 1989)

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Minimum counts from photo censuses during 1981–1993 ranged between 15,000 and 19,000 caribou. Annual variations in counts were caused by actual changes in herd size and/or sampling error (restricted coverage due to poor weather or errors in visual estimates). Because of concerns regarding winter range quality, in the late 1980s we decided to keep the herd at the lower end of the management objective. The herd began to decline below desired level in 1994. Despite a series of hunting restrictions implemented starting in 1994, which significantly reduced harvests, the herd continued to decline through 2008 (Table 1). Current vital rates and the population's age structure suggest that the herd will continue to decline over the next few years.

Population size

The size of the NAPCH has been reported in two ways: the actual number of caribou counted during the postcalving photo census, rounded to the nearest 100, and an estimated total herd size which included 1,000 to 1,500 "uncounted" caribou believed to be in fringe areas. Since 1995, staff of the Alaska Peninsula/Becharof Refuge has counted caribou in portions of the Aleutian Mountains and Pacific drainages. This area had not been counted since the early 1980s, so counts after 1995 represent a more complete "minimum count" than those obtained from photo censuses in previous years. Cooperative counts conducted during 1999–2002 resulted in estimates of 8,600, 7,200, 6,300, and 6,660, respectively (Table 1). Since 2003 weather conditions and funding have limited our ability to complete the population surveys in a timely manner that ensures no caribou are missed or double counted during the survey. However, based on the number of caribou observed during fall composition surveys the current population size of the NAPCH has been estimated at 2,000 to 2,500 caribou.

Population Composition

During 1970–1980, when the NAPCH was growing, the average fall ratio was 50 calves:100 cows (range = 45–56). The fall ratio averaged 39 calves:100 cows (range = 27–52) between 1981 and 1994 when the population was near management objectives. During the decline the ratio averaged 26 calves:100 cows (range = 18–38 between 1995 and 2002). Since 2003 fall calf ratios have been the lowest ever recorded for this herd, with an average of 9 calves:100 cows (range = 7–14, Table 1).

From 1990 to 2004, the bull:cow ratio averaged 41:100 (range = 34–49), but the ratio dropped to an average of 23 bulls:100 cows during 2007 and 2008 (Table 1) despite hunting closures. It is likely that poor calf recruitment since 2003 and the relatively short lifespan of bulls compared to cows have decreased the bull:cow ratio in this herd.

Distribution and Movements

Traditionally the NAP's primary calving grounds are in the Bering Sea flats between the Cinder and Bear rivers, and the herd wintered between the Ugashik and Naknek rivers. Beginning in 1986 many caribou wintered between the Naknek River and the Alagnak River. Since 2000, this extended wintering range appears to have become less important for the NAP. No radiocollared NAP caribou have wintered north of the Naknek River since the winter of 2000–01, with the exception of one in 2003–04. Since 2004 calving has been increasingly dispersed with decreased use of traditional calving grounds. A greater portion of the herd calves in mountainous terrain between the Meshik River and Katmai National Park.

MORTALITY

Harvest

Season and Bag Limits. Since the Tier II permit hunt was instituted in 1999 the bag limit has been one bull. The season has been 10 August–20 September and 15 November–28 February in 9C, excluding the Alagnak River drainage. In Unit 9E the season ran 10 August–20 September and 1 November–30 April until state and federal hunts were closed in 2005 due to concerns for the herd's status; they have not been reopened.

Board of Game Actions and Emergency Orders. The Board of Game took no regulatory action regarding the NAP during this reporting period.

Hunter Harvest. The Board of Game authorized up to 1,500 Tier II permits, and the Federal Subsistence Board authorized an additional 10%. No Tier II permits were issued in 2005, 2006, or 2007. Two ceremonial permits were issued to harvest one caribou under each permit (one permit in January 2007 and one in January 2008). Harvests from state hunts are presented in Table 2.

Hunter Residency and Success. Both hunters that received a ceremonial permit to harvest caribou were successful (Table 3). Both permits were requested at a time when caribou were reported to be in the village.

Harvest Chronology. September historically has been the most important month, especially for nonresidents, because of the combination of relatively good weather, the best chance to harvest a trophy bull, and relatively easy access by boat and aircraft. Under the Tier II permit hunt, harvests are more spread out, with early fall and late winter accounting for most of the harvest (Table 4). The subsistence harvest is primarily opportunistic, and chronology of harvests varies among villages depending on caribou availability.

Transportation Methods. Prior to 1999 airplanes were the most important method of transportation reported from harvest tickets, but under Tier II most hunters used 4-wheelers, snowmachines, or boats (Table 5). The level of snowmachine use varies annually depending on snow conditions.

Other Mortality

Telemetry flights to monitor survival rates were sporadic and preclude precise dating of natural mortalities or determining the cause of death. There appears to be a higher rate of natural mortality of adult females since the population reached peak size in 1984. From October 1980 through March 1984, the average annual mortality rate was approximately 7%. Annual mortality rate averaged 18% from 1985 to 1989 and averaged 25% from 1992 to 1998. Since 1998 annual adult mortality has remained high, at an average of 21%.

Illegal harvests of caribou are known to occur, but are thought to be at low levels. In April 2008, a dead caribou was found within a mile of Port Heiden with a bullet wound. The meat had not been salvaged. While there is general acceptance of closing the caribou hunting season for the NAP, some local residents still feel entitled to being able to harvest a caribou. The general philosophy behind these actions generally falls into two categories. These hunters feel that if somebody else received a permit they should also be able to harvest a caribou, and if wolves and bears are eating caribou they should also be able to eat caribou.

We reported the results of the calf mortality study conducted during June 1998 in Sellers et al. 1998*a* and the results of the 2005–2006 calf mortality study in Butler et al. 2007. During the 1998 study 35% of radiocollared calves (n = 37) died during their first month of life. Predators, primarily brown bears (*Ursus arctos*), bald eagles (*Haliaeetus leucocephalus*), and wolves (*Canis lupus*), caused most of the mortality of calves <2 weeks old, but disease apparently was an

important mortality factor in calves >3 weeks old. During the 2005–2007 study, 60% of the radiocollared calves died during the first 2 weeks of life, primarily due to predation by wolves and brown bears. Calf mortality remained high between 2 weeks and 4 months of age (66% mortality) though the cause of the late calf mortality is unknown. Evidence that large predators were present at mortality sites was found, but scavenging could not be distinguished from predation due to the large time interval between calf mortality and site investigation (typically $\geq$1 month).

Habitat and Animal Condition

Little quantitative data are available to assess range conditions. Visual assessment of winter range condition based on the abundance of lichens in the early 1980s clearly noted a difference between the traditional range south of the Naknek River and areas between the Naknek River and Lake Iliamna..

Based on our preliminary analysis of data (i.e., weights and body size) from the caribou translocated to the Nushagak Peninsula in 1988 and from animals captured in April 1990, 1992, and 1994, NAP adult females are intermediate in body size and condition between the Southern Alaska Peninsula herd (SAP) and Mulchatna herd animals (Pitcher et al. 1990). Progeny of the translocated caribou on the Nushagak Peninsula are larger than animals from the parent NAP (ADF&G unpublished data, and Hinks and VanDaele 1994).

During 1998 and 1999 neonate calves averaged 8.4 kg (n = 41) for males and 7.2 kg (n = 42) for females at the time of capture. Neonates captured between 2005 and 2007 averaged 8.6 kg for males (n = 74) and 8.0 kg for females (n = 69) at capture. These weights are intermediate compared to other herds in the state.

Between 1995 and 1998 we captured female calves and collected female calves every October to further assess body condition, looking for differences over time and to make comparisons with other herds. Weights and percent bone marrow fat of female calves collected in October were also intermediate, but a high percentage of these caribou showed lesions from lungworms. In October 1999, 11 captured female calves weighed an average of 114.2 pounds. Female calves captured in April averaged 120.3 pounds in 2001 and 110 pounds in 2004. Age-specific productivity has also been monitored between 1997 and 2000.

This work was reported by Valkenburg et al. (1996a, 1996b), and Sellers et al. (1998*a*, 1998*b*, 1999, 2000). Overall, this work demonstrates that the NAP is under moderate nutritional stress. No 2-year-old females have produced calves (n = 32), and only 33% of 3-year-olds (n = 18) have been pregnant. Overall pregnancy rates were low but are generally improving for cows over 2 years of age. Pregnancy rates were 57%, 63%, 74%, and 78% in 2005, 2006, 2007, and 2008 respectively.

In 2005 a herd health assessment identified heavy parasite loads, the presence of bovine respiratory disease complex, poor immune response, low levels of micronutrients, and chronic dehydration in animals examined. An experimental study to investigate the effects of parasite removal on body condition and calf production was conducted between 2005 and 2007. This data is currently being analyzed.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

A few encouraging signs of improved nutrition were noted in 2001 and 2002, including improved survival rates, higher body weights of calves captured in April 2001, higher calf:cow ratios, and renewed fidelity to traditional winter range. Additionally, postcalving counts in 2002 showed a slight increase over the previous year for the first time in 10 years, but after 2002 survival rates and body weights of calves captured in April 2004 returned to levels at or below those observed in the late 1990s. While there was noticeable improvement in several key parameters in 2007 and 2008, calf:cow ratios remain at very low levels.

CONCLUSIONS AND RECOMMENDATIONS

In spite of improvements observed in 2001, 2007, and 2008, the NAP continues to decline and survival and recruitment remain low. Hunting restrictions and closures were implemented to minimize any negative human influence on the population, but were never expected to reverse the population trend. Currently there is no intention of reopening the hunts until the herd begins to recover. Biologists evaluated intensive management options for this population in 1999, 2004, 2005, 2007, 2008, and 2009 and concluded that no viable solutions existed to alter the status of this herd. The major impediments to creating a successful intensive management plan include nutritional limitations, which are not fully understood but appear to be improving, and limitations imposed by federal lands and how they are managed. With increasing frustration surrounding the decline of this population and the perceived influence of predators, pressure to reopen caribou hunting for the NAP and to manage predators is increasing in local communities. In March 2009 the Board of Game adopted a proposal to develop a predator management plan that is to be reviewed during the spring 2010 Board of Game meeting. The management objective for this herd is to have at least 25 bulls:100 cows in October. This objective is lower than most herds in the state and should be adjusted, particularly now that the herd size is smaller. When hunting opportunity is eventually reauthorized the bag limit will undoubtedly offer a bull-only hunt. A higher bull ratio objective will increase the number of bulls encountered by hunters in the field. A new management objective of at least 35 bulls:100 cows should be instituted now in anticipation of hunt seasons being authorized in the future.

LITERATURE CITED

BUTLER, L., B. DALE, J. GUDE, K. BECKMEN, AND R. SQUIBB. 2007. Production and early calf mortality in the Northern Alaska Peninsula Herd, 2005–2007. Alaska Department of Fish and Game and US Fish and Wildlife Service Cooperative Agreement 06-069 Final Report. Alaska Department of Fish and Game, Division of Wildlife Conservation, King Salmon, Alaska.

HINKES, M. T. AND L .J. VANDAELE. 1996. Population growth and status of the Nushagak Peninsula caribou herd following reintroduction, southwest Alaska, 1988–93. Rangifer, Special Issue 9:301-309.

PITCHER, K., C. DAU, D. JOHNSON, R. SELLERS, AND R. WEST. 1990. Causes of low calf recruitment in the Southern Alaska Peninsula caribou herd and recent herd history.

Research Progress Report. Alaska Department of Fish and Game, Division of Wildlife Conservation. Juneau, Alaska. 22pp.

POLLOCK, K. H., S. R. WITERSTEIN, AND C. M. BUNCK. 1989. Survival analysis in telemetry studies: the staggered entry design. *Journal of Wildlife Management* 53:7–15.

SELLERS, R. A., P. VALKENBURG, R. L. ZARNKE, R.C. SQUIBB. 1998*a*. Natality and early calf mortality of Northern Alaska Peninsula Caribou. Alaska Department of Fish and Game and US Fish and Wildlife Service Cooperative Agreement 98–079 Final Report. Alaska Department of Fish and Game, Division of Wildlife Conservation, King Salmon, Alaska.

SELLARS, R.A., VALKENBURG, P., ZARNKE, R.L., SQUIBB, R.C., AND ROY, M. 1998. Fall sex/age composition, body condition, disease screening and collaring of Northern and Southern Alaska Peninsula caribou herds, 1998. Alaska Department of Fish and Game and US Fish and Wildlife Service Cooperative Agreement 99-014 Final Report. Alaska Department of Fish and Game, Division of Wildlife Conservation, King Salmon, Alaska.

SELLARS, R.A., VALKENBURG, P., R. SQUIBB, M. ROY, B. DALE. 1999. Survival, natality, and calf weights of caribou on the Alaska Peninsula, 1998–99. Alaska Department of Fish and Game and US Fish and Wildlife Service Cooperative Agreement 99–017 Final Report. Alaska Department of Fish and Game, Division of Wildlife Conservation, King Salmon, Alaska.

SELLARS, R.A., VALKENBURG, P., SQUIBB, R., DALE, B.W., AND ZARNKE, R.L. 2003. Natality and early calf mortality in the Northern Alaska Peninsula and Southern Alaska Peninsula caribou herds. Rangifer, Special Issue 14:161-166.

SELLARS, R.A., VALKENBURG, P., DALE, B.W., SQUIBB, R.C., AND ROY, M. 2000. Fall sex/age composition, genetic screening and collaring of Northern and Southern Alaska Peninsula herds, 1999. Alaska Department of Fish and Game and US Fish and Wildlife Service Cooperative Agreement 00-020 Final Report. Alaska Department of Fish and Game, Division of Wildlife Conservation, King Salmon, Alaska.

SKOOG, R.O. 1968. Ecology of caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. thesis. University of California, Berkeley, CA. 699pp.

VALKENBURG, P., VERHOEF, J.M., AND ZARNKE, R.L. 1996. Investigation and improvement of techniques for monitoring recruitment, population trend, and nutritional status in the Western Arctic Caribou Herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Final Report. Project W-24-1, W-24-2, W-24-3, W-24-4. Juneau. 53 pp.

WHITTEN, K,R. 1995. Antler loss and udder distention in relation to parturition in caribou. *Journal of Wildlife Management* 59(2): 273–277.

PREPARED BY: SUBMITTED BY:

Lem Butler	Gino Del Frate
Wildlife Biologist	Management Coordinator

Please cite any information taken from this section, and reference as:

BUTLER, L. 2009. Units 9C & 9E caribou management report. Pages 32–42 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 NAP caribou fall composition counts and estimated population size, 1984–2008

Regulatory Year	Total bulls: 100 cows	Calves:100 cows	Calves (%)	Cows (%)	Small bulls (% of bulls	Medium bulls (% of bulls)	Large bulls (% of bulls)	Total bulls (%)	Composition sample size	Estimate of herd size
1984	39	39	22	56	67	16	17	22	1,087	20,000
1990	41	29	17	59				24	1,484	17,000
1991	42	47	25	53	54	34	12	22	1,639	17,000
1992	40	44	24	54	44	38	19	22	2,766	17,500
1993	44	39	21	55	52	29	19	24	3,021	16,000
1994	34	34	20	59	58	28	14	20	1,857	12,500
1995	41	24	15	60	49	29	22	25	2,907	12,000
1996	48	38	19	54	71	19	10	26	2,572	12,000
1997	47	27	16	57	54	31	14	27	1,064	10,000
1998	31	30	19	62	57	28	15	19	1,342	9,200
1999	40	21	13	62	58	30	12	25	2,567	8,600
2000	38	18	12	64	59	24	18	24	1,083	7,200
2001	49	28	16	57	61	24	15	28	2,392	6,300
2002	46	24	14	59	57	19	24	27	1,007	6,600
2003	36	11	8	68	46	30	24	24	2,776	
2004	34	7	5	71	40	34	25	24	1,355	3,400
2005	23	7	6	77	37	41	22	18	1,914	
2006	26	14	10	72	26	43	31	18	1,725	
2007	27	7	5	75	29	38	33	20	1,719	
2008	19	10	8	77	33	25	43	15	1,841	2,000[a]

[a] Minimum population estimate based on fall composition surveys that were not designed to estimate population size. Actual population size is believed to be between 2,000 and 2,500 caribou based on field observations.

TABLE 2 NAPCH harvest, 2001-2008

Regulatory Year	Hunter Harvest				Estimated Unreported	Illegal	Estimated Total[a]
	Reported						
	M (%)	F (%)	Unk.	Total			
2001–2002	81 (91)	8 (9)	0	89	30	-	120
2002–2003	77 (95)	4 (5)	1	82	30	-	110
2003–2004	118 (95)	6 (5)	0	124	75	-	200
2004–2005	31 (94)	2 (6)	1	34	30	-	60
2005–2006[b]	-	-	-	0	-	-	0
2006–2007[b]	1	-	-	1	0	15	16
2007–2008[b]	1	-	-	1	0	15	16

[a] Estimated total is rounded off.
[b] No Tier II permits issued

TABLE 3 NAP caribou annual hunter residency and success, 2001-2008

Regulatory Year	Successful				Unsuccessful				Total Hunters
	Local Resident[a]	Nonlocal Resident	Nonresident	Total[b] (%)	Local Resident[a]	Nonlocal Resident	Nonresident	Total[b] (%)	
2001–2002	89	0	0	89 (67)	42	1	0	43 (33)	132
2002–2003	74	6	0	82 (61)	46	7	0	53 (39)	135
2003–2004	111	13	0	124 (72)	39	10	0	49 (28)	173
2004–2005	34	0	0	34 (69)	13	2	0	15 (31)	49
2005–2006[b]	-	-	-	0	-	-	-	0	0
2006–2007[b]	1	-	-	1 (100)	-	-	-	0	1
2007–2008[b]	1	-	-	1 (100)	-	-	-	0	1

[a] Local residents are residents of Subunits 9A, 9B, 9C and 9E.
[b] Includes hunters of unspecified residency
[c] No Tier II permits issued

TABLE 4 NAP caribou annual harvest chronology percent by month 2001–2008

Regulatory Year	Percent of Harvest									
	August	September	October	November	December	January	February	March	April	*n*
2001–2002	13	11	0	8	7	6	18	10	26	89
2002–2003	19	21	0	5	4	4	5	18	25	80
2003–2004	17	18	1	5	24	7	10	6	11	124
2004–2005	21	14	0	7	28	7	0	0	24	29
2005–2006[a]	-	-	-	-	-	-	-	-	-	0
2006–2007[a]	-	-	-	-	-	100	-	-	-	1
2007–2008[a]	-	-	-	-	-	100	-	-	-	1

[a] No permits issued

TABLE 5 NAP caribou harvest percent by transport method, 2001–2008

Regulatory Year	Percent of Harvest							
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway Vehicle	Other
2001–2002	1	0	17	44	24	6	8	0
2002–2003	9	0	20	46	5	18	0	2
2003–2004	8	0	16	35	23	13	3	2
2004–2005	0	0	18	44	26	6	6	0
2005–2006[a]	-	-	-	-	-	-	-	-
2006–2007[a]	-	-	-	-	-	-	-	100
2007–2008[a]	-	-	-	-	-	-	-	100

[a] No permits issued

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 P.O. BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

LOCATION

GAME MANAGEMENT UNIT: 9D (3,325 mi^2)

HERD: Southern Alaska Peninsula

GEOGRAPHIC DESCRIPTION: Southern Alaska Peninsula

BACKGROUND

The range of the Southern Alaska Peninsula caribou herd (SAP) extends from Port Moller to False Pass. There have been reports of caribou moving between Unimak Island and the mainland, including what may have been a substantial emigration from Unimak Island in 1976. Still, caribou on Unimak Island have been determined to be genetically isolated enough with fidelity to calving areas on the island to be designated a separate herd. Historically, the size of the SAP has varied widely, ranging from 500 to more than 10,000. Skoog (1968) speculated that the Alaska Peninsula was marginal habitat for sustaining large caribou populations because of severe icing conditions and ash from frequent volcanic activity affecting food supply and availability. Recent herd history includes growth from 1996 to 2002 and decline from 2002 to 2008.

Harvest of the SAP was fairly high from 1980 to 1985, probably exceeding 1,000 in several years. Starting in 1986, restrictive regulations reduced harvests as the herd continued to decline. By 1993 the herd was below 2,500 and all hunting was closed. Poor nutrition appears to have played a major role in the decline of the SAP in the 1980s and early 1990s. Predation by wolves and brown bears and human harvest may also have contributed to the decline (Pitcher et al. 1990). A survey by Izembek National Wildlife Refuge (INWR) staff early in 1997 showed a substantial increase in numbers, and a federal subsistence season was opened that fall. The herd continued to grow slowly, and in 1999 a general state hunt was opened. Herd size grew to 4,100 caribou by 2002. Following this brief recovery, calf recruitment decreased and population size began to decline. Little data was collected during the initial decline to assess the underlying cause, but recent investigations have shown that wolf predation on the calving grounds significantly reduced calf survival and recruitment. State and federal hunts were closed in 2007 due to increasing concern for the status of the herd and a predator control program was initiated in 2008 to reduce wolf predation on caribou calves.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

The cooperative, interagency (Alaska Department of Fish and Game [ADF&G] and the U.S. Fish and Wildlife Service [FWS]) management plan was revised and adopted in March 2008. This plan sets the following population and management objectives:

1. Sustain a total population with a minimum of 3,000 caribou and a maximum of 4,000 caribou.

2. Maintain a fall bull:cow ratio of 35:100.

3. Provide limited harvest of bulls when the herd exceeds 1,000 caribou.

4. Cow harvests may be authorized when the population exceeds 2,000 caribou and population size is increasing.

METHODS

Postcalving population count surveys are conducted in late June or early July when funds are available. Staff of INWR periodically conducted winter aerial counts along systematic transects. Parturition surveys have been conducted when funding is available since June 1997. Fall sex and age composition surveys are conducted annually with a helicopter in October. In April 2004, October 2006, and October 2007 female caribou were captured and marked with radio collars during cooperative projects with the FWS. Herd distribution and survival rates are monitored periodically by radiotracking collared animals. Caribou calf mortality studies were conducted in 1989–1990 (Pitcher et al. 1990), 1999 (Sellers et al. 1999) and 2008 (L. Butler, ADF&G wildlife biologist, unpublished data), and range conditions were studied in 1991 and 1992 (Post and Klein 1999).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Following a peak of more than 10,000 caribou in 1983, the SAP began a precipitous decline. By 1993 the herd was below the 2,500 threshold at which all hunting was to be closed. The population stabilized during the mid 1990s and grew slowly to 4,100 caribou by 2002. Since 2002 estimates of calf recruitment have been chronically low, and population size declined rapidly. Given the current age structure of the population, the population's ability to increase will be very limited over the next few years even though calf recruitment was increased in 2008.

Population Size

A partial survey by FWS in February 2002 counted only 1,700 caribou, but a more complete FWS survey in November 2002 counted 4,100. FWS counted 1,800 caribou in December 2004 during two surveys of the SAP and 1,651 caribou in February 2006. In 2007 ADF&G reinitiated efforts to count caribou in July, when the animals are grouped in postcalving aggregations, to confirm the low population size. ADF&G surveys utilized radiotelemetry to locate animals to

obtain a more accurate count of the herd. Counts completed during 2007 and 2008 estimated the minimum population size to be 600 and 700 caribou during each respective year.

Population Composition

Fall composition surveys conducted from 2000 through 2007 identified a declining trend in calf:cow ratios, reaching a recorded low of 0.5 calves:100 cows in 2007 (Table 1). During 2008 calf survival was improved by reducing wolf predation in the calving area, and the calf ratio increased to 39 calves:100 cows. Bull:cow ratios averaged 45 bulls:100 cows from 1997 to 2001 and decreased to an average of 36 bulls:100 cows between 2002 and 2005. During 2006, 2007, and 2008 bull:cow ratios dropped below management objectives (16, 15, and 10 bulls:100 cows respectively. The decrease in the bull:cow ratio is a product of the population's age structure becoming increasingly skewed toward older age animals due to the low calf recruitment observed since 2002 and the relatively short life-span of bulls compared to cows. The bull:cow ratio has continued to decline in spite of hunting closures instituted in 2007. Similarly harvests prior to 2007 were not sufficient to explain the decrease in the bull:cow ratio.

Distribution and Movements

Data from radiotracking surveys indicate that the SAP has two main calving areas. Approximately 40% of the herd calves on the Caribou River flats. Many of these animals are relatively sedentary and remain in the area throughout winter. However, some have been located during the winter near Cold Bay. The remainder of the herd calves in the Black Hills/Trader Mountain area and winter near Cold Bay. Additionally, a few caribou calve in the mountains east of the Caribou River flats.

In October 1998, 6 caribou in the extreme southeastern corner of Unit 9E and 8 caribou in the northeastern portion of Unit 9D were fitted with satellite collars to further investigate whether interchange between herds occurred in this area. None of these caribou moved from the unit in which they were captured. Genetic testing for interbreeding among caribou in 9E, 9D, and Unimak Island also confirms relatively little genetic interchange between these herds. Exchange of caribou between Unimak Island and the mainland has not been documented in recent years.

MORTALITY

Harvest

Season and Bag Limits. There was no state hunt in Unit 9D during 1993–1998. In 1999 a state hunt was resumed in 9D with a resident season 1–20 September. and 15 November–31 March with a 1 caribou limit. In 2001 fall seasons were again lengthened for residents (19 August–30 September) and nonresidents (1–30 September– during odd-numbered years and 1 September–10 October during even-numbered years). Between 1999 and 2004 the bag limit was 1 caribou for residents and 1 bull for nonresidents. In 2005 resident bag limit was changed from 1 caribou to 1 bull in the fall portion of the season or 1 antlerless caribou during the winter.

Board of Game Actions and Emergency Orders. In March 2007 the Board of Game restricted caribou hunting in Unit 9D by instituting a Tier I registration hunt for the SAP with a bag limit of 1 bull. The season was closed by emergency order in July 2007 after postcalving counts confirmed the low population size (600 caribou) and calf survival to 1 month of age was found to

be less than 1% during that year. In March 2008 the Board of Game approved a predation reduction plan that allowed Department of Fish and Game (ADF&G) staff and agents to remove wolves from the calving grounds of the SAP.

Federal Subsistence Board (FSB) Actions. In July 2007, the Federal Subsistence Board approved an emergency petition to closed federal subsistence hunting of caribou.

Hunter Harvest. Hunters reported harvesting an average of 63 caribou during state hunts from regulatory year 2002 through regulatory year 2006 (Table 2; a regulatory year runs 1 July–June 30; e.g., RY 2002 = 1 July 2002–30 June 2003). Much of the annual variation in harvest is attributed to a longer nonresident season during falls of even numbered years. Improved data sharing between the state and federal governments has provided more timely harvest data for the federal subsistence hunt (RC091), although the hunter reporting rate is still thought to be low according to federal staff.

Hunter Residency and Success. Local hunters accounted for 64% of the reported harvest and had a 46% success rate in 2006 (Table 3). Nonresident hunters accounted for 29% of the reported harvest and had a 47% success rate. Alaska residents from other parts of the state reported harvesting the remaining 7% and had a 40% success rate. The harvest by local residents is believed to be underreported in Table 3 both because of noncompliance with state harvest tickets and use of federal permits.

Harvest Chronology. Timing of the harvest (Table 4) is influenced primarily by season dates and availability of caribou on the Cold Bay road system. Fall and early winter months have accounted for the majority of the harvests since 1999. The harvest in 2006 was much more sporadic, presumably because it was more difficult to locate and access the caribou.

Transportation Methods. The vast majority of nonresident hunters used aircraft, while local hunters generally used boats, 4-wheelers, and highway vehicles (Table 5).

Other Mortality

In 2007 more than 99% of the calves died prior to reaching the age of 1 month, with predation being the most likely cause of death. Nutrition was not believed to be an important factor based on adult female body condition, high pregnancy rates, and blood serology. A wolf predation reduction plan was successfully implemented during the summer of 2008 in conjunction with a caribou calf mortality study designed to monitor calf survival and causes of death. Department staff removed 28 wolves (14 adults and 14 pups) from two key packs affecting caribou calf survival. Caribou calf survival was significantly improved by the wolf removal. The mortality rate of calves from birth to one month of age decreased from >99% in 2007 to 43% in 2008. Similarly, the recruitment of calves to fall increased from 0.5 calves:100 cows in 2007 to 39 calves:100 cows in 2008. Predation accounted for 80% of the calf mortalities investigated (n = 19) when calves were 0 to 14 days of age.

HABITAT

Assessment

Adult caribou in the SAP appear to be in good overall condition based on an evaluation of adult females captured during the winters of 2006-07 and 2007-08. Caribou calf weights and early survival also support the conclusion that nutrition is not limiting population growth or caribou survival at this time.

The overall pregnancy rate in the SAP was relatively good based on the evaluation of a random sample of cows that were older than 2 years of age. Of the caribou observed 79% were pregnant in 2007 (n = 235) and 86% pregnant in 2008 (n = 202). A sample of 30 known-aged adults, fitted with radio collars, displayed indications of having a similar pregnancy rate in 2008 (90%) based on physical characteristics prior to giving birth. Of the radio collared cows, 27 of the 30 were later observed accompanied by healthy calves, including one cow that was originally categorized as not being pregnant based on a lack of antlers, udder development, and overall appearance.

Caribou calves born during the summer of 2008 appeared to be in good condition and calf body weights were similar to values reported for the SAP during periods of population growth. Male calves averaged 7.6 kg (capture weight, n = 32) and female calves averaged 7.5 kg (n = 29).

CONCLUSIONS AND RECOMMENDATIONS

The short duration of the recovery from the population low in the 1990s is not fully understood because little data was collected at the time; however, given the chronically low calf recruitment the decline is not surprising. Recent studies offer evidence that predation by wolves significantly reduced calf survival and is the primary limiting factor currently. Brown bears, though abundant in the area, were not a major source of calf mortality. During the same period other caribou herds throughout Southwest Alaska were also declining, and herds on the Alaska Peninsula and Unimak Island experienced similarly low calf recruitment. The similarity in timing may be coincidental or it may imply that a common regional factor is affecting caribou populations in this portion of the state. While it is possible the initial decline of the SAP involved some unknown environmental factor, nutritional stress or any other expected indicators are not apparent at this time. Similarly, no weather anomalies or changes in vegetative patterns have been observed that would form the basis for such a hypothesis. A possible explanation of the initial decline is that the caribou range had not recovered sufficiently following the population high in the 1980s and the caribou were presented with a range with reduced carrying capacity in the 2000s.

Currently the low bull:cow ratio (10 bulls:100 cows) is worrisome, but should improve quickly as new calves are recruited into the population. Department staff should continue efforts to survey population size, composition, productivity, and survival to document how the population responds to the wolf control efforts.

LITERATURE CITED

PITCHER, K., C. DAU, D. JOHNSON, R. SELLERS, R. WEST. 1990. Causes of low calf recruitment in the Southern Alaska Peninsula caribou herd and recent herd history. Research Progress Report. Alaska Department of Fish and Game, Juneau. 22pp.

POST, E.S. AND D. KLEIN. 1999. Caribou calf production and seasonal range quality during a population decline. *Journal of Wildlife Management* 63:335–345.

SELLERS, R.A., P. Valkenburg, R.C. Squibb, M. Roy, and B. Dale. 1999. Survival, natality, and calf weights of caribou on the Alaska Peninsula, 1998–99. Final Report. Cooperative Agreement 99-017.

SKOOG, R.O. 1968. Ecology of caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. Thesis. University of California, Berkeley, CA. 699pp.

PREPARED BY: SUBMITTED BY:

Lem Butler
Wildlife Biologist

Gino Del Frate
Management Coordinator

Please cite any information taken from this section, and reference as:

BUTLER, L. 2009. Southern Alaska Peninsula Unit 9D caribou management report. Pages 43–51 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 Southern Alaska Peninsula caribou composition and survey results, 1986–2008

Regulatory year	Bulls: 100 cows	Calves: 100 cows	% Calves Summer	% Calves Fall	% Cows	% Bulls	Small bulls (% of bulls)	Medium bulls (% of bulls)	Large bulls (% of bulls)	sample size	Postcalving Count	INWR[a] counts
1986	32	20	17	13	66	21	59	28	13	2,307		4,543
1987	36	26	12	16	62	22	54	25	21	1,769	4,067	6,401
1988	41	19	16	12	59	29	61	37	4	886	3,407	
1990	19	12	14	9	76	15				1,051	3,375	
1991	28	19	18	13	68	19	53	33	14	883	2,287	2,830
1992	22	22	15	15	70	15	46	32	21	746	2,380	
1993	30	24	16	16	65	19	59	24	17	745	1,495	1,929
1994	29	28	21	18	64	18	46	27	27	531	2,137	1,806
1996			10									1,403
1997	42	19	15	12	62	26	36	36	27	546	1,844	3,243
1998	32	35		21	60	19	42	23	36	987		3,127
1999	51	25	26	15	57	28	48	30	22	1,049	3,612	
2000	42	37	24	21	56	23	50	24	26	982		
2001	57	38		19	51	30	57	26	17	1,313		
2002	38	16		10	65	25	44	34	23	932		4,100
2003	40	8		5	68	27	40	26	33	1,257		
2004	36	7		5	70	25	24	38	38	966		1,872
2005	30	6		5	73	22	27	46	28	1,040		1,651
2006	16	1		1	86	13	26	24	50	713		770
2007	15	0.5	1	1	87	12	20	47	33	431	600	
2008	10	39	27	26	67	7	3	30	68	570	700	

[a] Counts by INWR staff

TABLE 2 SAP caribou harvest, 2001–2008

Regulatory Year	Hunter Harvest: Reported M (%)	Reported F (%)	Reported Unknown	Reported Total	Estimated Unreported	Illegal	Estimated Total[a]
2001–2002	52 (93)	4 (7)	0	56	30	-	90
2002–2003	61 (87)	6 (9)	3 (4)	70	30	-	100
2003–2004	47 (94)	2 (4)	1 (2)	50	30	-	80
2004–2005	68 (88)	8 (10)	1 (1)	77	30	-	110
2005–2006	58 (95)	3 (5)	0	61	30	-	90
2006–2007	56 (97)	2 (3)	0	58	30	-	90
2007–2008[b]	-	-	-	-	-	10	10

[a] Estimated total is rounded off.
[b] No permits issued

TABLE 3 SAP caribou annual hunter residency and success, 2001–2008

Regulatory	Successful: Local	Successful: Nonlocal	Successful: Nonresident	Successful: Total[b] (%)	Unsuccessful: Local	Unsuccessful: Nonlocal	Unsuccessful: Nonresident	Unsuccessful: Total[b] (%)	Total
2001–2002	26	13	12	56 (70)	12	2	6	24 (30)	80
2002–2003	29	8	25	70 (71)	12	14	2	29 (29)	99
2003–2004	9	13	25	50 (70)	10	6	5	21 (30)	71
2004–2005	24	24	29	77 (73)	14	8	6	29 (27)	106
2005–2006	30	9	20	59 (63)	20	5	8	34 (37)	93
2006–2007	37	4	17	58 (46)	44	6	19	69 (54)	127
2007–2008[c]	-	-	-	-	-	-	-	-	-

[a] Local residents are residents of Subunit 9D
[b] Includes hunters of unspecified residency
[c] No permits issued

TABLE 4 SAP caribou annual harvest chronology percent by month 2001–2008

Regulatory Year	Percent of Harvest								n
	August	September	October	November	December	January	February	March	
2001–2002	4	41	2	12	16	20	5	0	56
2002–2003	1	39	13	22	18	5	0	2	67
2003–2004	2	63	2	8	15	0	4	6	49
2004–2005	0	36	6	16	33	5	1	3	77
2005–2006	0	46	0	28	13	5	5	3	61
2006–2007	0	2	13	15	31	13	4	22	46
2007–2008[a]	-	-	-	-	-	-	-	-	-

[a] No permits issued

TABLE 5 SAP caribou harvest percent by transport method, 2001–2008

Regulatory Year	Percent of Harvest						
	Airplane	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway Vehicle	Foot
2001–2002	23	23	30	0	4	20	0
2002–2003	35	25	23	0	0	17	0
2003–2004	56	6	26	0	0	12	0
2004–2005	39	16	13	1	7	23	1
2005–2006	42	6	20	0	0	32	0
2006–2007	29	30	21	0	2	16	2
2007–2008[a]	-	-	-	-	-	-	-

[a] No permits issued

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 P.O. BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

LOCATION

GAME MANAGEMENT UNIT: 10 (6,435 mi^2)

HERD: Unimak

GEOGRAPHIC DESCRIPTION: Unimak Island

BACKGROUND

There have been numerous historical reports of caribou moving between Unimak Island and the mainland, including what may have been a substantial emigration in 1976. Based on this interchange, caribou on Unimak Island were originally considered a segment of the Southern Alaska Peninsula (SAP) caribou herd. But fidelity to calving grounds on the island and recent evidence from genetic sampling show there is enough distinction between caribou on the island and mainland to classify these as two different herds. Caribou numbers on Unimak Island have varied substantially, ranging from 5,000 in 1975 to 300 during the 1980s. Emergency orders closed state and federal hunts on Unimak Island in 1993. The federal subsistence season reopened in 2000, and the state general season reopened in 2001 when the herd was at the maximum population size recommended by ADF&G biologists for Unimak Island. Though the survey data is not available for all years, observations suggest that calf recruitment has been very low in this herd since 2005.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

No formal management objectives are in place for caribou on Unimak Island, and practically speaking, there is little opportunity to actively manage this herd given formidable logistics involved in reaching the island. Given poor access and the relatively limited habitat, the herd ideally should be kept below 1,000 animals.

METHODS

We periodically conduct fall sex and age composition surveys with a helicopter in October and have recently begun assessing pregnancy rates in June prior to calving. Occasional radiotracking flights are used to monitor herd distribution. Staff of the Izembek National Wildlife Refuge (INWR) periodically conduct winter aerial counts along systematic transects.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Following a peak of more than 5,000 caribou in 1975, the Unimak herd began a precipitous decline, apparently initiated by a sizable emigration. By the early 1980s the herd numbered just several hundred animals. By 1997 the herd had grown to at least 600 and continued to increase. After reaching the recommended population size in 2000 the herd size remained relatively stable until 2005. The population is currently declining and has experienced very poor calf recruitment in recent years.

POPULATION SIZE

In January 1997 the U.S. Fish and Wildlife Service (FWS) counted 603 caribou on Unimak Island. This was the first comprehensive survey of Unimak Island in more than two decades. In May 2000 Rod Schuh, a registered guide who has hunted on Unimak for several years, counted 983 caribou on the north and west sides of the island. That count and the number classified during fall composition surveys suggest there were close to 1,000 caribou on Unimak between 2000 and 2006 (Table 1). While no formal population counts have been conducted since 2006, the population size was estimated to be approximately 700 caribou in 2007 and 300 to 400 caribou in 2008 based on the number of caribou observed during composition surveys and reports from local guides.

POPULATION COMPOSITION

Fall composition surveys in 1999 showed a ratio of 46 calves:100 cows on Unimak, but only 126 caribou were classified. Fall calf ratios remained at acceptable levels until 2002, but had dropped to very low levels by 2005 and have remained low since that time (Table 1). While it is unclear when the poor calf recruitment started, the lack of calf recruitment in recent years is undoubtedly having an effect on key population parameters, including population size, age structure, and the bull ratio. Bull ratios were above management objectives for most herds from 2000 to 2005. The bull ratios in 2007 and 2008 (31 bulls:100 cows and 9 bulls:100 cows) are likely the result of poor calf recruitment. Human harvest of caribou from this population is low and does not explain the decrease in the bull ratio.

DISTRIBUTION AND MOVEMENTS

No significant interchange between Unimak Island and the mainland has been documented in recent years.

Mortality

Harvest

Season and Bag Limits. There were no state or federal hunts on Unimak Island from 1993 to 1999. In 2000 a federal subsistence hunt (RC101) was resumed. In 2001 a general state hunt was established with a one caribou bag limit, with seasons of 1–30 September for nonresidents and 10 August–30 September and 15 November–31 March for residents.

Board of Game Actions and Emergency Orders. The Board of Game closed the caribou hunting season on Unimak Island during the March 2009 meeting.

Federal Subsistence Board Actions. The Federal Subsistence Board decreased the bag limit for the federal subsistence hunt from 4 caribou to 2 caribou in 2007.

Hunter Harvest. Hunters reported harvesting an average of 14 caribou from 2001 and 2007 (Table 2). Little information was available for the federal registration permit hunt (RC101) for this reporting period, but hunting effort on Unimak appears to be low in federally qualified villages. However, caribou are harvested infrequently by local residents if caribou migrate to False Pass.

Hunter Residency and Success. Nonresident hunters had an average success rate of 91% and have accounted for 77% of the reported harvest (Table 3) during this reporting period. Success rates for nonlocal residents was 100% (n = 4). Participation in the hunts by local residents is undoubtedly underreported both because of noncompliance with state harvest tickets and use of federal permits.

Harvest Chronology. All reported caribou harvest since 2001 has occurred in September with the exception of one caribou taken in November of 2002 and one taken in December of 2006.

Transportation Methods. The main form of access to Unimak is small aircraft from Cold Bay. Local residents likely use off-road vehicles (ORVs) and boats to hunt caribou, but have not reported these activities.

OTHER MORTALITY

There are no active radio collars on caribou of this herd to allow calculation of survival rates.

HABITAT ASSESSMENT

No data are available.

CONCLUSIONS AND RECOMMENDATIONS

Caribou on Unimak Island are now managed as a separate and independent caribou herd, even though it is recognized we will not be able to manage this herd to dampen population fluctuations and that some interchange with the mainland may occur, particularly at high population sizes. The recent population decline, which is undoubtedly the result of poor calf recruitment and possibly poor adult survival rates, is of concern although there is little managers can do to reverse this trend. Hunting seasons were closed by the Alaska Board of Game during the March 2009 meeting and proposals have been submitted to the Federal Subsistence Board to close federal hunts before the next hunting season begins. Pregnancy rates of adult cows (2 years of age or older) appear to be normal (85% pregnancy rate in 2008), but calves are not surviving to the fall. Predation on caribou calves is believed to be the cause of the poor calf survival; however, more work is needed before nutrition can be ruled out as a factor in the decline. The Alaska Department of Fish and Game intends to deploy 10 to 15 radio collars on adult cows during the next year to assess body condition, health, age, and survival of adult females and aid biologists in

locating caribou during survey flights. Biologists should continue to monitor this herd periodically to detect changes in population status and to gather additional information on population dynamics of caribou in Southwest Alaska.

PREPARED BY: SUBMITTED BY:

Lem Butler	Gino Del Frate
Wildlife Biologist	Management Coordinator

Please cite any information taken from this section, and reference as:

BUTLER, L. 2009. Unit 10 caribou management report. Pages 52–57 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 UCH caribou fall composition counts and estimated population size, 2000–2008.

Regulatory Year	Total bulls:100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Total bulls (%)	Small bulls (% of bulls)	Medium bulls (% of bulls)	Large bulls (% of bulls)	Composition sample size	Estimate of herd size
2000	40	21	13	62	25	34	32	33	406	983[a]
2002	54	31	17	54	29	50	22	29	392	1,262[b]
2004										1,006[b]
2005	45	7	5	66	29	24	37	39	730	1,009[b]
2006										806[b]
2007	31	6	4	73	23	28	34	38	433	
2008	9	6	5	86	9	33	33	33	260	

[a] Count by Rod Schuh, registered guide, in May
[b] Winter count by Izembek National Wildlife Refuge staff

TABLE 2 Unimak caribou harvest, 2001–2008

Regulatory Year	Hunter Harvest: Reported M (%)	Reported F (%)	Reported Unknown	Reported Total	Estimated Unreported	Illegal	Estimated Total[a]
2001–02	19 (100)	0	0	19	-	-	19
2002–03	11 (92)	1 (8)	0	12	-	-	12
2003–04	10 (100)	0	0	10	-	-	10
2004-05	15 (100)	0	0	15	-	-	15
2005-06	15 (100)	0	0	15	-	-	15
2006-07	12 (92)	1 (8)	0	13	-	-	13
2007-08	13 (100)	0	0	13	-	-	13

[a] Estimated total is rounded off.

TABLE 3 Unimak caribou annual hunter residency and success, 2001–2008

Regulatory Year	Successful: Local Resident	Successful: Nonlocal Resident	Successful: Nonresident	Successful: Total[b] (%)	Unsuccessful: Local Resident	Unsuccessful: Nonlocal Resident	Unsuccessful: Nonresident	Unsuccessful: Total (%)	Total Hunters[b]
2001–02	0	5	14	19 (95)	0	1	0	1 (5)	20
2002–03	0	5	7	12 (92)	0	1	0	1 (8)	13
2003–04	0	1	9	10 (77)	0	2	1	3 (23)	13
2004-05	0	3	12	15 (71)	0	5	1	6 (29)	21
2005-06	0	4	11	15 (94)	0	0	1	1 (6)	16
2006-07	0	3	10	13 (87)	0	0	2	2 (13)	15
2007-08	2	1	10	13 (100)	0	0	0	0 (0)	13

[a] Local residents are residents of Unimak Island.
[b] Includes hunters of unknown residency

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNIT: 12 (3300 mi^2) and adjacent Yukon, Canada (500–1000 mi^2)

HERD: Chisana

GEOGRAPHIC DESCRIPTION: Upper Chisana and White River drainages in the Wrangell–St. Elias National Park and Preserve in southeastern Unit 12 and adjacent Yukon, Canada

BACKGROUND

The Chisana caribou herd (CCH) is a small, nonmigratory herd inhabiting eastcentral Alaska and southwest Yukon, Canada. Skoog (1968) assumed the CCH derived from remnant groups of Fortymile caribou that used the Chisana's range during the late 1920s and early 1930s. Genetic analysis conducted by Zittlau et al. (2000) found that the genetic distance between the CCH and 5 other nearby caribou herds is large, suggesting the herd has been unique for thousands of years and was not formed through emigration from another herd. Their analysis also indicates that the CCH is a woodland caribou herd, the only one in Alaska.

Little is known about CCH population trends before the 1960s. Scott et al. (1950) estimated herd size at 50 animals in 1949, but Skoog (1968) thought their estimate was low due to sampling problems and estimated the CCH at 3000 animals in 1964. By the mid to late 1970s, the herd declined to an estimated 1000 caribou (Kellyhouse 1980). Similar declining trends were reported in other Interior caribou herds (Valkenburg et al. 1994). During the 1980s, environmental conditions were favorable, and the herd increased to about 1900 caribou by 1988 (Kellyhouse 1990).

The herd declined after 1988 to an estimated low of 315 caribou in 2002 (Table 1). Weather and predation were the primary causes for the decline (Farnell and Gardner 2002) and harvest had a minor effect on population fluctuations (Table 2). Between 1979 and 1994, the bag limit was

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

1 bull caribou, and harvest was limited to 1–2% of the population. By 1991 declining bull numbers became a concern, and harvest was reduced through voluntary compliance by guides and local hunters. In 1994 the bull portion of the population declined below the management objective, and all hunting of Chisana caribou was stopped in Alaska. Hunting in Alaska will remain closed until the bull:cow ratio exceeds 30 bulls:100 cows for 2 years, and productivity is high enough to compensate for harvest.

By fall 2002 the herd declined further to an estimated 315 caribou. Between 2003 and 2006 a captive rearing program was conducted by the Yukon Department of Environment (YDE; formerly Yukon Department of Renewable Resources) in Yukon. Annually, 20–50 pregnant female caribou were captured during March–April, retained in a holding facility in Yukon, and released from the facility after calves were 5-weeks old. This program successfully increased the number of calves recruited into the population during 2003–2006. From 2004 through 2008, the population appeared to be stable and was estimated at 700–800 caribou during summer 2008.

During the early 1900s, the CCH was used as a food source by residents of the Athabascan villages at Cross Creek and Cooper Creek and by gold seekers. Subsistence use of the herd declined after 1929, once the gold rush ended. Use of the herd declined again after the Cooper Creek village burned in the mid 1950s (Record 1983). People from Northway and Scotty Creek villages hunted the herd through the 1940s but rarely thereafter (unpublished data recorded at the 2001 Northway–White River First Nation Traditional Knowledge Workshop). For the last 60 years, few people in Alaska or Yukon have depended on Chisana caribou for food.

Guided hunting became common in the Chisana area after 1929 and was the primary use of the CCH from the mid 1950s through 1994, with 4 guide–outfitters working in Alaska and 1 guide operating in Yukon. Due to limited access, use of the CCH and their range for wildlife viewing is negligible.

Before the mid 1980s, the CCH was not a high management priority because of its small size, remoteness, and the light and selective (primarily mature males) hunting pressure it received. In 1980 the Wrangell–St Elias National Park and Preserve was created, and the preserve boundaries encompassed most of the Chisana herd's range. The Alaska National Interest Lands Conservation Act that created the preserve mandated that the National Park Service (NPS) preserve healthy populations and also allow for consumptive uses of the herd. Chisana caribou management became more complex because the Alaska Department of Fish and Game (ADF&G) and the NPS have different mandates and approaches to meeting management objectives.

To meet the diverse management needs, ADF&G initiated a cooperative study with NPS and the YDE in October 1987. Initially, 15 adult female caribou were radiocollared to monitor movements and to facilitate spring and fall censuses and composition surveys. From 1990 through 2002, 57 adult females and 33 4-month-old female calves were radiocollared. Radiocollaring and herd monitoring costs were shared by ADF&G, NPS, and YDE.

A cooperative draft CCH management plan was developed in 2001, and a Yukon CCH recovery plan was developed in 2002. Both plans were designed to aid herd recovery. The management and recovery plans were in effect in regulatory year (RY) 2002 through RY06 (RY = 1 Jul

through 30 Jun, e.g., RY02 = 1 Jul 2002–30 Jun 2003). An updated cooperative CCH management plan is being developed for 2009. Additional details about the CCH prior to 2003 can be found in Farnell and Gardner (2002).

MANAGEMENT DIRECTION

During RY06–RY08, CCH management and research was cooperatively developed to aid herd recovery. Activities that met the different mandates and philosophies of ADF&G, NPS, and YDE were assigned to the respective agencies.

The current Chisana caribou management goal and objective are:

MANAGEMENT GOAL

- Manage the Chisana herd for the greatest benefit of the herd and its users under the legal mandates of the managing agencies and landowners.

MANAGEMENT OBJECTIVE

- Cooperatively with YDE and NPS, develop and implement management strategies to increase calf recruitment to 25 calves:100 cows.

METHODS

Following a population survey in October 2005, a population estimate was developed by Layne Adams of the U.S. Geological Survey (USGS; Anchorage, Alaska). Techniques are summarized in an unpublished USGS progress report (L. Adams, personal communication).

Since 2003, ADF&G has participated in a cooperative (USGS, NPS, YDE, and ADF&G) research project to evaluate the population dynamics and effects of recovery efforts on the CCH during 2003–2008. Composition counts were conducted in RY06 and RY07 by USGS; methods are summarized in unpublished USGS reports (L. Adams, personal communication). Similar composition counts were conducted cooperatively by ADF&G, NPS, and YDE in 2008.

There is an established hunting season for CCH; however, no permits were issued during RY95–RY08 because recruitment in the population was inadequate. Harvest data since 1989 are included in this report (Table 2) to clarify herd population and composition trends. Hunting seasons are based on regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size, Population Composition, and Herd Distribution and Movements

The CCH increased through the 1980s, and the population peaked in 1988 at about 1900 caribou. During 1988–2002, ADF&G believed the herd size declined to an estimated 315 caribou in 2002 (Table 1). Following a more intense population survey by the USGS in 2003, the CCH

population was estimated at 720 caribou, substantially higher than previous estimates. Numerous caribou were likely missed during previous surveys because of the small number of radiocollared caribou, patchy aggregations of caribou, and the tendency of the CCH to use timbered habitat in the fall when surveys were conducted.

During RY04–RY07, ADF&G suspended CCH population monitoring because USGS conducted this aspect of the cooperative research effort. During this time, ADF&G provided technical support in the cooperative management planning, and assisted with capture operations for the captive rearing project by Rick Farnell of YDE in Yukon Canada.

Herd status and movement during RY04–RY08 is summarized in unpublished USGS progress reports (L. Adams, personal communication). Preliminary data indicated that age structure was skewed toward old animals and that recruitment of wild-born calves remained chronically low. A USGS population survey in October 2007 indicated that the CCH numbered approximately 766 caribou, with 13 calves:100 cows and 50 bulls:100 cows. In October 2008, ADF&G and YDE conducted composition surveys on the CCH. We recorded 21 calves:100 cows and 44 bulls:100 cows. Both calf:cow and bull:cow ratios have been relatively stable since 2005 when they were 23:100 and 46:100, respectively. Factors influencing low calf survival are still under investigation. Preliminary analysis of RY04–RY07 radiotracking data indicated the herd primarily used its historic range in the White River drainage between the Alaska Highway bridge in Yukon and the Solo Creek Flats in Alaska, with some movements as far east as the Donjek River in Yukon. During RY04 and RY05, a larger portion of the herd moved into Alaska during the early summer but moved back to Yukon during early winter, where the majority of the herd remained until spring to early summer. Results of this research will be summarized in a final USGS research report in 2009 (L. Adams, personal communication).

MORTALITY

Harvest

Season and Bag Limit during RY93–RY08.

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 12, that portion east of the Nabesna River and south of the winter trail from the Nabesna River to Pickerel Lake to the Canadian border.		
1 bull by registration permit only. The season will be closed when 20 bulls have been taken.	1 Sep–20 Sep (General hunt only)	1 Sep–20 Sep

Alaska Board of Game Actions and Emergency Orders. The Alaska Board of Game took no actions, and no emergency orders were issued during RY06–RY07.

Human-induced Mortality. There has been no legal harvest of Chisana caribou in Alaska or Yukon since RY94 (Table 2). Reports from local residents and the incidence of illegal take of radiocollared caribou indicate that illegal harvest in Alaska has been 3 or fewer caribou annually during RY06–RY08. During RY94–RY08, the Alaska hunting season in the CCH range remained in the regulations, but ADF&G issued no permits. While the bulls:100 cows ratio exceeded 30 during RY04–RY08, productivity remained below levels considered necessary to sustain hunting mortality. In Yukon, between 1996 and 1999, First Nation members killed 3–20 Chisana caribou annually along the Alaska Highway. After 2001, Yukon First Nation members voluntarily have not harvested Chisana caribou. Because the herd is inaccessible most of the year in Alaska, illegal or incidental harvest was not a management concern during RY06–RY08.

Other Mortality

ADF&G conducted no activities to evaluate other causes of mortality on the CCH during RY06–RY07. However, as summarized by Gardner (2003), predation by wolves was identified as the primary factor limiting herd growth.

HABITAT

Assessment

No habitat assessment activities were conducted during RY06–RY07. Gardner (2003), Lenart (1997), and Boertje (1984) provided information about habitat within the CCH range. The most frequently used range in both winter and summer is predominantly grass–sedge habitat with few lichens. Fecal samples containing high proportions of mosses and evergreen shrubs relative to lichens indicate much of the range may be suboptimal (Farnell and Gardner 2002).

Enhancement

No habitat enhancement activities were conducted during RY06–RY07.

CONCLUSIONS AND RECOMMENDATIONS

From 1988 to 2005 the CCH experienced a substantial (60%) decline. This decline was primarily due to poor calf recruitment and high adult mortality associated with adverse weather and predation (Farnell and Gardner 2002). Research during 1991–2003 indicated that predation was the cause of 89% of documented mortality among radiocollared cows ≥4 months old (Gardner 2003). Preliminary results from recent research indicate that similar levels of predation occurred during RY06–RY07 (L. Adams, personal communication).

Hunting was allowed during the herd's initial decline (1989–1994); however, annual harvest was restricted to bulls and removed 2% or less of the population. Hunting in Alaska did not appear to limit the herd's ability to grow.

Winter range quality in the eastern portion of the herd's range is below average compared with other Interior herds and may have contributed to higher overwinter adult mortality during 1994

and 1995. Lichen availability on winter range in Yukon is lower compared to other caribou herds, but herd body condition is comparable to adjacent herds with greater lichen availability within their range, except following severe winters. For the herd to stabilize, the calf recruitment rate must increase to 25 calves:100 cows while maintaining the cow mortality rate at or below 12–15% and the bull mortality rate at or below 21–25%. For calf recruitment to increase, pregnancy and natality rates must remain high, and mortality caused by predators must decline.

The extreme and chronically low recruitment rates experienced by the CCH over the past 18 years have not been documented in any other wild caribou herd (R. Boertje, ADF&G wildlife biologist, personal communication). Factors causing low calf recruitment in the CCH are not fully understood, but USGS research during 2003–2008 is expected to address this question.

When hunting was allowed, the primary users of the Chisana herd were nonresidents. During RY90–RY94, 43% of the hunters participating in the Chisana caribou hunt were nonresidents, who took 58% of the harvest, while local subsistence users took 9% of the harvest. Because this is an international herd and extensive efforts have been made to help the herd recover to sustainable levels, care should be taken to include input from all interested parties prior to future harvest of the herd. An international harvest management plan is being developed, with input from all interested parties, to help guide harvest once the herd recovers. In Alaska, efforts should be made to resume harvest under existing regulations for bulls only, primarily to reestablish opportunity for guided nonresident hunters.

Although we met our objective to develop and implement management strategies to increase calf recruitment, the levels of recruitment were still below our objective of 25 calves:100 cows. In RY06–RY07 we worked cooperatively with YDE and NPS to monitor the effects of the captive rearing program. This program likely helped raise the calf recruitment in the herd to 21 calves:100 cows during RY06–RY07. ADF&G will continue to work cooperatively with the NPS, YDE, and USGS to try to maintain or increase calf survival throughout the next report period. A cooperative CCH management plan is being developed for 2009. This plan will likely update management goals and objectives for the next report period. Expected changes include reducing the calf:cow objective to >15 calves:100 cows over a 3-year average, and maintaining a sex ratio of at least 35 bulls:100 cows.

Although no fiscal allocation was made for CCH management activities during RY06–RY07, we conducted surveys in RY08. Limited funds will likely continue to be available in RY09–RY10. Tok ADF&G personnel will continue to provide personnel support and participate in cooperative management activities and research efforts for the CCH during the next report period.

LITERATURE CITED

BOERTJE, R. D. 1984. Seasonal diets of the Denali caribou herd, Alaska. Arctic 37:161–165.

FARNELL R., AND C. GARDNER. 2002. Chisana caribou herd–2002. Yukon Department of the Environment. Whitehorse, Yukon, Canada.

GARDNER, C. L. 2003. Unit 12 caribou. Pages 76–91 *in* C. Healy, editor. Caribou management report of survey and inventory activities 1 July 2000–30 June 2002. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

KELLEYHOUSE, D. G. 1980. Unit 12 caribou. Pages 29–530 *in* R. Hinman, editor. Annual report of survey–inventory activities. Alaska Department of Fish and Game. Project W-17-11 Juneau, Alaska, USA.

KELLEYHOUSE, D. G. 1990. Unit 12 caribou. Pages 46–54 *in* S. O. Morgan, editor. Caribou annual report of survey and inventory activities 1 July 1988–30 June 1989. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

LENART, E. A. 1997. Climate and caribou: Effects of summer weather on the Chisana caribou herd. Thesis, University of Alaska Fairbanks, Alaska, USA.

RECORD, H. 1983. Where raven stood, cultural resources of the Ahtna Region. Cooperative Park Studies Unit, Occasional Paper 35. University of Alaska Fairbanks, Alaska, USA.

SCOTT, R. F., E. F. CHATELAIN, AND W. A. ELKINS. 1950. The status of the Dall sheep and caribou in Alaska. North American wildlife conference transcripts 15:612–626.

SKOOG, R. D. 1968. Ecology of the caribou (*Rangifer tarandus*) in Alaska. Dissertation, University of California, Berkeley, USA.

VALKENBURG, P., D. G. KELLEYHOUSE, J. L. DAVIS, AND J. M. VER HOEF. 1994. Case history of the Fortymile caribou herd, 1920–1990. Rangifer 14:11–22.

ZITTLAU, K., J. COFFIN, R. FARNELL, G. KUZYK, AND C. STROBECK. 2000. Genetic relationships of the Yukon woodland caribou herds determined by DNA typing. Rangifer Special Issue 12:59–62.

PREPARED BY:

Torsten W. Bentzen
Wildlife Biologist II

SUBMITTED BY:

Doreen I Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section and reference as:

BENTZEN, T. B. 2009. Unit 12 caribou. Pages 58–67 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Chisana caribou fall composition counts and estimated population size, 1987–2008

Date (mm/dd/yr)	Bulls: 100 Cows	Calves: 100 Cows	% Calves	% Cows	% Small bulls (% of bulls)	% Medium bulls (% of bulls	% Large bulls (% of bulls)	% Bulls	Composition sample size	Estimated herd size[a]
10/9/1987	39	28	17	60	53	26	21	23	760	1800
9/27/1988	36	31	19	60	28	46	26	21	979	1882
10/16–17/89[b]			9						625	1802
10/4–5/90	36	11	7	68	37	44	19	25	855	1680
9/29/1991	40	1	1	71	45	42	13	28	855	1488
9/27/1992	31	0	0[c]	76	34	43	23	24	1142	1270
10/5/1993	24	2	2	79	30	45	24	19	732	869
9/29/1994	27	11	8	72	20	44	35	20	543	803
9/30/1995	21	4	4	80	30	23	47	17	542	679
9/30/1996	16	5	4	83	40	18	42	13	377	575
10/1/1997	24	14	10	72	3	68	28	18	520	541
9/28/1998	19	4	3	81	49	14	37	15	231	493
10/1/1999	17	7	6	81	57	16	27	14	318	470
9/30/2000	20	6	5	80	52	25	23	15	412	425
10/1/2001	23	4	3	79	42	23	34	18	356	375
9/30/2002	25	13	10	72	28	23	49	18	258	315
9/30/03[d]	37	25	15	62	n/a	n/a	n/a	23	603	720
9/30/05[d]	46	23	14	59	n/a	n/a	n/a	27	646	706
10/12/2006	48	21	13	59	34	33	33	28	628	n/a[e]
10/13–14/2007[d]	50	13	8	61	n/a	n/a	n/a	30	719	766
10/9/2008	44	21	13	61	n/a	n/a	36	27	532	n/a[e]

[a] Based on population model designed by P. Valkenburg and D. Reed (Alaska Department of Fish and Game).
[b] Classification accomplished from fixed-wing aircraft rather than from a helicopter.
[c] Only one calf was seen in this survey.
[d] U.S. Geological Survey survey results. Bulls were not classified to size.
[e] U.S. Geological Survey survey results. Estimates pending.

TABLE 2 Chisana caribou harvest, regulatory years 1989–1990 through 2008–2009

Regulatory year	Alaska harvest					Yukon harvest		
	Reported				Estimated			
	M	F	Unk	Total	Illegal	Reported	Unreported	Total
1989–1990	34	0		34	0	18	5–20	57–72
1990–1991	34	0	0	34	0	11	5–20	50–65
1991–1992	21	0	0	21	0	0	5–20	26–41
1992–1993	16	0	0	16	0	0	5–20	21–36
1993–1994	19	0	0	19	0	0	5–20	24–39
1994–1995[a]	0	0	0	0	0	0	5–20	5–20
1995–1996	0	0	0	0	3	0	1–3	4–6
1996–1997	0	0	0	0	3	0	7	10
1997–1998	0	0	0	0	3	0	3–5	6–8
1998–1999	0	0	0	0	3	0	20	23
1999–2000	0	0	0	0	3	0	3–5	6–8
2000–2001	0	0	0	0	1	0	1–3	2–4
2001–2002	0	0	0	0	1	0	1–3	2–4
2002–2003	0	0	0	0	0–3	0	0[b]	0–3
2003–2004	0	0	0	0	0–3	0	0	0–3
2004–2005	0	0	0	0	0–3	0	0	0–3
2005–2006	0	0	0	0	0–3	0	0	0–3
2006–2007	0	0	0	0	0–3	0	0	0–3
2007–2008	0	0	0	0	0–3	0	0	0–3
2008–2009	0	0	0	0	0–3	0	0	0–3

[a] No registration permits were issued for the Alaska hunt during regulatory years 1994 through 2008.
[b] After 2001, Yukon First Nation members voluntarily stopped harvesting Chisana caribou.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNITS: Portions of Units 12 and 20D (1900 mi^2)

HERD: Macomb

GEOGRAPHIC DESCRIPTION: Eastern Alaska Range between Delta River and Yerrick Creek south of the Alaska Highway

BACKGROUND

Little was known about the Macomb caribou herd (MCH) before 1972, when herd size was estimated at 350–400, and it received little sport harvest (Jennings 1974). Hunting pressure increased in 1972 when restrictions were placed on hunting other road-accessible herds, including the Fortymile, Nelchina, and Mentasta herds.

With increased hunting pressure on the MCH, the bag limit was reduced from 3 to 1 caribou in 1973. The Macomb Plateau Management Area (MPMA) was established in 1974 to prohibit the use of motorized vehicles while hunting from 10 August to 20 September, except for floatplanes at Fish Lake. The MPMA included the area south of the Alaska Highway, draining into the south side of the Tanana River between the east bank of the Johnson River upstream to Prospect Creek, and the east bank of Bear Creek (Alaska Highway Milepost 1357.3).

The MCH numbered about 500 during the early 1970s (Larson 1976). By 1975 the MCH numbered 700–800 caribou, but the apparent increase in herd size from 1972 to 1975 was probably because of increased knowledge about the herd rather than an actual increase in the number of caribou. Hunting pressure and harvest continued to increase on the MCH, despite a reduced bag limit and restrictions imposed by the MPMA. In 1975, hunting pressure increased 72% over 1974 levels, and in 1976 there were 70% more hunters than in 1975 (Larson 1977). Despite the larger known herd size, the harvest equaled or exceeded recruitment.

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

During the 1977 hunting season, it was necessary to close the season by emergency order on 8 September. Even with the emergency closure, the reported harvest totaled 93 caribou and exceeded recruitment. The large harvest, combined with predation by wolves and bears, led to a determination that harvest had to be reduced (Davis 1979). In 1978 the bag limit for the MCH was further restricted from 1 caribou of either sex to 1 bull by drawing permit. The drawing permit hunt reduced the reported harvest from 93 caribou in 1977 to 16 in 1978.

In addition to concerns about excessive hunting of Macomb caribou, there was also concern the herd was limited by predation. Wolf control in the eastern Alaska Range during winter 1980–1981 removed most of the wolves believed to prey on the MCH. With wolf control, fall calf:cow ratios increased from 13 calves:100 cows in 1980 to 33 calves:100 cows in 1981.

The MPMA was renamed the Macomb Plateau Controlled Use Area (MPCUA) in 1981 to more accurately reflect the access restrictions that were in effect. The boundaries and access restrictions remained the same.

Previous management objectives for the MCH (ADF&G 1976) included maintaining a population of at least 350 caribou in Unit 20D south of the Tanana River. This population objective was based on incomplete data on herd size, movements, and identity of the MCH.

In 1987 the Alaska Board of Game made a customary and traditional (C&T) use determination for the MCH; the amounts necessary to meet subsistence needs were determined to be a harvest of 40 caribou. The C&T finding was based on use by residents of Dot Lake, Tanacross, and Tok, and other residents outside of these communities.

On 29 June 1988, herd size was estimated to be 800 caribou. Historical information from local residents indicated more caribou between the Robertson and Delta rivers than were previously estimated by ADF&G. Therefore, a population objective was established to increase MCH size to 1000 caribou by 1993.

For the 1990 fall hunting season, the hunt was changed from a drawing permit hunt to a Tier I registration permit hunt because C&T use determinations precluded conducting the hunt as a drawing permit hunt.

The hunting season was closed from regulatory years (RY) 1992 (RY = 1 Jul through 30 Jun; e.g., RY92 = 1 Jul 1992 through 30 Jun 1993) through RY96 because the herd was below the population objective. Also, a registration permit hunt did not allow adequate control of harvest because of relatively high hunter interest and low harvest quotas.

In 1995 the Board of Game adopted a Wolf Predation Control Implementation Plan (5 AAC 92.125) for Unit 20D. It established a new objective to reverse the decline of the MCH and increase the fall population to 600–800 caribou with a harvest of 30–50 caribou annually by the year 2002.

In RY97 and RY98 the hunting season was 10–20 September by registration permit, the season was closed again in RY99 and open in RY00 and RY01 from 10–20 September by registration permit. In RY02 the season dates were changed to 15–25 August to separate the season from the

moose hunting season. Additionally, the boundary of the Delta Controlled Use Area (DCUA), was moved from the Richardson Highway, west to the Delta River. This was to include the area between the Richardson Highway and the Delta River within the DCUA (which prohibits the use of motorized vehicles and pack animals for big game hunting during 5–25 Aug) for caribou management purposes. The boundary change, combined with the season change, helped make this road-accessible caribou hunt manageable, while providing reasonable opportunity to hunt (at least 10 days) without exceeding the harvest quota. Providing reasonable opportunity for rural residents to hunt is necessary due to the C&T use determination for this herd.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVE

- Increase the fall population to 600–800 caribou with a sustainable harvest of 30–50 caribou.

METHODS

We used a Robinson R-44 helicopter in October to count total numbers and classify caribou sex and age composition. A fixed-wing aircraft accompanied the helicopter to help find radiocollared caribou and groups without radios and to help count total numbers. Caribou were classified according to criteria specified by Eagan (1995).

Fall radiotracking flights were flown some years to determine if there was mixing of the Macomb and Delta caribou herds in southwestern Unit 20D during the hunting season and to determine location of the MCH during the hunting season. Surveys were flown in a Piper PA-18 Super Cub by listening for radio signals from both herds from an altitude of 8000–10,000 feet along a route over the Delta River (the boundary between Units 20D and 20A) from Delta Junction to Black Rapids Glacier and between the Delta and Robertson rivers. When signals were heard from radiocollared caribou, a general location was achieved and the latitude and longitude were recorded.

Hunting was conducted by registration permit. Hunters were required to report hunt status, kill date and location, transportation mode, and commercial services used. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We met our MCH population objective during RY06–RY08.

RY06. We conducted a census on 6 October 2006 and counted 857 caribou. Survey conditions were not optimal with little snow cover and strong winds west of the Johnson River (Table 1).

RY07. We conducted a census on 9 October 2007 and counted 951 caribou for composition and 1305 caribou total. Survey conditions were good with complete snow coverage (Table 1).

RY08. We were not able to complete a census in 2008 due to poor weather and survey conditions. However, we did complete a fixed-wing aircraft survey on 18 October 2008 during which 754 caribou were counted west of the Little Gerstle River with 9 of 17 radiocollared caribou located. An estimated 8 radio collars were east of the Little Gerstle River, indicating that a substantial portion of the MCH was not counted (Table 1).

Population Composition

RY06. Composition data were collected from 857 caribou during the 6 October 2006 MCH census. The bull:cow ratio of 48:100 was a decrease from the previous 2 years. Bulls composed 27% of the herd, with small bulls composing 14% of all bulls, medium bulls composing 45%, and large bulls composing 41% of all bulls. The calf:cow ratio was 31 calves:100 cows (Table 1), the highest ratio since 1984.

RY07. Composition data were collected from 951 caribou during the 9 October 2007 census. The bull:cow ratio of 68:100 was the highest since at least 1982. Bulls composed 34% of the herd, with small bulls composing 53% of all bulls, medium bulls composing 18%, and large bulls composing 29% of all bulls. The calf:cow ratio was 29 calves:100 cows (Table 1).

RY08. Composition data were not collected in RY08 due to poor survey conditions (Table 1).

Distribution and Movements

The MCH occupies the mountains of the eastern Alaska Range from the Delta River to the Mentasta Highway. Its core range is in Unit 20D between the Robertson River and the Richardson Highway, with primary calving grounds on the Macomb Plateau. The MCH also uses the lowlands of the Tanana River valley as winter range.

RY06. During a 16 August 2006 radiotracking flight, 2 of 12 radiocollared caribou (17%) were located west of the Gerstle River, with 10 located east of the Johnson River including one radiocollared caribou up the Robertson River. None were located west of the Delta River and no radiocollared Delta caribou were located in Unit 20D.

During our fall 2006 MCH census on 6 October, most caribou (56% with accurate locations) were located west of the Gerstle River. Fifteen percent were located between the Johnson and Little Gerstle rivers, and 30% were located west of the Johnson River. A later radiotracking flight on 17 October 2006 resulted in 40% of the caribou located west of the Gerstle River, 14% between the Johnson and Little Gerstle rivers, and 46% east of the Johnson River.

RY07. A MCH radiotracking flight was conducted on 4 October 2007 with 921 caribou located. Thirty-six percent were west of the Gerstle River, 24% were between the Gerstle and Johnson rivers, and 40% were east of the Johnson River.

During the 9 October 2007 census, 1305 caribou were located with 27% west of the Gerstle River, 29% between the Gerstle and Johnson rivers, and 44% east of the Johnson River.

RY08. A MCH radiotracking flight was flown on 21 August 2008. Two of 14 (14%) active radiocollars were located west of the Gerstle River, with 6 (43%) between the Gerstle and Johnson rivers, and 6 (43%) east of the Johnson River.

During an 18 October 2008 radiotracking flight, weather conditions were too poor to survey east of the Johnson River. We located 754 caribou west of the Johnson River, with 86% of those caribou located west of the Gerstle River.

MORTALITY

Harvest

Season and Bag Limit.

RY06 — Hunting for the MCH was conducted as Tier I registration permit hunt RC835 from 10 August to 25 August with a harvest quota of 25 caribou. During RY06, 5 days were added to the beginning of the season to provide for a longer season but still be within the motorized vehicle restrictions of the Delta Controlled Use Area, with the portion of southern Unit 20D west of Jarvis Creek closed to hunting.

RY07 — Hunting for the MCH was conducted as Tier I registration permit hunt RC835 from 10 August to 25 August with a harvest quota of 25 caribou with the portion of southern Unit 20D west of Jarvis Creek closed to hunting.

RY08 — Hunting for the MCH was conducted as Tier I registration permit hunt RC835 from 10 August to 28 August with a harvest quota of 50 caribou, and with the portion of southern Unit 20D west of Jarvis Creek closed to hunting. Three days of motorized access hunting were allowed in the western portion of the hunt area from 26 August to 28 August when the motorized vehicle restrictions were lifted on 26 August in the Delta Controlled Use Area.

Alaska Board of Game Actions and Emergency Orders. At the March 2008 meeting of the Alaska Board of Game, the board passed regulation proposal 22 which increased the allowable harvest quota of Macomb caribou from 50 to 100.

Harvest by Hunters. The intensive management harvest quota of 30–50 caribou harvested/year was not met in RY06 or RY07 but was met in RY08 (Table 2). However, harvest did increase each year from an average of 12.5 for the previous 2 years as regulations were liberalized.

Permit Hunts.

RY06 — Registration permits were issued to 103 people (Table 2) and 56 (54%) actually hunted (Table 3), killing 21 bulls for a 38% success rate (Table 2). This harvest was below the harvest quota of 25 and the harvest objective of 30–50.

One hunter received an American's With Disabilities Act, Methods and Means exemption to use a motorized vehicle in the Jarvis Creek drainage during the RY06 hunting season.

RY07 — Registration permits were issued to 161 people (Table 2) and 85 (53%) actually hunted (Table 3) killing 27 bulls for a 32% success rate (Table 3). This harvest was slightly above the quota and below the harvest objective.

Two hunters received an American's With Disabilities Act, Methods and Means exemption to use a motorized vehicle in the Jarvis Creek drainage during the RY07 hunting season.

RY08 — Registration permits were issued to 267 people (Table 2) and 167 (63%) actually hunted (Table 3) killing 48 bulls for a 29% success rate (Table 3). This harvest was only 2 caribou less than the harvest quota of 50 and met the harvest objective.

The substantial increases in number of permits issued, hunters who hunted, and harvest in RY08 were results of adding 26–28 August to the hunting season. Numerous moose hunters also registered for RC835 so they could hunt Macomb caribou while traveling to their moose hunting camps, plus many hunters who would not have walked into the area had the opportunity to use motorized vehicles.

No estimates of accidental death or illegal harvest were made during RY06–RY08 (Table 4).

Hunter Residency and Success.

RY06 — Hunters had a 38% success rate (Table 3). Most successful hunters (57%) were not local residents of Unit 20D (Table 3).

RY07 — Hunters had a 32% success rate (Table 3). Most successful hunters (56%) were not local residents of Unit 20D (Table 3).

RY08 — Hunters had a 29% success rate (Table 3). Most successful hunters (71%) were not local residents of Unit 20D (Table 3).

Two factors may explain the relative abundance of nonlocal residents participating in RC835. Unit 20D hunters were qualified to hunt in the federal subsistence hunt for the Nelchina caribou herd in nearby Unit 13 and may have preferred to hunt in Unit 13 where they could use motorized vehicles and had a bag limit of 2 caribou. Concomitantly, RC835 attracted nonlocal residents who did not qualify for federal subsistence hunts and were looking for a road accessible caribou hunt.

Harvest Chronology.

RY06 — Most caribou (57%) were killed in the first 5 days of the season (Table 5).

RY07 —Harvest was distributed throughout the season with 37% of caribou taken during the first 5 days, 30% taken during the second 5 days, and 33% taken during the last 6 days of the season (Table 5).

RY08 —Harvest chronology had 35% of the harvest in the first 5 days of the season, but also had 35% of the harvest in the last 3 days of the season (26–28 Aug) when motorized vehicles were allowed (Table 5).

Harvest Location.

RY06 —Most caribou harvest was reported in the Johnson River drainage (52%) (Table 6).

RY07 — Nine of 27 (33%) caribou harvested were taken in the Jarvis Creek drainage. Sixty-three percent were taken east of the Johnson River with 14 (52%) of those reported taken on the Macomb Plateau (Table 6).

RY08 — Adding 3 days of motorized hunting to the hunting season increased harvest in the Jarvis Creek drainage to 44% of the total harvest. An additional 46% of harvest was east of the Johnson River, with 31% taken on the Macomb Plateau and 15% taken out of the Robertson River drainage. Hunters who have Tok Management Area permits for that area often get caribou registration permits (Table 6).

Transportation Methods.

RY06 — The most commonly used modes of transportation for successful hunters were highway vehicles (48%) and horses (24%) (Table 7).

RY07 — The most commonly used modes of transportation for successful hunters were highway vehicles (52%) and horses (30%) (Table 7).

RY08 — The most commonly used mode of transportation for successful hunters was highway vehicles (31%), but 3- or 4-wheelers replaced horses as the second most commonly used mode of transportation (25%) when 3 days of motorized hunting were allowed after the Delta Controlled Use Area restrictions were lifted (Table 7).

Other Mortality

No additional mortality sources were identified for the MCH.

HABITAT

Assessment and Enhancement

No habitat assessment work occurred for the MCH during RY06–RY08.

CONCLUSIONS AND RECOMMENDATIONS

The MCH increased during this reporting period, meeting the intensive management population objective. The population increase allowed for increased hunting opportunity and harvest in RY08. The increased harvest met the intensive management harvest objective without having to regulate the hunting season by emergency order as in many previous years. Herd size will continue to be monitored closely and further opportunities to provide increased hunting opportunity will be investigated.

LITERATURE CITED

ALASKA DEPARTMENT OF FISH AND GAME. 1976. Alaska wildlife management plans: Interior Alaska. Alaska Department of Fish and Game. Juneau, Alaska, USA.

DAVIS, J. L. 1979. Macomb caribou. Pages 169–170 *in* R. Hinman, editor. Caribou management report of survey and inventory activities. Part II. Volume IX. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

EAGAN, R. M. 1995. Unit 20A caribou. Pages 111–122 *in* M. V. Hicks, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

JENNINGS, L. B. 1974. Macomb caribou. Pages 217–218 *in* D. McKnight, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Part II. Volume IV. Study 3.0. Juneau, Alaska, USA.

LARSON, R. W. 1976. Macomb caribou. Pages 34–35 *in* D. McKnight, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Part III. Volume VI. Study 3.0. Juneau, Alaska, USA.

———. 1977. Macomb caribou. Pages 152–153 *in* R. Hinman, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Part II. Volume VII. Study 3.0. Juneau, Alaska, USA.

PREPARED BY:

Stephen D. DuBois
Wildlife Biologist III

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

DUBOIS, S. D. 2009. Units 12 and 20D caribou. Pages 68–82 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Macomb caribou fall composition counts and estimated population size, 1982–2008

Survey date	Bulls: 100 cows	Calves: 100 cows	Calves %	Cows %	Small bulls %	Medium bulls %	Large bulls %	Total bulls %	Composition sample size	Count or estimate of herd size
10/82	21	26	18	68	61	29	10	14	218	700
10/83[a]	33	24	15	64	48			21	238	700
12/1/84	28	40	24	60	45	34	21	17	351	700
10/30/85	45	31	17	57	43	38	20	26	518	700
10/16/88	46	32	18	56	41	31	28	26	671	772
10/26/89	33	34	20	60	54	31	15	20	617	800
10/9/90	44	17	11	62	34	34	32	27	600	800
9/25/91	34	9	6	70	21	42	37	24	560	560
9/26/92	25	14	10	72	30	36	33	18	455	527
10/2/93	22	18	13	72	38	34	28	16	374	458
10/2/94	21	13	10	74	53	16	31	16	345	532
10/1/95	39	10	7	67	44	17	39	26	477	477[b]
10/2/96	43	30	17	58	29	31	40	25	586	586
10/28/97	28	18	12	69	40	26	33	19	451	597[c]
9/30/98	50	25	14	57	32	46	22	28	472	522–572[d]
10/15/99	57	22	12	56	49	21	30	32	606	640
10/2/00	45	11	7	64	43	29	29	29	605	650[d]
10/9/01	39	11	7	66	40	30	30	26	467	500–550[d]
11/2/02	51	21	12	58	39	43	19	30	234	Unk
10/4/03	46	19	12	60	44	22	31	28	526	550–575
10/9/04	61	40	20	50	18	37	45	30	546	600–650
10/04/05	64	17	9	55	53	16	31	35	628	630–650
10/06/06	48	31	17	56	14	45	41	27	857	857
10/09/07	68	29	15	51	53	18	29	34	951	1305
10/18/08										754[e]

[a] Large and medium bulls not classified in this survey.
[b] Poor survey conditions due to lack of snow cover.
[c] Based on population modeling estimate using spreadsheet developed by P. Valkenburg and D. Reed (ADF&G unpublished data, Fairbanks).
[d] Estimated.
[e] Incomplete survey and no composition data collected.

TABLE 2 Macomb caribou harvest data by permit hunt, regulatory years 1985–1986 through 2008–2009

Hunt	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Harvest			Total harvest
						Bulls (%)	Cows (%)	Unk	
530[a]	1985–1986	140	61	22	78	12 (100)	0 (0)	0 (0)	12
	1986–1987	100	62	26	74	10 (100)	0 (0)	0 (0)	10
570[b]	1986–1987	15	53	14	86	1 (100)	0 (0)	0 (0)	1
530[a]	1987–1988	150	53	76	24	53 (100)	0 (0)	0 (0)	53[c]
	1988–1989	150	57	55	45	36 (100)	0 (0)	0 (0)	36[d]
	1989–1990	150	47	55	45	44 (100)	0 (0)	0 (0)	44[d]
535[e]	1990–1991	351	42	21	79	42 (100)	0 (0)	0 (0)	42
	1991–1992	317	33	16	50	48 (96)	0 (0)	2 (4)	50
	1992–1993 through 1996–1997[f]								
RC835[e]	1997–1998[g]	143	34	23	77	22 (100)	0 (0)	0 (0)	22
	1998–1999	168	32	28	72	32 (100)	0 (0)	0 (0)	32
	1999–2000[f]	0							0
	2000–2001[g]	274	31	12	88	22 (100)	0 (0)	0 (0)	22
	2001–2002[g]	255	32	25	75	43 (100)	0 (0)	0 (0)	43
	2002–2003[g]	158	41	28	73	25 (100)	0 (0)	0 (0)	25
	2003–2004[g]	161	27	25	75	29 (100)	0 (0)	0 (0)	29
	2004–2005	76	58	22	78	7 (100)	0 (0)	0 (0)	7
	2005–2006	117	53	33	67	18 (100)	0 (0)	0 (0)	18
	2006–2007	103	46	38	63	21 (100)	0 (0)	0 (0)	21
	2007–2008	161	47	32	68	27 (100)	0 (0)	0 (0)	27
	2008–2009	267	37	29	71	48 (100)	0 (0)	0 (0)	48

[a] Drawing permit hunt.
[b] Subsistence registration permit hunt for Dot Lake residents only.
[c] Thirty-three caribou killed during the permit hunt, an estimated 20 killed in Unit 12 outside the permit area, and 4 (not included in the total) killed by subsistence hunters.
[d] Nonpermit subsistence harvest was 2 (not included in 1988 and 1989 total).
[e] Registration permit hunt.
[f] Hunt canceled.
[g] Hunt closed by emergency order.

TABLE 3 Macomb caribou hunter residency and success of permit hunters, regulatory years 1986–1987 through 2008–2009

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	
1986–1987[b]	9	0	1	10 (18)	19	27	1	47 (82)	57
1987–1988[b]	21	36	0	57 (61)	15	21	1	37 (39)	94
1988–1989[b]	15	20	1	36 (55)	4	25	0	29 (45)	65
1989–1990[b]	18	20	0	38 (54)	8	24	0	32 (46)	70
1990–1991[c]	28	14	0	42 (23)	80	64	0	144 (77)	186
1991–1992[c]	23	27	0	50 (24)	77	81	0	158 (76)	208
1992–1993 through 1996–1997[d]									
1997–1998[c]	15	7	0	22 (23)	50	22	0	72 (77)	94
1998–1999[c]	22	10	0	32 (28)	39	43	0	82 (72)	114
1999–2000[d]									
2000–2001[c]	11	11	0	22 (12)	89	75	0	164 (88)	186
2001–2002[c]	13	30	0	43 (25)	67	64	0	131 (75)	174
2002–2003[c]	10	15	0	25 (28)	30	36	0	66 (73)	91
2003–2004[c]	7	22	0	29 (35)	29	57	0	54 (65)	115[e]
2004–2005[c]	1	6	0	7 (22)	12	13	0	25 (78)	32
2005–2006	10	8	0	18 (33)	13	24	0	37 (67)	55
2006–2007	9	12	0	21 (38)	8	27	0	35 (63)	56
2007–2008	12	15	0	27 (32)	14	44	0	58 (68)	85
2008–2009	14	34	0	48 (29)	36	83	0	119 (71)	167

[a] Resident of Unit 20D.
[b] Hunt by drawing permit.
[c] Hunt by registration permit.
[d] Hunt canceled.
[e] Success of 32 hunters was unknown.

TABLE 4 Macomb caribou harvest[a] and accidental death, regulatory years 1985–1986 through 2008–2009

Regulatory year	Harvest							Accidental death	Total
	Reported				Estimated				
	M	F	Unk	Total	Unreported	Illegal	Total		
1985–1986	12	0	0	12	0	2	2	0	14
1986–1987	10	0	0	10	0	2	2	0	12
1987–1988	57	0	0	57	0	2	2	0	59
1988–1989	42	0	0	42	0	2	2	0	44
1989–1990	44	0	0	44	0	2	2	3	49
1990–1991	42	0	0	42	0	2	2	0	44
1991–1992	48	0	2	50	0	2	2	0	52
1992–1993[b]					0	2	2	0	2
1993–1994[b]					0	2	2	0	2
1994–1995[b]					0	2	2	0	2
1995–1996[b]					0	2	2	0	2
1996–1997[b]					0	2	2	0	2
1997–1998	22	0	0	22	0	2	2	0	24
1998–1999	32	0	0	32	0	0	0	0	32
1999–2000[b]					0	0	0	0	0
2000–2001	22	0	0	22	0	0	0	0	22
2001–2002	43	0	0	43	0	0	0	0	43
2002–2003	25	0	0	25	0	0	0	0	25
2003–2004	29	0	0	29	0	0	0	0	29
2004–2005	7	0	0	7	0	0	0	0	7
2005–2006	18	0	0	18	0	0	0	0	18
2006–2007	21	0	0	21	0	0	0	0	21
2007–2008	27	0	0	27	0	0	0	0	27
2008–2009	48	0	0	48	0	0	0	0	48

[a] Includes permit hunt harvest.
[b] Hunt canceled.

TABLE 5 Macomb caribou harvest chronology during permit hunt RC835, regulatory years 1997–1998 through 2008–2009

Harvest	Regulatory year (RY)[a]											
date	1997	1998	1999[b]	2000	2001	2002	2003	2004	2005	2006	2007	2008
August												
10										4	5	2
11										3	0	3
12										1	1	6
13										2	3	2
14										2	1	4
15						11	18	4	2	0	1	0
16						4	9	0	3	0	3	1
17						5	1	0	2	0	0	2
18						1	1	0	0	2	3	3
19						1	0	1	1	1	1	0
20						3	0	0	5	1	2	0
21						0	0	0	3	0	0	3
22						0	0	0	0	0	0	0
23						0	0	1	0	1	4	2
24						0	0	0	0	2	0	1
25						0	0	1	1	1	3	1
26												12
27												4
28												1
September												
10	8	13		9	34							
11	1	6		3	4							
12	3	4		1	5							
13	4	0		3	0							
14	3	0		5	0							
15	2	2		0	0							
16	0	7		0	0							
17	0	0		0	0							
18	0	0		1	0							
19	0	0		0	0							
20	1	0		0	0							
Unk									1	1		
n	22	32		22	43	25	29	7	18	21	27	47

[a] Regulatory year (RY) = 1 Jul–30 Jun, e.g., RY08 = 1 Jul 2008–30 Jun 2009.
[b] Hunt canceled.

TABLE 6 Macomb caribou harvest location during permit hunt RC835, regulatory years 1997–1998 through 2008–2009

Harvest location/drainage	Regulatory year[a]											
	1997	1998	1999[b]	2000	2001	2002	2003	2004	2005	2006	2007	2008
Jarvis Creek	8	16		18	24	22	22	2	4	2	9	21
Little Gerstle River	3	2		2	0	0	0	0	0	0	0	2
Granite Mountains	0	1		0	3	0	0	1	0	2	0	2
Johnson River	0	0		0	0	0	0	0	1	1	1	1
Macomb Plateau	9	9		0	13	2	6	2	12	11	14	15
Robertson River	0	3		0	0	0	1	1	1	0	2	7
Unit 12	0	0		0	1	1	0	0	0	0	1	0
Unknown	1	1		2	2	0	0	1	0	0	0	0

[a] Regulatory year = 1 Jul–30 Jun, e.g., RY08 = 1 Jul 2008–30 Jun 2009.
[b] Hunt canceled.

TABLE 7 Macomb caribou harvest percent by transport method, regulatory years 1986–1987 through 2008–2009

Regulatory year	Percent harvest by transport method[a]									
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Walking[b]	Unk	*n*
1986–1987	21	21	0	4	0	0	54		0	24
1987–1988	6	37	0	6	0	3	49		0	68
1988–1989	15	25	0	6	0	5	49		0	65
1989–1990	5	45	0	0	5	39	7		0	44
1990–1991	2	5	0	24	0	14	17	38	0	42
1991–1992	4	10	0	32	0	8	20	0	26	50
1992–1993 through 1996–1997[c]										
1997–1998	0	32	0	14	0	23	18	0	14	22
1998–1999	0	9	0	25	0	25	22	0	19	32
1999–2000[c]										
2000–2001	0	0	0	46	0	46	5	0	5	22
2001–2002	0	12	0	56	0	7	16	0	9	43
2002–2003	4	0	0	0	0	8	40	0	48	25
2003–2004	0	3	0	0	0	3	62	28	3	29
2004–2005	0	14	0	14	0	0	57	14	0	7
2005–2006	0	33	0	0	0	11	33	11	11	18
2006–2007	10	24	0	0	0	5	48	5	10	21
2007–2008	0	30	0	4	0	7	52	4	4	27
2008–2009	8	15	0	25	0	4	31	8	8	48

[a] Includes permit hunt harvest.
[b] Walking was not listed as a transportation type from 1986–1987 to 1989–1990.
[c] Hunt canceled.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 P.O. BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

LOCATION

GAME MANAGEMENT UNIT: 13 and 14B (25,000 mi^2)

HERD: Nelchina Caribou herd

GEOGRAPHIC DESCRIPTION: Nelchina Basin

BACKGROUND

The Nelchina caribou herd (NCH) contained 5,000–15,000 caribou in the late 1940s. The herd increased during the early 1950s, aided by intensive predator control conducted by the federal government. The NCH continued to grow, and peaked at about 70,000 caribou by the mid 1960s. A dramatic decline began in the late 1960s, and the herd reached a population low of 7,000–10,000 caribou in 1972. Starting in 1973 the NCH began to increase and continued to grow through the mid 1990s, reaching an estimated 50,000 animals in 1995. Hunting pressure was increased with the intent of reducing the herd size. During the past decade, the NCH has been held near or within the population objective of 35,000–40,000.

The NCH has been important to large numbers of hunters because of its accessibility and proximity to Anchorage and Fairbanks. The Board of Game (BOG) increased bag limits and extended seasons when the NCH began to increase in the late 1950s. Annual harvests from 1955 through 1971 ranged from 2,500 to more than 10,000 caribou. After the herd declined, the bag limit was reduced to one caribou in 1972, and seasons were dramatically curtailed. In 1976 the season was closed by emergency order after hunters killed 800 caribou in only five days. It became apparent that a general open season with unlimited participation was no longer possible for the NCH. Since 1977, Nelchina caribou have been hunted by permit only. Between 1977 and 1990 most permits issued were random drawing permits under general hunting regulations. Unit 13 residents took a small number of caribou under a subsistence registration permit hunt. Since 1990, Nelchina permits have been issued only for state and federal subsistence hunts, except for a very limited drawing hunt in Unit 14. Both the number of permits and the allowable harvest fluctuate, depending on herd status. During the last 20 years (1988–2007) there have been more than 56,000 caribou harvested from the NCH.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

- Maintain a fall population of 35,000–40,000 caribou, with a minimum of 40 bulls:100 cows and 40 calves:100 cows.

- Provide for an annual harvest of 3,000–6,000 caribou.

METHODS

Censuses and sex and age composition counts are conducted annually. The censuses involve aerial counts of caribou observed during June in postcalving aggregations and are followed immediately by sex and age composition surveys. Aerial count techniques include fixed-wing photo censuses, or traditional censuses using hand-held cameras and direct field estimates made from fixed-wing aircraft. Aggregation of caribou and weather conditions determine the census technique; loosely aggregated caribou cannot be photographed effectively. Composition data is collected via helicopter immediately after the census in late June to determine productivity, and again in early October during the rut to determine the bull:cow ratio and estimate calf survival. Fall post hunt population estimates are then calculated from the spring counts and fall composition data. Population data are modeled to determine future population trends and allowable yearly harvest rates.

Radiocollared caribou are located seasonally to delineate herd distribution, determine seasonal range use, and estimate mortality rates. To accomplish this, we attempt to maintain a minimum of 40 to 60 radiocollared cow caribou in the herd. Collars are placed on 4- or 11-month-old female calves to obtain survival and parturition data for known-age females. Radiocollared cows are located during the calving period to determine parturition rates and the mean calving date.

Biologists use permit reports, radiotelemetry flights, and hunter field checks to monitor hunt conditions and harvests.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The NCH fall population estimate of 32,569 in 2007 was down 11% from the 2005 estimate of 36,428 (Table 1). The estimated stocking density was 0.7 caribou/km^2 based on an approximate range of 44,200 km^2 (Lieb et al. 1988). A spring 2008 census was not completed because unseasonably cold temperatures and persistent snow kept the caribou from grouping into large postcalving aggregations necessary for an aerial census. Modeling productivity and harvest data resulted in a population estimate of 33,288 caribou in the fall of 2008.

Population Composition

In 2007, pregnancy among radiocollared females was 84%. The summer composition survey verified good calf production with 48 calves:100 cows observed. Unfavorable weather conditions that prevented a census in 2008 also forced cancellation of summer composition surveys. Herd productivity in 2008 was, however, thought to be quite high based on the number of radiocollared cows observed with calves (88%) during May calving flights. During the last 10 years, summer calf ratios have varied from 31 calves:100 cows in 2000 to 52: 100 in 2005. Observed fluctuations in calf production are largely attributable to either a decline in physical condition of the cows, which results in a delay in age of first reproduction (from 2 or 3, to 4 years of age), or a reproductive pause in many adult cows. Lactating cow caribou nutritionally stressed because of poor forage conditions during dry summers often skip a breeding season to regain body condition (Whitten 1995).

Calf mortality to 4 months of age is monitored by comparing changes in calf:cow ratios between June and October. There were 35 calves:100 cows observed in fall 2007 and 40:100 in fall 2008 (Table 1). When the herd was rapidly declining in the late 1990s, fall ratios dropped to a low of 20:100. During historical periods of stability or herd growth, NCH fall ratios have ranged from 38 to 48 calves:100 cows.

The fall 2008 bull:cow ratio was 39 bulls:100 cows. This is the highest bull:cow ratio in more than 10 years. Bull:cow ratios during the 1980s, when the herd was increasing, were often in the range of 50–60 bulls:100 cows but declined to an average of only 32 bulls:100 cows between 2001 and 2007. In 2006, only 23 bulls:100 cows were counted, though in 2007, 34: 100 were observed. Fall bull:cow ratios have been below the management objective of 40 bulls:100 cows since 1995. Lower bull:cow ratios in recent years are largely due to 'bull only' bag limits and higher bull than cow harvest quotas in years with 'either sex' bag limits.

Considering most subsistence permittees select for large bulls, hunting can impact this segment of the population in a short period of time (Milner et al. 2007). As subsistence permit numbers were increased in the late 1990s, not only did the percentage of bulls decline, but the age structure of the bull population became skewed toward younger animals. Between 1998 and 2001, the percentage of large bulls averaged only 13%. Harvests were curtailed beginning in 2000, and the herd began to grow. The number of large bulls increased, and has averaged 20% since 2002.

DISTRIBUTION AND MOVEMENTS

Calving takes place in the eastern Talkeetna Mountains from the Little Nelchina River north to Fog Lakes. The core calving area extends from the Little Nelchina River to Kosina Creek. This area is also used during the postcalving and early summer period. During summer and early fall, caribou disperse. Their fall distribution can extend from the Denali Highway near Butte Lake, across the Alphabet Hills and the Lake Louise flats, and as far east as the Gulkana River.

The rut in 2007 was concentrated in the foothills of the eastern Talkeetna Mountains near the Oshetna River in 13A. In 2008, the rut occurred in the Tangle Lakes area between the Alphabet Hills and the foothills of the Alaska Range in 13B. Winter habitat for the NCH extends from

Cantwell in 13E, east across 13A and 13B, and northeast into units 11, 12, and 20E. Through the 1980s and 1990s, caribou use of GMU 13 winter range slowly declined as old burns (50 years and older) in Unit 20E began providing higher lichen biomass.

In 2004 much of the NCH winter range in 20E burned. While caribou can use small unburned inclusions such as river bottoms, in general they do not utilize recently burned areas. Radiotelemetry flights in winters since the burn have indicated that Nelchina caribou that traveled to 20E have been using different areas each year and traveling longer distances in attempts to find good winter forage. Due to the loss of such a large amount of high quality winter range, winter locations and movements of the NCH will continue to be monitored to assess the impacts on the herd.

MORTALITY

Harvest

Season and Bag Limit. The season dates for the state Tier II (TC566) subsistence hunt in Unit 13 are 10 August–20 September and 21 October–31 March. Since 2005 the bag limit has been one caribou. Since 1993 a limited state drawing hunt (DC590) for any caribou with season dates of 10 August–20 September has also been held in Subunit 14B. The Unit 13 federal subsistence hunts for rural residents (RC513 and RC514) are held 10 August–30 September and 21 October–31 March. The federal bag limit is 2 caribou. The Unit 13 federal subsistence hunt is by registration, administered by the Bureau of Land Management (BLM); only residents of Unit 11, Unit 13, Unit 12 along the Nabesna Road, and Unit 20 residents from Delta Junction are eligible. A Unit 12 federal subsistence hunt (RC412) for rural residents of Unit 12, Dot Lake, Healy Lake, and Mentasta is opened by emergency order when the NCH migrate through the Tetlin Refuge during winter months. This hunt has been held 14 of the last 18 years.

Board of Game Actions and Emergency Orders. The Tier II hunt in 2007–08 was closed 20 September by emergency order. In 2008–09, the hunt was also emergency closed, effective 20 October.

During the March 2007 Board of Game meeting, the Nelchina Tier II scoring system was altered by the addition of two new questions: one to address income, and one to address time spent in the hunt area collecting wild game and fish. Salvage requirements and motorized access were also modified to better describe the subsistence use. Hunters were required to salvage the head, hide, kidneys, liver, and heart. During the 2007–08 season the use of aircraft or motorized vehicles over 1,500 pounds was prohibited. The motorized access restriction was repealed by the Board of Game in January 2008.

Hunter Harvest. The reported harvest in 2007–08 for the combined state and federal hunts for the NCH was 1,391 caribou, half the 2,953 average reported harvest between 2005 and 2006 (Table 2). The decline in harvest was largely due to a 45% reduction in the number of Tier II permits issued in 2007 due to a lower herd population estimate.

Illegal and unreported harvests of Nelchina caribou are an additional source of mortality. The most common type of illegal harvest occurs when a permittee fails to validate the permit after

taking a caribou. Once a permittee transports a caribou from the field without validating the permit, there is minimal chance of citation for taking additional caribou on the same permit. Individuals also transfer permits to family members or friends. The estimated illegal and unreported take (Table 3) was increased during 2005 and 2006 because of the large increase in hunting pressure due to more permits issued.

Wounding loss can also be high because caribou are herd animals; caribou are often shot while in groups, so more than one animal can be hit with a single shot. Also, identifying a specific animal from a group is difficult, especially cows and small bulls. If a caribou is not knocked down with the first shot, it may be lost in the herd and another caribou shot until one eventually drops. Wounding loss is thought to be lower under bull-only seasons. While some cows are mistakenly taken when a hunter is required to take only bulls, more care is exercised to be sure of the target, especially with subsequent shots.

Permit Hunts. Nelchina caribou were harvested by four separate permit hunts. Permit and harvest data are presented in Table 2.

The state Tier II subsistence hunt (TC566) is the primary way of allocating harvests from the NCH, and accounts for 60–90% of the total herd harvest. All Alaska residents may apply for this hunt. Permits are scored according to certain subsistence criteria and issued based on an applicant's rank. This is one of the most popular hunts in the state and in the past had more than 17,000 applicants for up to 10,000 permits. The hunt takes place entirely in Unit 13 (both fall and winter seasons). The bag limit is usually 'either sex,' but was changed to 'bulls only' between 2000 and 2004 when harvests needed to be reduced. For the 2007–08 hunt, 3,000 Tier II permits were issued, the harvest quota was increased, and the 'either sex' bag limit was reinstituted. Hunters reported a harvest of 966 caribou in 2007–08. Between 2003 and 2007, the average annual Tier II harvest was 1,458 caribou (range=752-2503; Table 2).

The number of participants in Unit 13 federal registration hunts (RC 513/514) has been fairly stable the last six years with about 2,600 permits issued. Federal hunters are generally issued 2 permits per person. The harvest was 572 in 2006–07 and 385 in 2007-08 (Table 2). The highest reported harvest under this hunt was 647 caribou in 1991, when the hunt first opened. Federal hunting opportunity in Unit 13 is limited to unencumbered federal lands, those not selected by the state or native corporations. Much of the federal land in subunits 13B and 13E along the Denali Highway originally open to federal subsistence caribou hunting has been selected by the state. Eventually, over-selections will return to federal status and at that time, the additional hunting opportunity will likely result in an increase in the number of caribou taken in the federal hunts. The potential for a high harvest under these hunts still exists even with the limited amount of land open to federal subsistence hunting. During the fall migration, caribou consistently cross in large numbers along the Richardson Highway between Paxson and Sourdough and near Slana, where they are accessible by federal hunters.

Federal registration hunt RC412 occurs in Unit 12, and is a subsistence hunt for rural residents of Unit 12, Dot Lake, Healy Lake, and Mentasta. U.S. Fish and Wildlife Service (FWS) administers this hunt on Tetlin National Wildlife Refuge and on Wrangell St. Elias National Preserve lands north of the Pickerel Lake winter trail. This hunt is held by emergency order when a sufficient

number of Nelchina caribou migrate into the hunt area. This hunt has primarily been 'bulls only.' Since it was established in 1990, the average take has been 21 caribou (range = 1–58). The harvest was 17 caribou in 2007 (Table 2).

The state drawing permit hunt (DC590) is for any caribou and is held in Unit 14B. This is the only NCH hunt that is not a subsistence hunt, and is open to both residents and nonresidents. Up to 100 permits are issued. Bulls predominate the harvest, though the overall take has been very low, ranging 4–23 animals during the last 5 years (Table 2).

The total reported harvest for the NCH in 2007 for all hunts was 1,391 (980 bulls, 402 cows, 9 unknown sex) caribou. The estimated illegal, unreported, and accidental take was 500. The total estimated take was 1,891 caribou (Table 3). The total estimated take for the past 5 years averaged 2,549 caribou (range = 1,587–3,890), which is approximately a 7% harvest rate.

Hunter Residency and Success. Only Alaska residents are allowed to hunt Nelchina caribou in Units 12 and 13, while nonresident hunters are allowed to hunt the NCH in 14B under the drawing permit hunt. Table 4 lists hunter residency and success rates for local (Units 11, 13, and 12 along the Nabesna road) and nonlocal hunters for the state Tier II hunt. Most of the Tier II permits are issued to nonlocal Alaska residents. In 2007 local hunters made up 9% of the total Tier II hunters, and were responsible for 5% of the total harvest. Federal hunts (RC412, RC513, and RC514) are open only to residents of defined subsistence zones; thus, only federally defined local rural residents harvest caribou in these federal hunts.

Hunter effort varies somewhat between years, depending on caribou distribution and migration patterns in relation to the road system and hunter access points. Over the last 5 years, successful Tier II hunters spent an average of 5 days hunting to get a caribou, while unsuccessful hunters averaged 8 days in the field.

Permit success rates for all permit holders in the Tier II NCH hunt have averaged 45% (range = 32–54) since 2003–04. Success rates for only those that reported hunting averaged 49%. Fluctuations in hunter success between years with similar hunting effort are usually attributed to fall caribou distributions away from the road system, winter migrations out of the unit, or whether the winter season was closed early by emergency order. Success rates for Tier II hunters are lower than rates observed under the old NCH drawing hunt. Considering many of the same hunters get the Tier II permit every year, a Nelchina Tier II permit is not the valued prize it was under the old drawing system. Then, an individual was fortunate to get drawn for a permit once every 4 or more years. Permit success rates often exceeded 60% for the old drawing hunts.

Harvest Chronology. The fall caribou season occurs in August and September and is the most popular time to hunt. Sixty to 100 percent of the yearly Tier II harvest occurred in August and September during this reporting period (Table 5). Bulls become more vulnerable in September because of the onset of the rut. Hunting pressure also increases during moose season by hunters on combination hunts. Historically, winter harvest levels have depended on the number of caribou that remained in Unit 13. Winter seasons are subject to emergency closures in those years when the harvest quota is reached before the season ends on March 31.

Transport Methods. For successful Tier II subsistence hunters during this reporting period, 4-wheelers were the predominant method of transportation, followed by highway vehicles and snowmachines (Table 6). Aircraft and ORVs weighing over 1,500 lbs were prohibited in the Tier II hunt for the 2007 –08 season. During the early 1990s, highway vehicles were the most important method of transportation, but in 1994 the number of hunters using 4-wheelers began to climb. The use of snowmachines has fluctuated widely and depends on both the length of the winter hunt and the availability of caribou. Because most of the federal land open to hunting is adjacent to the Denali and Richardson highways, successful Unit 13 federal subsistence hunters (RC513 and 514) report highway vehicles (40–60%) as the most important transportation method. Aircraft is the primary transportation method in the Unit 14B drawing hunt (DC590).

OTHER MORTALITY

Eagles are abundant on the NCH calving grounds, and during flights monitoring survival of neonatal caribou calves born to radiocollared cows there have been numerous observations of both golden and bald eagles feeding on neonates. The number of calves taken by eagles is unknown, but predation by eagles is considered to be an important source of neonatal calf mortality. Field observations suggest eagle numbers on the NCH calving grounds are very high and increasing.

Grizzly bears are present and considered numerous throughout the NCH summer range. Grizzlies are also known to be important predators of caribou (Boertje and Gardner 1998); however, predation rates and their effects on the NCH have not been studied. Many of the grizzlies radiocollared between 2006 and 2008 on the calving grounds by Glennallen staff have been observed feeding on caribou in addition to moose.

Wolves are present throughout the NCH range, and predation by wolves is thought to be an important source of mortality. Ballard et al. (1987) reported that Unit 13 wolves preyed on caribou whenever they were available. The importance of wolf predation on caribou depends on wolf numbers, the relative availability of moose, and the size and distribution of the NCH. When the moose population declines caribou become a more important prey for wolves. When the NCH declines in size but distributes itself over a wider area, thus encompassing more wolf territories, wolf predation has a larger impact on herd population dynamics.

The NCH is currently benefiting from an active wolf management program that has been ongoing in GMU 13 since 2001, originally implemented to increase moose numbers. Caribou calf loss between summer and fall composition counts averaged 32% between 1997 and 2000, before active wolf management, and 15% since.

An important factor affecting winter predation on caribou by wolves is the migratory pattern of the NCH. In most years, a large percentage of the caribou leave the predator management area in Unit 13 in October and do not return from wintering areas in units 11, 12, and 20E until April. Losses to wolf predation in Units 11 and 12 are thought to be substantial.

HABITAT ASSESSMENT

Between 1955 and 1962, Alaska Department of Fish and Game (ADF&G) established 39 range stations, including exclosures, throughout much of the Nelchina caribou range. Biologists examined these stations at approximately 5- to 6-year intervals from 1957 through 1989. A complete description of the Nelchina caribou range, range station locations, and results of long-term monitoring was presented by Lieb (1994). Lieb concluded that lichen use was high during the 1960s, when caribou were abundant, and the result was an overall decline in lichens on the Nelchina range. Following a decline in caribou numbers, lichen increased over much of the fall and traditional winter range from the early 1970s until 1983. However, as the herd doubled in size between 1974 and 1983, increases in lichen biomass ceased in areas of substantial caribou use. Between 1983 and 1989, continued increases in caribou numbers resulted in a decline in lichen biomass. Lieb concluded that in 1989, 77% of the Nelchina range exhibited poor lichen production, 2% was considered to have fair production, and only 21% good production; this compared to 33% of the range in each category in 1983. On the important calving and summer range in the Eastern Talkeetna Mountains, Lieb (1994) reported the lowest lichen biomass ever recorded, with all the preferred lichen species virtually eliminated. Lichen standing crops are expected to improve considering the herd has been reduced in recent years.

Initial research in the early 1990s designed to evaluate body condition in various caribou herds led to the conclusion that Nelchina animals were in poorer body condition than animals from the Alaska Peninsula or Mulchatna Caribou herds (Pitcher 1991). Between 1992 and 2003, female calves were captured and radiocollared, or collected to assess body condition and future age-specific productivity data. Four-month fall and 10-month spring weights have averaged between 105 and 135 lbs since 1992. These represent the lightest and most variable weights for the Interior caribou herds (Patrick Valkenburg, ADF&G files).

Variations in spring and summer weather conditions that influence timing of plant emergence, rate of growth, and overall forage quality may be responsible for much of the variation in fall body condition. During hot summers, insect harassment may also be an important factor (Colman et al. 2003). Considering the traditional calving grounds and summer range of the Nelchina herd have been heavily grazed for years, even slight annual variations in weather may be significantly impacting foraging conditions. During hot, dry summers, increased stress from low forage availability combined with insect harassment minimizes summer weight gain; some of the lowest calf weights have been observed following these summers. Alternately, cool, cloudy summer conditions minimize insect activity as well as increase forage quality in terms of higher nitrogen levels in vascular plants (Lenart 1997). The fall 2007 average 4-month-old calf weight was 135 lbs, the highest ever obtained in the NCH, but the fall 2008 average dropped to 115 lbs, one of the lowest. The high weights obtained in 2007 were attributed to a mild winter and wet cool summer. In contrast, temperatures during the spring and summer of 2008 were the coldest on record, which delayed green-up considerably.

Herd productivity is assessed by monitoring age of first reproduction among radiocollared cows captured initially as 4-month-old calves. Since 1992, no 2-year-old cows have produced calves in the NCH. In years with favorable to good forage production and availability, up to 64% of the 3-year-old cows (7 of 11 in 2002), and 94% of all radiocollared cows age 3 years and up have had

calves (29 of 31 in 2006). During years following drought or deep snow conditions, 3-year- old radiocollared cow calving rates have been zero, and overall pregnancy rates have been as low as 44%. Productivity consistently increases when favorable weather patterns result in high annual forage growth that allows cows to improve their overall body condition going into the rut. In 2007 and 2008, overall radiocollared cow pregnancy rates were 84% and 88% respectively.

ENHANCEMENT

Short-term caribou habitat enhancement depends more on weather conditions than any other factor. The Nelchina summer range has a short growing season due to the high average elevation of 1,256 m (4,122 ft). An early spring can provide caribou with abundant early nutritious forage that can have a substantial impact on lactation and summer body growth. If precipitation is adequate through the rest of the summer, range conditions usually improve. Drought summers can be devastating to both vascular and nonvascular forage plants.

Long-term caribou habitat enhancement is largely dependent on limiting herd growth beyond historical sustainable levels. The current herd objective is to maintain 35,000–40,000 caribou on the range versus the 45,000–50,000 level during the late 1990s. Since 1999, the herd has been maintained at or below the objective range, though more time is needed to fully evaluate the impact on range condition.

The other aspect of long-term enhancement is dependent on habitat diversity, and the return of wildfire or controlled burns. The Alaska Interagency Fire Management plan (1987) designates areas in Unit 13 where wildfires will not necessarily be suppressed. The plan provides for a natural fire regime to benefit wildlife habitat. While wildfire likely enhances summer range conditions by increasing forbs, sedges and deciduous shrub growth, recent research has focused on the role of fire on winter range. Joly et al. (2003) found that Nelchina caribou routinely select winter habitat that is more than 50 years post burn, likely due to the slow growth of lichen. Considering wildfire may play a role in the recovery of depleted or decadent stands of lichens important for overwintering caribou, a diversity of burn mosaics and habitat types is considered ideal. Therefore, small periodic wildfires ensure the availability of both winter and summer caribou forage.

Long-term fire suppression increases fuel buildup and the possibility of an intense fire over a large area. This type of wildfire creates less diversity and decreases year-round habitat availability for caribou (Joly et al. 2003). In spite of the current fire management plan and the benefits of wildfire, Unit 13 has had only one significant natural fire (the 5,000-acre Tazlina Lake burn) since 1950 because wildfire ignitions are rare, and many of the small strikes that did take were suppressed. A controlled burn in the Alphabet Hills and north Lake Louise flats to improve moose and caribou habitat burned about 5,000 acres in 2003, and another 36,000 acres in 2004. The burn plan calls for additional burning in subsequent years when conditions are adequate. Despite these recent fires, there are more than 5 million acres of caribou habitat in Unit 13 that can be improved.

NON-REGULATORY MANAGEMENT PROBLEMS/NEEDS

A proposed open pit mine adjacent to the Tangle Lakes in critical caribou fall and wintering habitat presents a very real threat to the NCH. In addition to this being an important rutting and migration area, in many years thousands of caribou winter in this area. Wintering caribou have heavily utilized this area, most recently in 2005–06 and 2006–07, perhaps in response to the recent large-scale wildfires on the 20E wintering grounds. Because of the presence of caribou in this area during the fall and winter hunting seasons, this area has a history of traditional use by subsistence and other hunters. Extensive mining, processing, and associated development and disturbance endangers future use of this critical habitat by the NCH. Additional management needs include: (1) monitoring range condition by continuing to monitor body condition parameters, (2) monitoring sources and rates of natural mortality, and (3) minimizing land use activities that adversely affect the Nelchina range.

CONCLUSIONS AND RECOMMENDATIONS

The fall 2007 NCH herd estimate of 33,744 caribou indicates the herd has declined from the recent high of 36,677 in 2004, and is below the population management objective of 35,000–40,000 caribou. Although a census was not completed in 2008, the modeled population estimate was similar to 2007. The cause for the recent decline in herd size is unknown. Calf production in 2007 and 2008 was considered good. Calf survival to fall decreased in 2007 but is still above that observed before the start of intensive wolf management in Unit 13 in 2003-04. Wolf numbers have been reduced across the core calving grounds, as well as fall and winter ranges within the unit.

Maintaining the NCH at or below the current objective population range is the most important management tool to maintain range quality. If the herd is allowed to increase above 40,000 animals, overstocking could result in a prolonged period of low herd productivity (Messier et al. 1988, Cameron and Ver Hoef 1994).

To ensure the management population objective is maintained, caribou harvests need to be adjusted yearly. Individual yearly harvest objectives for cows and bulls should be based on annual recruitment, bull:cow ratios, and the population trend. Harvest objectives for the NCH can be successfully attained by adjusting the number of Tier II permits issued, as well as separately closing the season for bulls and cows by emergency order when the management goal for each has been reached.

The current bull:cow ratio of 39:100 in 2008 approaches the management objective of 40 bulls:100 cows for the NCH. Higher harvest quotas for bulls are considered to be a major factor in lowering the number of large bulls, as most hunters select for older, larger bulls when they are available. Wolf predation may also have contributed to the decline in the number of large bulls, as their vulnerability to predation increases following the rut (Colman et al. 2003). The reduction in harvest over the past few years has allowed for an increase in bulls, including larger bulls. Moderately high bull:cow ratios should be maintained to allow more adult bulls in the population to participate in the rut. While young bulls are capable of breeding, adequate numbers of large bulls are considered essential for an efficient and timely rut as estrus can be induced by bull

physiology and behavior. Synchrony of the rut is important to achieve synchrony in parturition, which provides a survival advantage for calves.

The NCH is one of the only herds in the state over 30,000 animals that can have its upper population limit controlled solely by human harvests. This is only possible because the NCH is accessible by the road system from the major population centers of Fairbanks and Anchorage. The substantial increases in calf recruitment and adult survival since recent active wolf management began have directly resulted in an increased harvestable surplus for hunters. Given hunter interest and accessibility of this herd, there is little chance that the population will increase to unsustainable levels. Other caribou herds with less hunter access may not be manageable under the same conditions. Because of this, the NCH management strategy is considered a long-term experiment.

The management objective of having hunters control NCH size at a level that is below prior peak herd numbers, but well above herd lows, over a prolonged number of years, has never been accomplished on a large herd. A major benefit of this management strategy is to provide a more stable and predictable harvest of caribou from the herd over the long term. Historic annual harvests prior to the NCH peak in the 1960s ranged from 360 to 10,100. Following the crash in the 1970s, harvests remained low for many years. If losses to wolf predation can be held at 10% or less, and the herd can be stabilized at 35,000–40,000, the projected annual harvests are expected to be about 2,000–4,000 caribou each year, thus eliminating the boom-and-bust cycle. In addition to stable harvestable surpluses for hunters, herd stability should provide a consistent prey supply for wolves, somewhat reducing predation pressure on moose.

LITERATURE CITED

ALASKA INTERAGENCY FIRE MANAGEMENT COUNCIL. 1987. Copper Basin Planning Area.

BALLARD, W. B., J. S. WHITMAN, AND C. L. GARDNER. 1987. Ecology of an exploited wolf population in south-central Alaska. *Wildlife Monograph* 98. 54pp.

BOERTJE R. D. AND C. L. GARDNER. 1998. Reducing mortality on the Fortymile Caribou Herd, 1 July 1997–30 June 1998. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-27-1. Study 3.43. Juneau, Alaska.

CAMERON, R. D. AND J. M. VER HOEF. 1994. Predicting parturition rates of caribou from autumn body mass. *Journal Wildlife Management*. 58(4):674–679.

COLMAN, J. E., C. PEDERSON, D. HJERMANN, O. HOLAND, S. MOE, AND E. REIMERS. 2003. Do wild reindeer exhibit grazing compensation during insect harassment? *Journal Wildlife Management*. 67(1):11–19.

JOLY, K., B.W. DALE, W. B. COLLINS, AND L. G. ADAMS. 2003. Winter habitat use by female caribou in relation to wildland fires in interior Alaska. *Canadian Journal of Zoology*. 81:1192–1201.

LENART, E. A. 1997. Effects of weather on caribou forage productivity and nutrition within the range of the Chisana herd. M.S. thesis, University of Alaska, Fairbanks. 43pp.

LIEB, J. W. 1994. Analysis of Nelchina caribou range – III. Proj. Title: Wildlife Research and Management. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report. Juneau. 131pp.

_____, K. W. PITCHER, AND R. W. TOBEY. 1988. Optimum population size for the Nelchina caribou herd. Proceedings 3rd North Am. Caribou Workshop. Alaska Department of Fish and Game. Juneau. Wildlife Technical Bulletin No. 8: 133–145.MESSIER, F., J. HUOT, D. LE HENAFF, AND S. LUTTICH. 1988. Demography of the George River caribou herd: evidence of population regulation by forage exploitation and rangeexpansion. Arctic. 41(4):279–287.

MILNER, J.M., E.B. NISLEN, AND H.P. ANDREASSEN. 2007. Demographic side effects of selective hunting in ungulates and carnivores. Conservation Biology 21(1):36-47.

PITCHER, K. W. 1991. Nutritional status of the Southern Alaska Peninsula, Nelchina and other south central Alaska caribou herds. Alaska Department of Fish and Game. Progress Report Project W-23-4. Study 3.36. Juneau. 42pp.

WHITTEN, K. R. 1995. Influence of body condition on productivity of adult female caribou in the Porcupine caribou herd. Alaska Department of Fish and Game. Research Final Report. Project W-24-1. Study 3.39. Juneau. 26pp.

PREPARED BY:

Bob Tobey
Wildlife Biologist

Rebecca Schwanke
Assistant Wildlife Biologist

SUBMITTED BY:

Gino Del Frate
Management Coordinator

Please cite any information taken from this section, and reference as:

TOBEY, B. AND R. SCHWANKE. 2009. Units 13 and 14B caribou management report. Pages 83–98 in P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 Nelchina caribou fall composition counts and estimated herd size, regulatory years 2003–2009

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Total bulls (%)	Composition sample size	Total adults	Estimate of herd size	Postcalving[a] count
2003–2004	31	35	21	60	19	3140	23,786	30,141	31,114
2004–2005	31	45	26	57	17	1640	27,299	36,677	38,961
2005–2006	36	41	23	57	20	3263	28,071	36,428	36,993
2006–2007	23	40	25	61	14	3380	NA	34,699[b]	NA
2007–2008	34	35	21	59	20	3027	25,824	32,569	33,744
2008–2009	39	40	22	56	22	3378	NA	32,288[b]	NA

[a] Spring census.
[b] Modeled estimate.

TABLE 2 Nelchina caribou harvest data by permit hunt, regulatory years 2003–2008

Hunt No. /Area	Regulatory year	Permits Issued	Percent did not hunt	Percent Successful Permits	Percent Unsuccessful Permits	Bulls	(%)	Cows	(%)	Unk.	Total Harvest
TC566[a]	2003–2004	2005	24%	38%	37%	746	99%	3	0%	3	752
	2004–2005	1869	10%	48%	30%	884	99%	5	1%	5	894
	2005–2006	4001	14%	54%	29%	1614	74%	548	25%	15	2177
	2006–2007	5495	21%	46%	32%	1814	72%	685	27%	4	2503
	2007–2008	3003	30%	32%	36%	693	72%	272	28%	1	966
RC	2003–2004	2598	32%	12%	36%	318	99%	2	1%	1	321
513/514[b]	2004–2005	2558	34%	13%	39%	250	74%	86	26%	1	337
	2005–2006	2570	39%	24%	35%	369	60%	239	39%	7	615
	2006–2007	2641	47%	22%	28%	319	56%	239	42%	14	572
	2007–2008	2409	51%	16%	29%	258	67%	121	31%	6	385
RC412[c]	2003–2004	91	31%	11%	22%	9	90%	1	10%	0	10
	2004–2005	117	23%	20%	49%	22	96%	1	4%	0	23
	2005–2006	80	29%	16%	36%	6	46%	7	54%	0	13
	2006–2007	53	32%	6%	53%	0	0%	3	100%	0	3
	2007–2008	71	41%	24%	20%	10	67%	5	29%	2	17
DC590[d]	2003–2004	60	68%	7%	22%	4	100%	0	0%	0	4
	2004–2005	60	67%	18%	15%	10	91%	1	9%	0	11
	2005–2006	100	69%	8%	20%	6	86%	1	13%	1	8
	2006–2007	100	71%	12%	16%	9	75%	3	25%	0	12
	2007–2008	106	64%	22%	14%	19	83%	4	17%	0	23
Totals for	2003–2004	4754	29%	23%	35%	1077	99%	6	1%	4	1087
all permit	2004–2005	4604	25%	27%	35%	1166	92%	93	7%	6	1265
hunts	2005–2006	6751	24%	42%	31%	1995	71%	795	28%	23	2813
	2006–2007	8289	30%	37%	31%	2142	69%	930	30%	18	3090
	2007–2008	5589	40%	25%	32%	980	70%	402	29%	9	1391

[a] Tier II subsistence drawing permit.

[b] Subsistence registration for local residents (Unit11 & 13), administered by BLM as federal hunt RC513 in 1990, and includes 20D residents in hunt 514. Bag limit was 2 caribou, so percentages related to permits, not hunters.

[c] Subsistence registration for Unit 12 residents, administered by FWS as Federal Hunt RC512.

[d] A drawing hunt.

TABLE 3 Nelchina caribou harvest and accidental death, regulatory years 2003–2008

Regulatory	Reported						Estimated			Accidental	Grand
Year	M	(%)	F	(%)	Unk.	Total	Unreported	Illegal	Total	death	Total
2003–2004	1077	99%	6	1%	4	1087	200	100	300	200	1587
2004–2005	1166	92%	93	7%	6	1265	200	100	300	200	1765
2005–2006	1995	71%	795	28%	23	2813	400	200	600	200	3613
2006–2007	2142	69%	930	30%	18	3090	400	200	600	200	3890
2007–2008	980	70%	402	29%	9	1391	200	100	300	200	1891

TABLE 4 Nelchina caribou Hunt TC566 annual hunter residency and success, regulatory years 2003–2008

	Successful				Unsuccessful				
Regulatory year	Local[a] resident	Nonlocal resident	Total	%	Local[a] resident	Nonlocal resident	Total	%	Total hunters
2003–2004	48	704	752	51%	85	650	735	49%	1487
2004–2005	66	828	894	62%	69	486	555	38%	1449
2005–2006	125	2052	2177	65%	158	1016	1174	35%	3351
2006–2007	130	2373	2503	59%	186	1578	1764	41%	4267
2007–2008	53	913	966	47%	136	933	1069	53%	2035

[a] Local resident is a resident of Units 13, 11, or 12 along the Nabesna Road.

TABLE 5 Nelchina caribou hunt TC566 annual harvest chronology percent by harvest period, regulatory years 2003–2008

	Harvest Periods														
	Weeks (fall)								Months (winter)						
Regulatory year	1	2	3	4	5	6	7	8	Oct	Nov	Dec	Jan	Feb	Mar	n
2003–2004	0	7	8	12	11	16	23	22	--	--	--	--	--	--	747
2004–2005	0	5	9	9	11	15	14	13	8	6	2	3	1	4	892
2005–2006	0	4	7	7	8	12	12	10	16	6	3	3	3	8	2100
2006–2007	0	7	8	5	8	13	15	14	11	8	4	3	4	0	2444
2007–2008	1	11	12	9	13	16	22	17	--	--	--	--	--	--	942

TABLE 6 Nelchina caribou hunt TC566 harvest percent by transport method, regulatory years 2003–2008

	Percent of harvest								
Regulatory Year	Airplane	Horse	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Airboat	n
2003–2004	7	1	9	44	0	12	24	2	743
2004–2005	5	0	7	42	7	11	27	1	887
2005–2006	4	0	6	37	12	10	29	1	2149
2006–2007	5	0	8	38	10	9	29	1	2480
2007–2008[a]	0	0	8	62	0	8	19	2	962

[a] Aircraft and vehicles weighing over 1500 lbs illegal in 2007-08

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008

LOCATION

GAME MANAGEMENT UNIT: 18 (41,159 mi^2)

HERDS: Kilbuck Mountains and Mulchatna caribou herds

GEOGRAPHIC DESCRIPTION: Yukon–Kuskokwim Delta

BACKGROUND

Historically, caribou ranged throughout the Yukon–Kuskokwim Delta, including Nunivak Island, and populations probably peaked during the 1860s (Skoog 1968). By the early 1900s, there were few caribou in the lowlands of the Delta. From the 1920s to the 1930s, reindeer herds ranged throughout much of the area but declined sharply in the 1940s (Calista Professional Services and Orutsararmuit Native Council 1984). Since the decline of the reindeer herds, the abundant caribou habitat throughout Unit 18 was only lightly used until 1994, when large numbers of Mulchatna caribou herd (MCH) animals began regular, seasonal use of the Kilbuck Mountains. In the more recent years, a large portion of the Mulchatna herd has spent most of the year in Unit 18 and harvest in Unit 18 has become a larger proportion of the overall harvest.

The Andreafsky caribou herd (ACH) existed in Unit 18 north of the Yukon River until the mid 1980s. The origin of this small herd is unknown, and there was disagreement whether these *Rangifer*-type animals were caribou or reindeer. Poor compliance with the hunting regulations probably contributed to their disappearance.

Caribou from the Western Arctic herd (WAH), the largest herd in Alaska, occasionally venture into the northern part of Unit 18. Until this reporting period, hunting regulations north of the Yukon River were liberal to allow hunters to take advantage of these infrequent hunting opportunities. However, now that MCH caribou are as likely as WAH caribou to use the area north of the Yukon River, caribou management throughout Unit 18 is based on MCH considerations.

The Kilbuck caribou herd (KCH), or Qavilnguut herd, was located in the Kilbuck and Kuskokwim Mountains southeast of Bethel. Their range included the eastern portion of Unit 18, encompassing the edge of the lowlands of the Delta and the montane western border of Units 19B and 17B. Conservative management techniques were used to protect this small, discrete, resident herd, but since 1994 large numbers of MCH caribou have used the entire range of the KCH. Our current interpretation is that the KCH has been assimilated by the MCH, and caribou hunting regulations in Unit 18 reflect that interpretation.

Since 1985, ADF&G and U.S. Fish and Wildlife Service (FWS) have cooperated to study the KCH, and more recently the MCH, in Unit 18. We deployed radio collars and completed numerous aerial surveys and radiotelemetry flights during this study. A technical paper detailing this effort is currently in final stages of revision before being published.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

The caribou management goals for Unit 18 are:

- Increase the number of caribou.
- Improve compliance with caribou hunting regulations.
- Develop a better understanding of the interaction between caribou herds using Unit 18.

MANAGEMENT OBJECTIVES

The caribou management objectives for Unit 18 are:

- Gather accurate caribou harvest information in Unit 18.
- Increase compliance with caribou hunting regulations.
- Monitor caribou in Unit 18 to assess sex and age composition, numbers, distribution, and calving; and to address questions of herd identity and determine other population parameters of caribou using Unit 18.

METHODS

We continued cooperative caribou studies with FWS (National Wildlife Refuges: Yukon Delta; Togiak). We also met with other agencies with an interest in MCH caribou to coordinate our resources and efforts more efficiently.

We conducted fall sex and age composition surveys in the Kilbuck Mountains during October 2006. Two observers and a pilot used an R44 helicopter to sample caribou for composition. A fixed-wing Cessna 185 aircraft equipped with radiotelemetry equipment was used to locate groups of caribou throughout the area. We conducted a similar survey during October 2007 using an R44 helicopter.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Before 1994, the KCH was small but growing and was expanding its range when approximately 35,000 Mulchatna caribou overran it in September–October 1994. Since then we have recorded annual incursions of approximately 10,000 to 40,000 Mulchatna caribou during the fall migratory season (ADF&G files).

We concluded that the MCH has assimilated the KCH because we have radiotelemetry information showing that former KCH caribou were calving with the MCH; composition surveys during spring 2001 and 2002 revealed that more than 90% of the caribou in the traditional KCH calving areas during the calving season were bulls; and the last time a significant number of caribou were found calving in a traditional KCH calving area was in spring of 2000. Because the caribou using Unit 18 are from the MCH, the population size information for Unit 18 should be taken from the Unit 17 caribou report, but in general, the MCH has declined steadily since the mid 1990s.

Population Composition

We conducted a fall sex and age composition survey among MCH caribou in Unit 18 during October 2006 and in October 2007. Complete MCH composition data will be reported in the MCH caribou management report for Unit 17.

Distribution and Movements

Since 1994 and continuing through this reporting period, approximately 10,000 to 40,000 Mulchatna caribou entered Unit 18 from the east, generally during mid August to mid September. They wintered throughout the eastern lower Kuskokwim River and Kuskokwim Bay drainages, extending from the Whitefish Lake area near Aniak to the southernmost portions of Unit 18, and stayed through late March to early April, when they moved westward into Units 17A, 17B, and 19B, following trails such as those near Kisaralik Lake, along the upper Kwethluk River and Trail Creek, and other trails.

Occasionally, caribou are reported west of the Kuskokwim River. These reports are sporadic, and no long-term presence of caribou west of the Kuskokwim River has been established.

Caribou from the Western Arctic caribou herd (WAH) occasionally use portions of Unit 18 north of the Yukon River. The number of WAH caribou using this area is small relative to the size of the entire herd. Unit 18 is on the periphery of the WAH's range, and use of this area is occasional and intermittent. We did not find nor hear of any evidence of WAH caribou in Unit 18 during this reporting period.

MORTALITY

Harvest

Season and Bag Limit

2006–2007 and 2007–2008 Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18		
RESIDENT HUNTERS: 3 caribou; however, only bulls may be taken before 1 November	1 Aug– 15 March	
NONRESIDENT HUNTERS: One bull		1 Sep–30 Sep

Board of Game Actions and Emergency Orders. During its March 2006 meeting, the Board of Game changed the caribou season throughout Unit 18 so that, beginning in 2006–2007, the resident season was 1 August–15 March with a bag limit of 3 caribou, but no more than 1 bull taken prior to 1 November; and the nonresident season was 1–30 September with a 1 bull bag limit.

Hunter Harvest. In 2006–2007, 213 successful hunters reported killing 324 caribou. These included 256 bulls, 64 cows, and 4 of unrecorded sex. In 2007–2008 255 successful hunters reported killing 374 caribou, including 225 bulls, 144 cows, and 5 of unrecorded sex. In both years the proportion of bulls harvested in the fall is high and the winter harvest is nearly equal in bull and cows.

Harvest reporting remains poor, and the value of our reported harvest data for resident hunters is limited, except for those hunters using aircraft. Coffing et al. (2000) report that Akiachak residents (population of 560) harvested 374 caribou during the 1998 calendar year. If we consider that a similar harvest rate is possible among approximately 10,000 residents having similar access to caribou in Unit 18 (4,792 people in 13 villages and 5,449 people in Bethel), we can grasp the extent to which the harvest is underreported.

Permit Hunts. There were no permit hunts for caribou in Unit 18 during the reporting period.

Hunter Residency and Success. During the 2006–2007 season, 47 nonresident hunters (72%) were successful, while 166 residents (66%) reported taking at least one caribou. In 2007–2008, 19 nonresident hunters (66%) were successful, while 236 residents (72%) reported taking at least one caribou.

Harvest Chronology. Typically, most of the harvest is unreported and occurs during the winter months when caribou are available and snow conditions are favorable for travel by snowmachine, but even though the harvest is unreported the chronology of the unreported harvest probably parallels the reported harvest. During 2006–2007, snow conditions were poor in the southern part of the unit near Goodnews Bay and Quinhagak. Snow conditions close to the Kuskokwim River were much better. Caribou were distributed more to the south during the early and mid-winter of 2007–2008. Later in the winter the caribou moved closer to the Kuskokwim River and more hunters had access to them. The higher harvests in the late winter is probably due to better winter travel conditions and caribou movements that placed them within proximity of communities from which hunters could take day trips and successfully harvest caribou.

For many years the reported harvest had been greater during the month of September, but recently harvests in September have decreased and February and March experience the highest harvests. (Table 1).

Transport Methods. During the open water months, many caribou were reported taken using boats (31 in 2006–2007 and 22 in 2007–2008), but most were reported taken using airplanes (93 in 2006–2007 and 40 in 2007–2008). Nonresidents used airplanes almost exclusively.

During the winter months, caribou were typically taken using snowmachines (188 in 2006–2007 and 310 in 2007–2008) after snow conditions improved enough to permit safe travel. Only rarely are other transportation methods used.

Other Mortality

Little direct information is available regarding other mortality of caribou in Unit 18. Caribou are an important prey species for wolves, and predation by wolves has increased in recent years. The reported wolf harvest has increased more than tenfold in the last 15 years. Most of the wolves harvested in Unit 18 are taken opportunistically by caribou hunters. In the area south and east of the Kuskokwim River, we rarely see wolf tracks when caribou are absent.

Another source of mortality is predation by brown bears. However, we do not have an estimate of predation rates on caribou in Unit 18.

HABITAT

Assessment

The lichen ranges throughout Unit 18 are in excellent condition. Before the influx of Mulchatna caribou into the KCH range, neither the Andreafsky nor the Kilbuck mountains had been substantially grazed by caribou or reindeer since the 1940s (Calista Professional Services and Orutsararmuit Native Council 1984).

Enhancement

The existing caribou habitat in Unit 18 is underused. Enhancement is not being considered.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Cooperative Management Plan

The KCH Cooperative Management Plan provided guidelines for management of the KCH, but now that the KCH no longer exists as a separate herd, this management plan is no longer being followed, no additional meetings are planned, and we have suggested to the working group that it disband. Funding is not available for additional meetings, and public input is being accomplished through the ACs and the RAC. However, working group members are still consulted for public input as the need arises.

CONCLUSIONS AND RECOMMENDATIONS

Caribou found in Unit 18 are from the MCH, and management reflects that interpretation. We should continue to test this interpretation through searches for calving caribou during the calving season.

We should continue to meet with other agencies to consider our common interest in MCH caribou and to better use our limited resources. Unit 18 now harvests a significant portion of the entire harvest, especially the harvest in late winter. The interest in fall hunting has lessened, most likely due to the downward trend of the Mulchatna caribou herd. Caribou harvests in the winter are important to local subsistence hunters. Hunting effort and success are directly related to snow conditions and the proximity of caribou to communities when winter travel conditions are good.

LITERATURE CITED

CALISTA PROFESSIONAL SERVICES AND ORUTSARARMUIT NATIVE COUNCIL. 1984. Prospects for reviving the reindeer industry in the Yukon–Kuskokwim region. 178pp.

COFFING, M., M.L. BROWN, G. JENNINGS, AND C.J. UTERMOHLE. 2000. Subsistence Harvest and Use of Wild Resources in Akiachak, 1998. Technical Paper No. 258. Alaska Department of Fish and Game. Division of Subsistence. Juneau.

SKOOG R.O. 1968. Ecology of the Caribou (*Rangifer tarandus granti*) in Alaska. Ph.D Thesis. University of California, Berkeley. 699pp.

PREPARED BY:

Phillip Perry
Wildlife Biologist III

SUBMITTED BY:

Peter J. Bente
Survey-Inventory Coordinator

Please cite any information taken from this section, and reference as:

PERRY, P. 2009. Unit 18 caribou management report. Pages 99–105 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

TABLE 1 2000–2001 to 2007–2008, reported caribou harvest chronology in Unit 18

	Month											
Year	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
2000		28	117	2	11	16	14	27	38	2		
2001		35	132		10	116	56	92	131			
2002		28	117	2	11	16	14	27	35			
2003		35	248	1	10	116	56	92	131			
2004		17	158	5	8	44	36	26	78	84		
2005		4	169	19	25	54	21	14	104	88		
2006		6	102	8	28	35	22	26	67	8		
2007		2	44	11	10	26	42	72	155	5		

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNITS: 19A, 19B, 19C, 19D, 21A, and 21E (55,278 mi^{2*})

* Does not include the upper Nowitna River drainage, which was excluded from Unit 21A beginning 1 July 2006.

MCGRATH AREA HERDS: Beaver Mountains, Sunshine Mountains, Big River–Farewell, Rainy Pass, and Tonzona

GEOGRAPHIC DESCRIPTION: Unit 19, all drainages into the Kuskokwim River upstream from a straight line drawn between Lower Kalskag and Paimiut. Unit 21A, the Innoko River drainage upstream from and including the Iditarod River drainage; Unit 21E, the Yukon River drainage from Paimiut upstream to, but not including, the Blackburn Creek drainage; and the Innoko River drainage downstream from the Iditarod River drainage.

BACKGROUND

Historically, caribou have played an important role in the McGrath area. During the 1800s, caribou occurred sporadically in far greater numbers over a greater range than at present. Discussions with village elders and reports of early explorers corroborate this, although documentation is poor (Hemming 1970). The Mulchatna caribou herd once roamed throughout the Kuskokwim basin, but as numbers dwindled in the late 1990s, this herd retreated south to better range (Whitman 1997). The Mulchatna herd declined substantially from over 200,000 animals in the mid 1990s to 45,000 by July 2006 (Woolington 2007). The Alaska Department of Fish and Game (ADF&G) conducted a photocensus of the Mulchatna herd in 2008, however data are still being analyzed and the presence of this once large herd is expected to continue to decline in the McGrath area.

Several small herds exist in the McGrath area. In addition to the Mulchatna herd, caribou herds currently recognized south of the Kuskokwim River include the Tonzona, Big River–Farewell (previously called Big River), and Rainy Pass herds. Radiotelemetry data confirmed the separate

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

identity of the Tonzona herd, although there is some seasonal overlap between this herd and the Denali herd (Del Vecchio et al. 1995). Pegau (1986) radiocollared caribou in the Big River–Farewell herd near Farewell in the early 1980s. During the first year of the study, these caribou remained in the Farewell area, but some moved near the Swift River the following year and did not return for at least 2 years. These observations raised as many questions as they answered, and the discreteness and extent of the range of the Big River–Farewell herd is still poorly understood.

The Rainy Pass herd occupies the Rainy Pass area, drainages at the head of the South Fork Kuskokwim River, and surrounding area. This herd is perhaps the least studied and least understood in the state. Issues concerning the Rainy Pass herd are herd size, delineation of the range, and discreteness and interaction with other local herds.

The Beaver Mountains and Sunshine Mountains herds are the only 2 herds in the Kuskokwim Mountains north of the Kuskokwim River (Pegau 1986). Previous reports described these herds as the Kuskokwim Mountains herd/herds or the Beaver Mountains herd and Sunshine Mountains (Sunshine–Nixon) herd (Shepherd 1981; Pegau 1986). In the early 1980s, Pegau (1986) radiocollared caribou in the Beaver and Sunshine Mountains. Range overlap was not documented during the 4-year study. However, radiocollared caribou from the Beaver Mountains ranged south almost to Horn Mountain. Caribou in that vicinity were previously called the Kuskokwim Mountains herd, but are now considered Beaver Mountains herd animals.

Hunting effort and harvest for these 5 caribou herds continues to be low. Most caribou harvested in Unit 19A and Unit 19B are from the Mulchatna herd, although changing movement patterns and a recent dramatic decline (Woolington 2007) have affected harvest of this herd.

Hunter effort is low on the Beaver Mountains and Sunshine Mountains herds with <15 hunters annually. Historically the Tonzona herd is used by local hunters from Nikolai and Telida when the herd moves near those villages during the late fall and winter. However, nonresidents and nonlocal residents harvest the greatest proportion of this herd.

Residents of Nikolai periodically hunt the Big River–Farewell herd during the winter. However, nonresidents and nonlocal residents primarily hunting for moose, sheep, and bison take the majority of animals harvested from this herd. The Rainy Pass herd is hunted mostly by nonlocal and nonresident hunters primarily seeking moose and sheep.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Big River–Farewell herd (Unit 19)

- Provide for a harvest of up to 100 bull caribou.

Rainy Pass herd (Units 16B, 19B, and 19C)

- Provide for a harvest of up to 75 bull caribou.

Sunshine and Beaver Mountains herds (Units 19A, 19D, and 21A)

- Provide for a combined harvest of up to 25 caribou from the Sunshine and Beaver Mountains herds.

Tonzona herd (Units 19C and 19D)

- Provide for a harvest of up to 50 caribou.

METHODS

Population and harvest data were summarized for the report period by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY06 = 1 July 2006–30 June 2007). These data do not include Unit 19 Mulchatna herd harvest, which is reported elsewhere (Woolington 2009).

Current population size and recent trends in abundance for McGrath area caribou herds are based primarily on incidental observations and hunter information. A minimum population count was conducted in July 2007 for the Sunshine and Beaver Mountains herds and a partial survey of Alaska Range herds was conducted in June 2008. These survey flights were conducted from Piper PA-18 Super Cub aircraft in late June or early July when conditions are most likely to concentrate caribou seeking insect relief on higher, open terrain.

The statewide harvest reporting system is used to estimate harvest rates. In RY98, ADF&G's Information Management section began to send reminders to hunters who failed to report their harvests, resulting in higher reporting rates. While data with higher reporting rates are closer to actual effort and harvest figures, they should still be interpreted as minimums. Some harvest reports were difficult to code to specific location because hunters provided ambiguous information. This causes difficulty in discerning which herd the harvested animal was from, especially in Unit 19C, where there are 3 different herds.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The Beaver Mountains herd declined from the early 1960s until the late 1990s. Skoog (1963) estimated 3000 animals in 1963, Pegau (1986) estimated 1600 in 1986, and Whitman (1995) estimated 865 in 1992 and 536 caribou in 1994 (Whitman 1997). In early summer 1995, Whitman counted approximately 400 animals concentrated on the calving area. The normal herd range was searched in June 2001, and 86 caribou were observed in a single group. A second group of more than 50 caribou was observed on the same day in an adjacent area by a member of the public. During a survey in July 2007, 73 caribou were seen in the Beaver Mountains. Conditions were not ideal during this survey; however it is unlikely that there are more than 125 caribou in the Beaver Mountains herd.

The Sunshine Mountains herd also declined over the same period as the Beaver Mountains herd. Whitman (1997) estimated the population was 700 animals in 1994 and 500 in 1995. In July

2000 a search of the Sunshine Mountains was conducted from Cloudy Mountain north to Von Frank Mountain, mostly along ridges and open hillsides. No caribou were observed during that survey; however, caribou were observed calving in the Nixon Fork of the Takotna River during 2002, 2003, and 2004. In the July 2007 population survey of the Sunshine Mountains only 59 animals were located. Conditions were not ideal during this survey; however, it is unlikely that there are more than 75 caribou in this herd.

In July 1996, 1093 caribou from the Rainy Pass herd were counted in Unit 16 during sheep surveys. Whitman (ADF&G, personal communication) suspected that 1000–1500 more caribou of the Rainy Pass herd were located in Unit 19 at that time but were not counted. Therefore, the estimate for this herd in RY04–RY05 was 1500–2000 caribou. However, we have no data to suggest that there were this many caribou in the Rainy Pass herd during RY06–RY07. Furthermore, information from hunters regarding lack of caribou indicates that the population is likely much lower.

In 1997, Whitman estimated the Big River–Farewell herd at 1000–2000 animals. The herd may have declined since that estimate based on composition surveys and mortality of radiocollared caribou from the adjacent Rainy Pass herd (Boudreau 2003). The estimate for this herd in RY04–RY05 was 750–1500 animals. However, we have no data to suggest that there were this many caribou in the Big River–Farewell herd during RY06–RY07. Furthermore, information from hunters regarding lack of caribou indicates that the population was likely much lower.

In 1991, Denali National Park Service staff estimated 1300 caribou in the Tonzona herd while conducting surveys of the nearby Denali herd in Denali National Park and Preserve. The estimate in RY04–RY05 for this herd was 750–1000 animals. However, we have no data to suggest that there were this many caribou in the Tonzona herd during RY06–RY07. Furthermore, information from hunters regarding lack of caribou indicates that the population was likely much lower.

No surveys have been conducted in recent years and therefore we have no current population estimates for the Rainy Pass, Big River–Farewell, or Tonzona herds. However, during sheep surveys conducted in June 2008 only 55 caribou with 6 calves were observed over the range of the 3 Alaska Range herds. This leads us to believe that these populations were likely much lower than previously thought.

Population Composition

No composition surveys were conducted during RY06–RY07.

Distribution and Movements

Beaver Mountains. The Beaver Mountains herd ranges from the Beaver Mountains in the north to Horn Mountains near Red Devil in the south (Pegau 1986). Calving is in the Beaver Mountains, but postcalving groups occur throughout the herd's range. Wintering areas include the north side of the Kuskokwim Mountains from the Iditarod River east to the Dishna River.

Sunshine Mountains. The Sunshine Mountains caribou range predominantly in the drainages of the Nixon Fork from Cloudy Mountain to Von Frank Mountain and in the headwaters of the

Susulatna River, including Fossil Mountain and the Cripple Creek Mountains. Calving occurs throughout the range, but mostly on the Nixon Flats. Other than the Kenai Lowlands herd, the Sunshine Mountains herd is the only herd in Alaska known to regularly calve in low-lying, forested muskeg habitat. Wintering areas are primarily in the drainages of the Nixon Fork. In midsummer these caribou are found predominantly in the Sunshine Mountains; however, small groups were observed in summers 2003 and 2004 on the Nixon Flats.

Tonzona. The range of the Tonzona herd is from the Herron River to the lower Tonzona River near Telida and north to Otter Lake. Summer concentrations are found in the foothills of the Alaska Range. Winter range consists of lower elevation areas from Telida up the Swift River and north to the Otter Lake area (Del Vecchio et al. 1995).

Big River–Farewell. The range of the Big River–Farewell herd is from the South Fork Kuskokwim River southwest to the Swift River. Summering areas are in the foothills on the north side of the Alaska Range. Wintering areas are in the flats north of the summer range.

Rainy Pass. The range of the Rainy Pass herd is not well known. The herd has been found from the confluence of the Post River south through Rainy Pass to the west side of Cook Inlet. Caribou have been observed throughout the mountains in summer in both Units 16B and 19C. Identified wintering areas of radiocollared individuals are in the Post Lake area, upper South Fork, and upper Ptarmigan Valley (Boudreau 2003).

MORTALITY

Harvest

Season and Bag Limit.

RY06 Herd/Unit/Bag limit	Resident open seasons	Nonresident open seasons
Mulchatna		
Unit 19A, Lime Village Management Area.		
RESIDENT HUNTERS: 4 caribou total.		
Bulls.	1 Jul–30 Jun	
Any caribou.	10 Aug–31 Mar	
NONRESIDENT HUNTERS: 1 caribou.		10 Aug–30 Sep
Mulchatna, Beaver Mountains		
Unit 19A and Unit 19B within the Nonresident Closed Area.		
RESIDENT HUNTERS: 3 caribou, no more than 1 caribou may be taken 1 Aug–30 Nov.	1 Aug–15 Apr	
NONRESIDENT HUNTERS:		No open season

RY06 Herd/Unit/Bag limit	Resident open seasons	Nonresident open seasons
Remainder of Units 19A and 19B. RESIDENT HUNTERS: 3 caribou, no more than 1 caribou may be taken 1 Aug–30 Nov. NONRESIDENT HUNTERS: 1 caribou.	1 Aug–15 Apr	1 Aug–30 Sep
Tonzona, Big River–Farewell, Rainy Pass Unit 19C. RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
Beaver Mountains, Tonzona, Big River–Farewell Unit 19D, except the drainages of the Nixon Fork River. RESIDENT HUNTERS: 1 bull; or 1 caribou; or 5 caribou. NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep 1 Nov–31 Jan May be announced	10 Aug–20 Sep
Sunshine Mountains Remainder of Unit 19D. RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
Beaver Mountains, Sunshine Mountains Unit 21A. RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
Beaver Mountains Unit 21E. RESIDENT AND NONRESIDENT HUNTERS: 1 caribou and 2 additional caribou during winter if season announced.	10 Aug–30 Sep	10 Aug–30 Sep

RY07 Herd/Unit/Bag limit	Resident open seasons	Nonresident open seasons
Mulchatna, Beaver Mountains Unit 19A and Unit 19B within the Nonresident Closed Area.		
RESIDENT HUNTERS: 2 caribou, not more than 1 bull may be taken and only 1 caribou may be taken 1 Aug–31 Jan.	1 Aug–15 Mar	
NONRESIDENT HUNTERS:		No open season
Remainder of Units 19A and 19B.		
RESIDENT HUNTERS: 2 caribou, not more than 1 bull may be taken and only 1 caribou may be taken 1 Aug–31 Jan.	1 Aug–15 Mar	
NONRESIDENT HUNTERS: 1 caribou.		1 Sep–15 Sep
Tonzona, Big River–Farewell, Rainy Pass Unit 19C.		
RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
Beaver Mountains, Tonzona, Big River–Farewell Unit 19D, except the drainages of the Nixon Fork River.		
RESIDENT HUNTERS: 1 bull; or 1 caribou; or 5 caribou.	10 Aug–20 Sep 1 Nov–31 Jan May be announced	
NONRESIDENT HUNTERS: 1 bull.		10 Aug–20 Sep
Sunshine Mountains Remainder of Unit 19D.		
RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
Beaver Mountains, Sunshine Mountains Unit 21A.		
RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
Beaver Mountains Unit 21E.		
RESIDENT AND NONRESIDENT HUNTERS: 1 caribou and 2 additional caribou during winter if season announced.	10 Aug–30 Sep	10 Aug–30 Sep

Alaska Board of Game Actions and Emergency Orders. Changes to seasons and bag limits were made during this reporting period in Units 19A and 19B related to the decline of the Mulchatna caribou herd. In RY06 the resident hunters' bag limit was reduced from 5 caribou to 3 caribou and changed from 1 bull to 1 caribou during 1 August–30 November, except in the Lime Village Management Area. The nonresident hunters' bag limit remained the same in this portion of Units 19A and 19B; however, the season was shortened significantly from 10 August–15 April to 10 August–30 September.

Seasons and bag limits in Units 19A and 19B were again changed in RY07 because of continued concern over the declining Mulchatna caribou herd. The resident hunters' bag limit and season in the Lime Village Management Area were reduced and aligned with the remainder of Units 19A and 19B. The Units 19A and 19B resident season was shortened from 1 August–15 April to 1 August–15 March. The resident bag limit was reduced to 2 caribou, with not more than 1 caribou to be taken during 1 August–1 January and not more than 1 bull harvested over the entire season. The nonresident season was shortened to 1 September–15 September.

Harvest by Hunters. Reported harvest remained low for local caribou herds in the McGrath area from RY03 to RY07 (Table 1). Hunter effort declined over the same period from 126 hunters in RY03 to only 70 hunters in RY07 (Table 2a). In general, harvest and effort fluctuated by herd during RY03–RY07, but remained low (Tables 2b–2g). The average McGrath area caribou harvest during RY03–RY07 was 24 animals, of which 89% were bulls (Table 1).

Hunter Residency and Success. During RY03–RY07, local hunters took 9% of the reported harvest of local caribou herds. However, local users were less likely to report hunting activities than nonlocal residents and nonresidents. During RY03–RY07, nonlocal residents took 45% and nonresidents took 46% of harvested animals (Table 2a).

Harvest Chronology. The majority of the caribou harvested were taken during August and September (Table 3) with 28% and 68% of all harvest in August and September, respectively.

Transport Methods. Aircraft were the most common means of hunter transportation to access all area caribou herds. During RY03–RY07, 72% of caribou hunters used aircraft. Three- or 4-wheelers (22%) were the next most commonly used method of transportation. All other means of transportation averaged less than 3% from RY03–RY07 (Table 4).

Other Mortality

No specific data were collected concerning natural mortality rates or factors during RY03–RY07.

HABITAT

Biologists have not investigated caribou range conditions in Units 19 or 21 since at least 1996, but range is probably not limiting. Lichens appear abundant on winter ranges, and these areas supported many more caribou as recently as the 1990s.

CONCLUSIONS AND RECOMMENDATIONS

Harvest was low for all McGrath area caribou herds and management objectives were met during RY03–RY07. The Big River–Farewell herd was managed to provide for a harvest of up to 100 bull caribou and an average of 9 were harvested. The objective for the Rainy Pass herd was for a harvest of up to 75 bull caribou, and the average reported harvest was 6. The objective for the Sunshine Mountains and Beaver Mountains herds was to provide for a combined harvest of up to 25 caribou, and the average reported harvest was 1 caribou. The Tonzona herd objective was a harvest of up to 50 caribou, and the average reported harvest was 2 caribou.

Caribou harvest from all McGrath area herds remained low during RY03–RY07. During this period, the number of hunters declined by nearly 56%. This change most likely reflects changes in hunting pressure on the Mulchatna herd, which has declined dramatically in recent years.

All the herds in the McGrath area are small and cost-effective management is a particular challenge. Research is needed to develop cost-effective and efficient survey and inventory programs for these small caribou herds.

LITERATURE CITED

BOUDREAU, T. A. 2003. Units 19A, 19B, 19C, 19D, 21A, and 21E caribou. Pages 134–147 *in* C. Healy, editor. Caribou management report of survey and inventory activities 1 July 2000–30 June 2002. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

DEL VECCHIO, P. A., B. SHULTS, AND L. ADAMS. 1995. Status and distribution of the Tonzona caribou herd, 1988–1991. Natural Resources Final Report NPS/ARRNR/NRTR-95/27. National Park Service.

HEMMING, J. E. 1970. The distribution and movement patterns of caribou in Alaska. Wildlife Technical Bulletin 1. Alaska Department of Fish and Game. Juneau, Alaska, USA.

PEGAU, R. E. 1986. Units 19 and 21 caribou. Pages 23–26 *in* B. Townsend, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Job 3.0. Juneau, Alaska, USA.

SHEPHERD, P. E. K. 1981. Caribou. Pages 32–34 *in* R. A. Hinman, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Volume XI. Job 3.0. Juneau, Alaska, USA.

SKOOG, R. O. 1963. Caribou report. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Grant W-6-R-4. Volume IV. Juneau, Alaska, USA.

WHITMAN, J. S. 1995. Units 19A, 19B, 19C, 19D, 21A, and 21E caribou. Pages 102–110 *in* M. V. Hicks, editor. Caribou management report of survey–inventory activities 1 July 1992–30 June 1994. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———. 1997. Units 19A, 19B, 19C, 19D, 21A, and 21E caribou. Pages 108–118 *in* M. V. Hicks, editor. Caribou management report of survey–inventory activities 1 July 1994–30 June 1996. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

WOOLINGTON, J. D. 2007. Units 9B, 17, 18 south, 19A, and 19B Mulchatna caribou. Pages 14–32 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

———. 2009. Units 9B, 17, 18 south, 19A, and 19B Mulchatna caribou. *In* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA. In press.

PREPARED BY:

Joshua M. Peirce
Wildlife Biologist II

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section and reference as:

PEIRCE, J. M. 2009. Units 19A, 19B, 19C, 19D, 21A, and 21E caribou. Pages 106–121 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 McGrath[a] area caribou harvest by herd, regulatory years 2003–2004 through 2007–2008

Regulatory	Beaver Mtns			Big River			Rainy Pass			Sunshine Mtns			Tonzona			Unknown			Total harvest		
year	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total
2003–2004	1	3	4	5	1	6	11	0	11	0	0	0	3	0	3	12	0	12	32	4	36
2004–2005	2	0	2	9	2	11	10	0	10	0	0	0	3	0	3	6	2	8	30	4	34
2005–2006	0	0	0	3	1	4	1	0	1	0	0	0	2	0	2	1	0	2[b]	7	1	9[b]
2006–2007	0	0	0	13	0	13	4	0	4	0	0	0	1	0	1	4	2	6	22	2	24
2007–2008	0	0	0	9	0	9	2	0	2	0	0	0	1	0	1	4	1	5	16	1	17

[a] Excludes Mulchatna caribou herd animals taken in Unit 19.
[b] Includes 1 caribou of unknown sex.

TABLE 2A McGrath area[a] caribou herds hunter residency and success, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total (%)	
2003–2004	2	15	19	0	36 (29)	3	54	30	3	90 (71)	126
2004–2005	1	14	19	0	34 (34)	7	33	26	1	67 (66)	101
2005–2006	2	5	2	0	9 (10)	4	54	24	1	83 (90)	92
2006–2007	2	10	12	0	24 (27)	4	41	20	0	65 (73)	89
2007–2008	4	10	3	0	17 (24)	5	29	19	0	53 (76)	70

[a] Excludes Mulchatna caribou herd animals taken in Unit 19.
[b] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 2B Beaver Mountains caribou herd hunter residency and success, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2003–2004	0	3	1	0	4 (29)	0	7	3	0	10 (71)	14
2004–2005	0	0	2	0	2 (25)	2	1	3	0	6 (75)	8
2005–2006	0	0	0	0	0 (0)	0	5	1	0	6 (100)	6
2006–2007	0	0	0	0	0 (0)	0	4	0	0	4 (100)	4
2007–2008	0	0	0	0	0 (0)	0	2	0	0	2 (100)	2

[a] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 2C Big River caribou herd hunter residency and success, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful						Unsuccessful						Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total	(%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total	(%)	
2003–2004	1	4	1	0	6	(18)	2	16	9	0	27	(82)	33
2004–2005	0	7	4	0	11	(28)	1	15	12	0	28	(72)	39
2005–2006	2	2	0	0	4	(9)	1	26	14	1	42	(91)	46
2006–2007	2	8	3	0	13	(33)	0	21	5	0	26	(67)	39
2007–2008	4	3	2	0	9	(24)	2	16	10	0	28	(76)	37

[a] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 2D Rainy Pass caribou herd hunter residency and success, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful						Unsuccessful						Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total	(%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total	(%)	
2003–2004	0	3	8	0	11	(27)	0	17	11	2	30	(73)	41
2004–2005	0	5	5	0	10	(59)	0	4	3	0	7	(41)	17
2005–2006	0	1	0	0	1	(6)	0	12	5	0	17	(94)	18
2006–2007	0	2	2	0	4	(22)	1	7	6	0	14	(78)	18
2007–2008	0	2	0	0	2	(25)	0	5	1	0	6	(75)	8

[a] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 2E Sunshine Mountains caribou herd hunter residency and success, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2003–2004	0	0	0	0	0 (0)	1	1	0	0	2 (100)	2
2004–2005	0	0	0	0	0 (0)	1	0	0	0	1 (100)	1
2005–2006	0	0	0	0	0 (0)	0	1	0	0	1 (100)	1
2006–2007	0	0	0	0	0 (0)	0	0	0	0	0 (0)	0
2007–2008	0	0	0	0	0 (0)	0	0	0	0	0 (0)	0

[a] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 2F Tonzona caribou herd hunter residency and success, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2003–2004	0	1	2	0	3 (60)	0	1	1	0	2 (40)	5
2004–2005	0	1	2	0	3 (43)	0	1	3	0	4 (57)	7
2005–2006	0	0	2	0	2 (67)	0	1	0	0	1 (33)	3
2006–2007	0	0	1	0	1 (20)	0	0	4	0	4 (80)	5
2007–2008	0	1	0	0	1 (25)	0	1	2	0	3 (75)	4

[a] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 2G Hunter residency and success for caribou where herd identification was not known, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2003–2004	1	4	7	0	12 (39)	0	12	6	1	19 (61)	31
2004–2005	1	1	6	0	8 (28)	3	12	5	1	21 (72)	29
2005–2006	0	2	0	0	2 (11)	3	9	4	0	16 (89)	18
2006–2007	0	0	6	0	6 (26)	3	9	5	0	17 (74)	23
2007–2008	0	4	1	0	5 (26)	3	5	6	0	14 (74)	19

[a] Local resident is any resident of Units 19, 21A, or 21E.

TABLE 3 McGrath[a] area caribou harvest chronology by month, regulatory years 2003–2004 through 2007–2008

Regulatory year	Harvest chronology by month								
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Unk	*n*
2003–2004	10	23	0	0	0	3	0	0	36
2004–2005	12	22	0	0	0	0	0	0	34
2005–2006	1	6	0	0	0	0	0	1	9[b]
2006–2007	4	19	1	0	0	0	0	0	24
2007–2008	6	11	0	0	0	0	0	0	17

[a] Excludes Mulchatna caribou herd animals taken in Unit 19.
[b] Includes 1 caribou harvested in April.

TABLE 4 McGrath[a] area transportation method of successful caribou hunters, regulatory years 2003–2004 through 2007–2008

Regulatory year	Harvest by transport method								
	Airplane (%)	Horse (%)	Boat (%)	3- or 4-Wheeler (%)	Snowmachine (%)	ORV (%)	Highway vehicle (%)	Unk (%)	*n*
2003–2004	22 (61)	0 (0)	0 (0)	10 (28)	3 (8)	0 (0)	0 (0)	1 (0)	36
2004–2005	28 (82)	0 (0)	1 (3)	5 (15)	0 (0)	0 (0)	0 (0)	0 (0)	34
2005–2006	6 (67)	0 (0)	0 (0)	3 (33)	0 (0)	0 (0)	0 (0)	0 (0)	9
2006–2007	19 (79)	1 (4)	1 (4)	3 (13)	0 (0)	0 (0)	0 (0)	0 (0)	24
2007–2008	11 (65)	0 (0)	1 (6)	5 (29)	0 (0)	0 (0)	0 (0)	0 (0)	17

[a] Excludes Mulchatna caribou herd animals taken in Unit 19.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNIT: 20A (6796 mi^2)

HERD: Delta (including former Yanert herd)

GEOGRAPHIC DESCRIPTION: Central Alaska Range and Tanana Flats

BACKGROUND

The Delta herd primarily inhabits the foothills of the central Alaska Range between the Parks and Richardson Highways, north of the divide separating the Tanana and Susitna drainages. In recent years, the herd has also used the upper Nenana and Susitna drainages, mostly north of the Denali Highway. Like other small bands of Alaska Range caribou, the herd drew little attention until population identity studies began in the late 1960s. During the early to mid 1980s, the department recognized a small group of caribou in the Yanert drainage as a separate herd. The growing Delta herd eventually mixed with the Yanert herd, and after 1986 the Yanert caribou adopted the movement patterns of the larger herd (Valkenburg et al. 1988).

By the mid 1970s the Delta herd rose from anonymity to a herd of local and scientific importance. Its proximity to Fairbanks and good access made it popular with Fairbanks hunters. For the same reasons, it has been the subject of intensive management and research. Long-term studies of caribou population dynamics, ecology, and predator–prey relationships resulted in numerous publications and reports. Boertje et al. (1996) and Valkenburg et al. (1996, 2002) provide summaries and citations.

Estimated at 1500–2500 in 1975, by 1989 the Delta herd had grown to a peak of nearly 11,000. It declined sharply in the early 1990s, as did other central Alaska Range herds, to less than 4000. Valkenburg et al. (1996) present a detailed analysis of the decline. The herd continued a slow decline and dropped to less than 3000 animals by the late 1990s (Table 1).

Since statehood in 1959, 2 wolf control programs have been conducted in Unit 20A. During 1976–1982, state biologists killed wolves from helicopters to increase moose numbers and

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

harvest. Boertje et al. (1996) summarized the influence of this program on moose, caribou, and wolves. From October 1993 to December 1994 state biologists and trappers reduced wolf numbers by trapping to halt the decline of the Delta caribou herd. This ground-based predation control program was terminated amid considerable controversy. Valkenburg et al. (2002) summarized the effects of this program on the Delta caribou herd.

Caribou harvest and harvest regulations also varied widely due to population fluctuations and strong hunter interest. The Alaska Board of Game suspended hunting of the DCH in 1992 in response to declining numbers, and the herd remained closed to hunting through regulatory year (RY) 1995 (RY = 1 Jul through 30 Jun; e.g., RY95 = 1 Jul 1995–30 Jun 1996). Hunting has been by drawing permit for bull caribou only since the hunt was resumed in RY96 (Table 2).

Research and enhancement of Delta caribou was a regional priority through the late 1990s. The department initiated an experimental diversionary feeding program in 1996 to determine whether wolves can be diverted from calving areas during the peak of calving. The project was intended to evaluate the feasibility of this technique for increasing neonate survival (Valkenburg et al. 2002).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Since the mid 1970s, goals for the herd have included providing high-quality hunts, high harvests, and trophy caribou. The decline of the herd since 1989 gave impetus to the current management goals of restoring the herd and resuming a higher level of consumptive use. The current management objectives are defined in Intensive Management regulations (5 AAC 92.108) that permitted the 1993–1994 wolf control effort to reverse the decline. Although the wolf control program was suspended before an increase in caribou abundance was realized, the regulations remain in place.

MANAGEMENT OBJECTIVES

- Maintain a bull:cow ratio of ≥30:100 and a large bull:cow ratio of ≥6:100.
- Reverse the decline of the herd and increase the midsummer population to 5000–7000 caribou.
- Sustain an annual harvest of 300–700 caribou.

METHODS

POPULATION STATUS AND TREND

Population Census

A 2006 census was not conducted due to cool, wet weather conditions that precluded the tight grouping of the herd necessary for a census. In 2007 we conducted a census of the Delta caribou herd on 22 June 2007 using the radio-search technique (Valkenburg et al. 1985). The herd was

surveyed using 5 fixed-wing aircraft with pilot–observer teams. Caribou were radiotracked with 3 aircraft. Biologists in one of the aircraft conducted all photography. We did not use the department's DeHavilland Beaver aircraft during this survey.

Searching began at approximately 8:30 AM. Temperatures were between 60° and 70°F, skies were partly cloudy to completely overcast, and winds were light. Light smoke was present south of the Alaska Range and during the later part of the survey west of and including the Wood River drainage. We searched all appropriate habitat between the Delta River to the east, the Parks Highway to the west, the Alaska Range foothills to the north, and the upper Nenana River as far east as the Clearwater mountains to the south.

All photographs were taken with a handheld digital camera (Sony-Cyber shot, 3.2 megapixel, f = 8–24 mm 1:2.8–5.6 lens). Digital photographs were downloaded to a computer and imported into Microsoft® PowerPoint® (Microsoft Corporation, Redmond, Washington, USA) where image enlargement could be adjusted from 100% to 400% for counting purposes.

We counted 2575 caribou in 48 groups ranging in size from 1 to 746 caribou. We photographed 8 larger groups (>50 caribou). We accounted for 44 of 51 (1.1591 radio correction factor) active radiocollars. Applying the correction factor to the number of caribou counted, we estimate the Delta herd to number approximately 2985 caribou (Table 1).

Population Composition

We conducted composition surveys in late September or early October using R-22 or R-44 helicopters and Bellanca Scout or Piper PA-18 aircraft. Biologists in fixed-wing aircraft located the radiocollared caribou. Biologists in the helicopter classified caribou that were in groups with radiocollared members. Classification categories consisted of cows; calves; and large, medium, and small bulls. Biologists identified bulls by the absence of vulva and classified them as large, medium, or small by antler characteristics (Eagan 1993). We broadly searched areas containing numerous radiocollared caribou for additional groups. The helicopter observer also classified any caribou found in a search of the surrounding area and any caribou encountered while in transit between search areas. We tallied the composition of each group on a 5-position counter and recorded the tallies on a data sheet.

We monitored harvest characteristics through drawing permit hunt reports and summarized harvest data by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The Delta herd declined from more than 10,000 in 1989 to less than 4000 in 1993 (Table 1). The decline resulted from interrelated effects of adverse weather and predation, and also occurred in neighboring herds (Valkenburg et al. 1996). However, the Delta herd declined more than the neighboring Denali and Macomb herds. The Delta herd existed at a much higher density than Denali and Macomb herds, indicating that density-dependent food limitation might have

influenced the magnitude of the decline (Valkenburg et al. 1996). Since the decline, estimates of the size of the herd have varied. Survey data indicated the herd increased slightly in 1994 and 1995, but subsequent data indicated a declining trend. The minimum herd size declined from 4646 caribou in 1995 to 2168 caribou in 2004. Weather precluded completion of a census in 2005 and 2006. By 2007 the herd increased to approximately 2985 caribou, an increase of 774 caribou (35%) from the 2004 census. This estimate along with much improved fall calf:cow ratios during 2004–2007 are the first indications that the herd may be increasing.

Population Composition

In fall 2006 we classified 1022 caribou: 47 large bulls, 89 medium bulls, 110 small bulls, 612 cows and 164 calves (Table 1). We located approximately 63% (34/54) of active radiocollared caribou. The largest number of caribou classified from a single group was 223, the smallest a single caribou, and mean group size was 25. The 2006 calf:cow ratio was 27:100.

In fall 2007 we classified 719 caribou: 48 large bulls, 77 medium bulls, 34 small bulls, 451 cows and 109 calves (Table 1). We located approximately 78% (40/51) of the active radiocollared caribou. The largest number of caribou classified from a single group was 199, the smallest a group of 2 caribou, and mean group size was 30. The 2007 calf:cow ratio was 24:100.

Bull:cow ratios have varied considerably since 1990, ranging from 24:100 to 50:100, but have remained above 30:100 since 1998 (Table 1). The ratio of large bulls:100 cows improved once the steep population decline ended in about 1993. Most of the short-term variance in bull:cow ratios is probably a result of variable behavior and distribution of bulls during counts. Weather can affect herd distribution, movements, and behavior during rut counts, and survey timing relative to rut can affect the degree of sexual segregation.

In general, calf:cow ratios were relatively low and declining through the early 2000s (Table 1). Ratios in 2000 and 2001 were the lowest observed since 1993. Calf mortality studies conducted during 1995–1997 indicate this was primarily due to predation by wolves, grizzly bears, and golden eagles (Valkenburg et al. 2002). Analysis of fecal samples collected in late winter 1989 and 1993 indicated depletion of lichen in the foothills range in Unit 20A (Valkenburg 1997; Valkenburg et al. 2002). The proportion of lichens in the diet was relatively low and the proportion of mosses was high compared to caribou from other Interior herds. Calf:cow ratios in autumn have improved recently. Calf:cow ratios during 2004–2007 were 4 of the 5 highest since the population declined about 1990. We do not know whether this was the result of higher productivity or lower mortality, but we expect that these higher calf:cow ratios contributed to the modest herd growth during 2004–2007.

Distribution and Movements

Through the mid 1980s, the Delta herd showed strong fidelity to calving areas between the Delta and the Little Delta rivers in southeastern Unit 20A (Davis et al. 1991). However, as the herd increased, the area used for calving extended to the foothills between Dry Creek and the Delta River (Valkenburg et al. 1988). After 1993 the herd also used the upper Wood River, Dick Creek, upper Wells Creek, and the upper Nenana and Susitna drainages for calving (Valkenburg et al. 2002). During the remainder of the year, the herd has been generally distributed among the

northern foothills from the Delta River to the Nenana River. However, during fall and early winter 2000–2006, a significant portion of the Delta herd was located east of the Delta River in the Donnelly Dome and Donnelly Flats area. During 2006–2008, radiocollared caribou from the Delta herd were often found south of the Alaska Range in the Susitna drainage along the Denali highway and south to Butte Lake. This southern distribution presented some difficulty during composition counts and census efforts, because Delta herd animals were often mixed with portions of the Nelchina herd when they were south of the Yanert drainage. Management of the Delta caribou herd could be significantly affected if the herd continues to spend an increasing amount of time in Unit 13E south of the Yanert Drainage because harvest and herd inventory of caribou in Unit 13E is based on management objectives for the Nelchina herd.

MORTALITY

Harvest

Season and Bag Limit (RY04 and RY05).

	Resident open season	Nonresident open season
Unit 20A		
1 bull by drawing permit only; up to 200 permits may be issued.	10 Aug–20 Sep	10 Aug–20 Sep

Alaska Board of Game Actions and Emergency Orders. In response to a proposal at the March 1996 meeting and based on improvement in recruitment and large bull:cow ratios documented by the Alaska Department of Fish and Game (ADF&G), the Alaska Board of Game authorized a drawing permit hunt (DC827) beginning RY96. As noted previously, harvest had been suspended in RY92. In March 2004 the Board of Game authorized an increase in the number of drawing permits that ADF&G may issue for hunt DC827 from 100 to 200 because hunter participation had been declining and the harvest of bulls was below the recommended allowable harvest of 2–3% annually. No Board of Game actions or emergency orders for the Delta herd were issued during RY05–RY07.

Permit Hunts. We issued 75 permits annually in RY96 and RY97, 100 permits annually during RY98–RY03, and 150 permits annually during RY04–RY07. Since RY96, when the department first issued permits for DC827, the percentage of permittees who did not hunt has ranged between 17% (RY97) and 49% (RY06) (Table 2). Permittees who did not hunt decreased to 37% in RY07. Success rates of those who hunted have ranged between 35% (RY00) and 71% (RY97). Success rates in RY06 and RY07 averaged 47%, similar to the average during RY00–RY05 (49%). The relatively low hunter participation, especially for a drawing permit hunt, was probably a function of a large portion of the herd being distributed across the eastern and central portion of its range, which is relatively inaccessible compared to the western portion, where access by ATV is good.

Hunter Residency and Success. Beginning in RY02, harvest by nonlocal resident and nonresident hunters (22 caribou) surpassed that of local residents (15 caribou) for the first time since the hunt began in RY96 (Table 3). This trend continued during RY04–RY07 when an average of 21

caribou were taken by nonlocal resident and nonresident hunters and an average of 20 were taken by local resident hunters. This hunt is becoming more popular with nonlocal and nonresident hunters. Success rates of nonresident hunters (58%) continued to be higher in RY06–RY07 than that of resident (local and nonlocal) hunters (25%). A likely explanation is that nonresidents are more inclined to participate in guided hunts, which typically have higher success rates than nonguided hunts preferred by resident hunters. For example, in RY06–RY07, 38% (5/13) of the nonresident hunters reported using a guide compared to 0% (0/162) of resident hunters.

Harvest Chronology. No clear trends were apparent in harvest chronology for RY96–RY07 (Table 4). During RY96 harvest was, for the most part, evenly distributed throughout the season. During RY97 the highest harvest of caribou occurred late in the season, whereas in RY98 and RY02–RY04 the highest harvest occurred early in the season. In RY99 the highest harvest occurred in late August, while in RY00, RY01, and RY05 the highest harvests were in early September. Variations in harvest chronology within and among years were likely influenced by seasonal and annual variations in weather and caribou distribution.

Transport Methods. Overall, the most common mode of transportation used by successful hunters (RY96–RY07) was 3- or 4-wheelers followed by aircraft, other off-road vehicles (ORVs), horses, highway vehicles, and boats (Table 5). Interestingly, RY05 and RY06 were the only years since the permit hunt began that no successful hunters accessed the hunt area by highway vehicle.

Other Mortality

ADF&G research staff conducted calf mortality studies during 1995–1997, and found that wolves, grizzly bears, and eagles were primary predators of caribou in Unit 20A. Details of causes and trends in calf and adult mortality are in ADF&G research reports and publications (Davis et al. 1991; Boertje et al. 1996; Valkenburg et al. 1996; Valkenburg 1997; Valkenburg et al. 1999; Valkenburg et al. 2002). Calf and adult survival were poor during the population decline; consequently, the Board of Game adopted a wolf predation control implementation plan in Unit 20A to reduce wolf numbers to rebuild the caribou population. In addition, Valkenburg (1997) and Valkenburg et al. (2002) tested a diversionary feeding program that addressed predation by a wolf pack in the Wells Creek area. They concluded diversionary feeding of wolves near caribou calving areas could successfully reduce predation in some circumstances, but has significant limitations, primarily because wolves continue to hunt even when they are not hungry.

HABITAT

Assessment and Enhancement

Research and management staff members have collected fecal samples on the winter range to monitor the status and use of lichen. We also weigh female caribou calves to determine body condition and relate body condition to natality rates. Analysis of fecal samples collected in late winter 1989 and 1993 indicated depletion of lichens on winter ranges used by caribou in Unit 20A. The proportion of lichens in the diet was relatively low, and the proportion of mosses was high compared to caribou in other Interior herds (Valkenburg et al. 2002). Two studies, Valkenburg (1997) and Valkenburg et al. (2002), detailed trends in weights of caribou calves. They found the heaviest mean April calf weights occurred during 1979–1983 as the Delta herd

was recovering from its population low in the early 1970s. Mean calf weights declined dramatically from 1989 to 1991 coincident with deep snow winters and dry summers. Calf weights remained relatively low between 1992 and 2001, and have not recovered to the high levels seen during the late 1970s and early 1980s. Calf weight and fecal data have not been collected in recent years, but the improved calf:cow ratios may be a sign that habitat quality is improving after a long period when the caribou were at low density.

CONCLUSIONS AND RECOMMENDATIONS

The primary concern at this juncture is whether the Delta caribou herd will be able to grow or support increased harvests with potentially increasing wolf densities resulting from high moose densities in many parts of the DCH range. Currently, we believe wolf numbers are moderately high (ca. 13–16 wolves/1000 km^2) due to the abundant moose population. The degree to which high wolf:caribou ratios will influence predation rates on caribou is unknown. While high ratios seem certain to increase caribou mortality to some degree, a variety of mechanisms may have mitigating effects. Wolf behavior patterns, prey selection, and hunting patterns may result in wolves preying primarily on moose. Because lower population density of caribou can increase their nutritional status, they are likely to be less vulnerable to predation; thus lowering kill rates. Adams et al. (1995) presented data indicating that caribou spatial distribution may also reduce wolf predation risk for caribou calves. Nonetheless, it is unlikely that the Delta herd will grow substantially at this time, but moderate increases are possible.

We met the objective to maintain 30 bulls:100 cows and 6 large bulls:100 cows. We did not meet Intensive Management objectives to reverse the decline of the herd and increase the midsummer population to 5000–7000 and to sustain an annual harvest of 300–700 caribou. Continued research on the Delta herd, including analysis of fecal samples and condition of caribou, will help to determine if the current population objective is too high. However, even with favorable weather, meeting the management objectives will be unlikely without more effective predation management.

In March 2004 the board authorized an increase in the number of drawing permits the department may issue for hunt DC827 from 100 to 200 because hunter participation had been declining and the harvest of bulls had been below the recommended allowable harvest of 2–3% annually. In 2007 we achieved a harvest rate of 2.9%. The proportion of large bulls in the population has remained high, and our estimates indicate that additional bulls can be harvested from the population without affecting herd dynamics. We will continue to monitor sex ratios during fall surveys to ensure that management objectives concerning bull:cow ratios continue to be met.

LITERATURE CITED

ADAMS, L. G., B. W. DALE, AND L. D. MECH. 1995. Wolf predation on caribou calves in Denali National Park, Alaska. Pages 245–260 *in* L. N. Carbyn, S. H. Fritts, and D. R. Seip, editors. Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, Occasional Publication 35. University of Alberta, Edmonton, Canada.

BOERTJE, R. D., P. VALKENBURG, AND M. E. MCNAY. 1996. Increases in moose, caribou, and wolves following wolf control in Alaska. Journal of Wildlife Management 60:474–489.

DAVIS, J. L., P. VALKENBURG, M. E. MCNAY, R. O. BEASLEY, AND V. L. TUTTERROW. 1991. Demography of the Delta caribou herd under varying rates of natural mortality and human harvest and assessment of field techniques for acquiring demographic data. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-22-5 through W-23-3. Study 3.33. Juneau, Alaska, USA.

EAGAN, R. M. 1993. Delta herd caribou. Pages 122–147 *in* S. M. Abbott, editor. Caribou management report of survey–inventory activities. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

VALKENBURG, P. 1997. Investigation of regulating and limiting factors in the Delta caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-23-5 through W-24-4. Study 3.37. Juneau, Alaska, USA.

———, D. A. ANDERSON, J. L. DAVIS, AND D. J. REED. 1985. Evaluation of an aerial photocensus technique for caribou based on radiotelemetry. Pages 287–299 *in* T. C. Meredith and A. M. Martell, editors. Proceedings second North American caribou workshop, October 1984. McGill Subarctic Research Station, Schefferville, Quebec, Canada.

———, B. DALE, R. W. TOBEY, AND R. A. SELLERS. 1999. Investigation of regulating and limiting factors in the Delta caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-27-1. Study 3.42. Juneau, Alaska, USA.

———, J. L. DAVIS, AND D. J. REED. 1988. Distribution of radiocollared caribou from the Delta and Yanert herds during calving. Pages 14–32 *in* R. D. Cameron and J. L. Davis, editors. Reproduction and calf survival. Proceedings third North American caribou workshop, Chena Hot Springs, Alaska, 4–6 November 1987. Alaska Department of Fish and Game. Wildlife Technical Bulletin 8. Juneau, Alaska, USA.

———, J. L. DAVIS, J. M. VER HOEF, R. D. BOERTJE, M. E. MCNAY, R. M. EAGAN, D. J. REED, C. L. GARDNER, AND R. W. TOBEY. 1996. Population decline in the Delta caribou herd with reference to other Alaskan herds. Pages 53–62 *in* K. Brown, D. Cichowski, J. Edmonds, D. Seip, S. Stevenson, D. Thomas, and M. Wood, editors. Proceedings sixth North American caribou workshop, 1–4 March 1994. Prince George, British Columbia, Canada.

———, M. A. KEECH, R. A. SELLERS, R. W. TOBEY, AND B. W. DALE. 2002. Investigation of regulating and limiting factors in the Delta caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-24-5 and W-27-1 through W-27-5. Study 3.42. Juneau, Alaska, USA.

PREPARED BY:

C. Tom Seaton
Wildlife Biologist II

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

SEATON, C. T. 2009. Unit 20A caribou. Pages 122–135 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Delta caribou fall composition counts and estimated population size, 1983–2007

Survey date	Bulls: 100 Cows	Large bulls: 100 Cows	Calves: 100 Cows	Calves %	Cows %	Small bulls %	Medium bulls %	Large bulls %	% Total bulls	Composition sample size	Minimum herd size[a]	% Herd sampled
10/4/83	35	12	46	25	55	59	6	36	20	1208	5055	24
10/17/84	42	17	36	20	56	28	32	40	24	1093	6227	18
10/9–12/85	49	9	36	20	54	57	24	19	26	1164	8083	14
10/22/86	41	9	29	17	59	49	30	21	24	1934	7204[b]	27
10/05/87	32	8	31	19	61	53	23	24	20	1682	7780[b]	22
10/14/88	33	4	35	21	60	50	38	12	20	3003	8338[c]	36
10/10/89	27	2	36	22	62	64	28	7	16	1965	10,690	18
10/4/90	38	6	17	11	65	45	39	16	24	2411	7886[c]	31
10/1/91	29	5	8	6	73	55	29	16	21	1705	5755	30
9/28/92	25	3	11	8	74	46	43	11	19	1240	5870	21
9/25/93[d]	36	7	5	3	72	45	33	22	25	1525	3661	42
10/3–6/94[d]	25	10	23	16	68	33	29	39	7	2131	4341	49
10/3/95	24	10	20	14	69	41	19	40	17	1567	4646	34
10/3/96	30	9	21	14	66	51	20	29	20	1537	4100	37
9/27/97	27	9	18	12	69	48	20	32	19	1598	3699	43
10/1/98	44	9	16	10	62	31	49	20	27	1519	3829	40
10/2/99	44	10	19	11	62	37	40	23	27	674	3625	19
10/3–4/00	46	10	11	7	64	41	37	22	30	1010	3227	31
9/30/01	39	9	13	8	66	46	30	24	26	1378	2965	46
9/28/02	50	17	25	14	57	43	23	34	29	924	2803	33
10/6–7/03	37	10	20	13	64	32	39	29	23	1023	2581	40
9/29/04	49	14	35	19	54	29	42	29	27	1267	2211	58
9/26/05	50	11	33	18	55	28	49	23	27	1182	–[e]	62
10/5&15/06	40	8	27	16	60	45	36	19	24	1022	–[e]	64
10/8/07	35	11	24	15	63	21	48	30	22	719	2985	24

[a] Numbers of caribou counted during summer survey from the same calendar year.
[b] Census results probably considerably lower than true herd size.
[c] Excludes Yanert herd, which included approximately 600 caribou.
[d] Composition data was weighted according to the distribution of radiocollars.
[e] Census was not conducted due to weather conditions.

TABLE 2 Delta caribou harvest data by permit hunt, regulatory years 1996–1997 through 2007–2008

Hunt	Regulatory year	Permits issued	Did not hunt (%)	Unsuccessful hunters (%)	Successful hunters (%)	Bulls (%)	Cows (%)	Unk (%)	Harvest
DC827	1996–1997	75	31 (41)	22 (50)	22 (50)	22 (100)	0 (0)	0 (0)	22
	1997–1998	75	13 (17)	18 (29)	44 (71)	44 (100)	0 (0)	0 (0)	44
	1998–1999	100	29 (29)	21 (30)	50 (70)	49 (98)	1 (2)	0 (0)	50
	1999–2000	100	37 (37)	25 (40)	38 (60)	37 (100)	0 (0)	1 (3)	38
	2000–2001	100	31 (31)	45 (65)	24 (35)	24 (100)	0 (0)	0 (0)	24
	2001–2002	100	38 (38)	29 (47)	33 (53)	33 (100)	0 (0)	0 (0)	33
	2002–2003	100	33 (33)	30 (45)	37 (55)	37 (100)	0 (0)	0 (0)	37
	2003–2004[a]	101	37 (37)	31 (48)	33 (52)	33 (100)	0 (0)	0 (0)	33
	2004–2005	150	63 (42)	41 (47)	46 (53)	45 (98)	1 (2)	0 (0)	46
	2005–2006	150	71 (47)	44 (56)	35 (44)	35 (100)	0 (0)	0 (0)	35
	2006–2007	150	73 (49)	52 (68)	25 (32)	25 (100)	0 (0)	0 (0)	25
	2007–2008	156	57 (37)	41 (41)	58 (59)	58 (100)	0 (0)	0 (0)	58

[a] Includes 1 bull killed in hunt SC827 (Governor's Permit).

TABLE 3 Delta caribou annual hunter residency and success, permit hunt DC827, regulatory years 1996–1997 through 2007–2008

Regulatory Year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	
1996–1997	19	3	0	22 (50)	17	4	1	22 (50)	44
1997–1998	32	11	1	44 (71)	16	2	0	18 (29)	62
1998–1999	32	13	5	50 (70)	16	4	1	21 (30)	71
1999–2000	28	7	3	38 (60)	15	8	2	25 (40)	63
2000–2001	17	2	5	24 (35)	30	15	0	45 (65)	69
2001–2002	24	6	3	33 (53)	10	14	4	28 (47)	61
2002–2003	15	19	3	37 (55)	18	11	1	30 (45)	67
2003–2004[b]	17	10	6	33 (52)	14	14	3	31 (48)	64
2004–2005	24	17	5	46 (53)	20	20	1	41 (47)	87
2005–2006	14	16	5	35 (44)	14	27	3	44 (56)	79
2006–2007	8	11	6	25 (32)	21	28	3	52 (68)	77
2007–2008	35	21	2	58 (59)	17	21	2	40 (41)	98

[a] Residents of Unit 20.

[b] Includes 1 bull killed in hunt SC827 (Governor's Permit).

TABLE 4 Delta caribou annual harvest chronology percent by harvest periods, permit hunt DC827, regulatory years 1996–1997 through 2007–2008

Regulatory Year	Chronology percent by harvest periods					
	8/10–8/20	8/21–8/31	9/1–9/11	9/12–9/20	Unk	*n*
1996–1997	27	18	27	27	0	22
1997–1998	27	18	14	41	0	44
1998–1999	34	14	26	26	0	50
1999–2000	29	37	16	16	3	38
2000–2001	33	17	38	13	0	24
2001–2002	21	18	48	12	0	33
2002–2003	49	22	27	3	0	37
2003–2004[a]	39	15	15	27	3	33
2004–2005	43	28	17	9	2	46
2005–2006	20	17	46	14	3	35
2006–2007	40	20	24	16	0	25
2007–2008	33	17	22	26	2	58

[a] Includes 1 bull killed in hunt SC827 (Governor's Permit).

TABLE 5 Delta caribou harvest percent by transport method, permit hunt DC827, regulatory years 1996–1997 through 2007–2008

Regulatory Year	Harvest percent by transport method							
	Airplane	Horse	Boat	3- or 4-Wheeler	ORV[b]	Highway vehicle	Unk	*n*
1996–1997	32	0	0	36	18	9	5	22
1997–1998	14	10	0	52	11	11	2	44
1998–1999	20	8	0	52	14	6	0	50
1999–2000	29	8	0	45	5	13	0	38
2000–2001	17	13	8	33	21	8	0	24
2001–2002	39	0	0	45	9	3	3	33
2002–2003	30	3	0	51	11	5	0	37
2003–2004[a]	27	6	3	58	3	3	0	33
2004–2005	30	7	0	52	4	7	0	46
2005–2006	40	3	0	49	6	0	3	35
2006–2007	40	4	0	52	4	0	0	25
2007–2008	37	2	3	51	2	3	2	59

[a] Includes 1 bull killed in hunt SC827 (Governor's Permit).
[b] Other off-road vehicles.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNITS: 20B, 20C, 20D, 20E, and 25C (20,000 mi^2)

HERD: Fortymile

GEOGRAPHIC DESCRIPTION: Charley, Fortymile, Salcha, Goodpaster, and Ladue rivers, and Birch and Shaw Creek drainages between the Tanana River and the south bank of the Yukon River; the Fortymile caribou herd currently ranges up to 50 miles into Yukon, Canada

BACKGROUND

The Fortymile caribou herd (FCH) range includes portions of the upper Fortymile, Tanana and Yukon River drainages in both Alaska and Yukon, Canada. The FCH is important for consumptive and nonconsumptive uses in Interior Alaska and southern Yukon. Like other caribou herds in Alaska, the FCH has displayed major changes in abundance and distribution through time. During the 1920s it was the largest herd in Alaska and was one of the largest in the world, estimated at over 500,000 caribou (Murie 1935). For unknown reasons, the FCH declined during the 1930s to an estimated 10,000–20,000 caribou (Skoog 1956). Timing of the subsequent recovery is unclear, but by the 1950s the FCH had increased to an estimated 50,000 caribou (Valkenburg et al. 1994). Herd recovery was likely aided significantly by a federal predator control program that began in 1947. Through the early 1960s the herd fluctuated slightly, but most population estimates were around 50,000 animals (Valkenburg et al. 1994).

Between the mid 1960s and mid 1970s, the herd declined to its lowest point since the 1920s (an estimated 5740–8610 animals) during 1973–1976 (Valkenburg et al. 1994). This decline was attributed to a combination of high harvests, severe winters, and wolf predation (Davis et al. 1978; Valkenburg and Davis 1989). During this decline, the FCH reduced its range size and changed its seasonal migration patterns. By the early 1960s, the herd stopped crossing the Steese Highway in significant numbers, and by the early 1970s few Fortymile caribou continued to make annual movements into Yukon, Canada. Since the early 1970s, the herd's range has

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

remained about 19,300 mi^2 (50,000 km^2), less than 25% of the range thought to have been used by the FCH during the 1920s.

The FCH began increasing after 1976, likely in response to favorable weather conditions, reduced harvests, and a natural decline in wolf numbers. By 1990 the herd was estimated at 22,766 caribou. Between 1990 and 1995, the herd remained relatively stable with an estimated population of about 22,000 caribou. Population growth stabilized due to high adult mortality, unusually low pregnancy rate in 1993, and low to moderate calf survival during this period (Boertje and Gardner 2000*a*). In combination with public wolf trapping, ADF&G conducted nonlethal wolf control during November 1997–May 2001. Within the calving and summer range of the FCH, wolf numbers were reduced by 78% to 2 sterilized alpha wolves in each of 15 pack territories (Gardner 2003). During 1996–2002, the FCH doubled in size due to elevated pregnancy rates and increased adult and calf survival (Table 1). The current population objective of 50,000–100,000 and harvest objective of 1,000–15,000 were established by the Alaska Board of Game in 2000 and are defined in intensive management regulations (5 Alaska Administrative Code [AAC] 92.108).

The FCH historically provided much of the food needed by residents within its range. From the late 1800s to World War I, the herd was subject to market hunting in both Alaska and Yukon. Most hunting was concentrated along the Steese Highway and along the Yukon River upstream from Dawson before the Taylor Highway was constructed in the mid 1950s. During the 1960s, hunting was concentrated along the Steese and Taylor highways in Alaska and along the Top of the World Highway in Yukon. During the late 1970s and the 1980s, Alaska's hunting regulations for Fortymile herd caribou were designed to benefit subsistence hunters and to prevent harvest from limiting herd growth. Bag limits, harvest quotas, and season openings tailored to benefit local residents were primary regulatory mechanisms used to meet these objectives. Hunting seasons were deliberately set to avoid the period when road crossings were likely. Consequently, hunter concentration and harvest distribution shifted from highways to trail systems accessed from the Taylor and Steese highways to areas accessed from small airstrips within the Fortymile and Charley River drainages.

Harvest was further restricted during the early 1990s to reduce impact on herd growth. Harvest regulations also became increasingly complex due to a legal ruling regarding Alaska's subsistence law that initiated federal management of the herd on federal lands. Competition among Alaska hunters increased because of the reduced quotas and complex regulations. During this period, many residents within the herd's range were unhappy with the ineffectiveness of dual federal and state management in administering the hunts and bringing about a herd increase. In response, the Upper Tanana–Fortymile Fish and Game Advisory Committee, the Tr'ondëk Hwëchîn First Nation in Yukon, and other public groups requested that ADF&G, the U.S. federal agencies, and Yukon Department of Renewable Resources work with the public to develop a management plan for the FCH.

In 1994 the Fortymile Caribou Herd Management Planning Team was established. The team was comprised of 13 public members who represented subsistence users from Alaska and Yukon, sport hunters, Native villages and corporations, environmental groups, and agency

representatives from ADF&G, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, and Yukon Department of Renewable Resources.

The team completed the *Fortymile Caribou Herd Management Plan* (Alaska Department of Fish and Game 1995) in October 1995, which included recommendations for herd size, harvest, and habitat management. The plan recommended a combination of nonlethal wolf control by ADF&G and wolf trapping by the public to reduce wolf predation on caribou calves. Harvest management recommendations prompted the Alaska Board of Game and the Federal Subsistence Board to develop new harvest regulations. The Alaska Board of Game, the Federal Subsistence Board, and the Yukon Fish and Wildlife Management Board endorsed the plan, developed new harvest regulations that satisfied the plan, and guided regulatory decisions during 1996–2000. The plan formally ended in 2001.

In 1999, the 5 Fish and Game advisory committees within the herd's range in Alaska (Central, Delta, Eagle, Fairbanks, and Upper Tanana–Fortymile) recognized the need to cooperatively develop harvest regulations that would benefit hunters and carry out the goals of the *Fortymile Caribou Herd Management Plan*. These advisory committees, with input from the federal Eastern Interior Regional Advisory Council to the Federal Subsistence Board, Yukon Department of Renewable Resources, Yukon First Nations, and many other interested parties, developed the *2001–2006 Fortymile Harvest Management Plan* (ADF&G, unpublished document, Tok). This 2001–2006 harvest plan was endorsed by the Alaska Board of Game in March 2000 and guided regulation development and implementation during regulatory years (RY) 2002 through RY05 (RY = 1 July through 30 June; e.g., RY05 = 1 July 2005 through 30 June 2006).

In 2005, recognizing the 2001–2006 harvest plan was about to end, the 5 Alaska advisory committees reconvened to develop an updated plan. In March 2006, with input from the federal Eastern Interior Regional Advisory Council, Yukon Department of Environment (formerly Yukon Department of Renewable Resources), Yukon First Nations, and many other interested parties, they developed the *Fortymile Caribou Herd Harvest Plan 2006–2012* (Alaska Department of Fish and Game 2006). This 2006–2012 harvest plan was endorsed by the Alaska Board of Game in March 2006 and will guide regulation development and implementation during regulatory years RY06–RY12.

MANAGEMENT DIRECTION

Gardner (2003) summarized Fortymile caribou herd management direction during the 1970s through 2000. During RY02–RY05, management was guided by recommendations in the 2001–2006 harvest plan. During RY06–RY07, management was guided by recommendations in the 2006–2012 harvest plan.

The Fortymile harvest plans have proved to be a highly successful joint state–federal management program benefiting users and the herd. Since 2001 the harvest plans have had support of the public and regulatory boards and have withstood a number of proposals to state and federal boards that could have resulted in detrimental harvest levels or a return to separate state and federal systems. The following management goals and objectives were developed to meet the goals of the harvest plan and the intensive management regulations.

MANAGEMENT GOAL

- Restore the FCH to its traditional range in Alaska and Yukon.

MANAGEMENT OBJECTIVES

- Provide conditions for the Fortymile herd to grow at a moderate annual rate of 5–10% to a minimum herd size of 50,000–100,000 caribou.
- Manage the herd to sustain an annual harvest of 1,000–15,000 caribou.
- Maintain an October bull:cow ratio of at least 35:100.
- Provide for increased caribou hunting, viewing, and other wildlife-related recreation in Alaska and Yukon.

ACTIVITIES

- Minimize the impact of human activities on caribou habitat.
- Work with land agencies, landowners, and developers to mitigate developments detrimental to Fortymile caribou.
- Maintain a near-natural fire regime.

METHODS

POPULATION STATUS AND TREND

Population Census

During RY06–RY07 we attempted annual photocensus counts of the FCH between late June and mid July. Population size was estimated using the modified aerial photo-direct count technique (Davis et al. 1979). Photocensuses were conducted once the herd formed 5–15 tightly aggregated groups in areas that provided conditions adequate to visually count and photograph the caribou. Prior to the census, we conducted several reconnaissance flights to determine if the caribou were adequately grouped near or above treeline. These postcalving aggregations were located by radiotracking collared animals. Once the herd was grouped, we attempted the census using 3–5 spotter planes (Piper PA-18 or Bellanca Scout) and 1 radiotracking aircraft (Cessna 185 or 206, Bellanca Scout, or PA-18). Groups of caribou were photographed with a Zeiss RMK-A aerial camera mounted in the belly of a DeHavilland Beaver aircraft. During the census, the radiotracking plane located all radiocollared animals in the herd and the spotter planes flew search patterns to locate groups of caribou that did not have radiocollared animals associated with them. We photographed all groups that could not be counted accurately by the observers in the spotter planes (>50 caribou).

Caribou were counted directly from photographs and all photographs were counted twice, each time by a different person. If counts were within 3% of one another, the 2 counts were averaged; otherwise, photographs were counted a third time. We derived minimum population estimates by adding individual caribou counted on photographs to caribou counted from spotter planes that

were not photographed. No correction factors were used to account for caribou missed during the search. If caribou were not adequately aggregated or were not in areas that allowed for visual counting and photographing, the census was not conducted and population estimates were instead based on a population model developed by Boertje and Gardner (2000*b*).

Population Composition

We conducted aerial surveys between late September and mid October to estimate herd sex and age composition. To locate most of the herd, we radiotracked caribou from a fixed-wing aircraft (Piper PA-18 or Bellanca Scout) and used a Robinson R-44 helicopter to visually classify 12–15% of the herd. During counts, we classified each caribou as a cow, calf, or bull. Bulls were further classified as small, medium, or large, based on antler size (Eagan 1993). We tallied the composition of each group on a 5-position counter and recorded the tallies on a data sheet.

Distribution and Movements

We obtained herd distribution, movements, and estimates of annual mortality by radiotracking approximately 60–90 adults. Radiocollared caribou were located approximately weekly during hunting seasons in August–September and December, 3–4 times during calving in mid May, and approximately once a month during the rest of the year. We radiocollared 15 5-month-old female calves in September 2006 and in September 2007 to replace radiocollars that went off the air due to failure or caribou mortality.

Harvest

Harvest was monitored using hunter checkstations, hunter contacts in the field, and registration permit hunt reports. To reduce the risk of overharvest, successful hunters were required to report their kill within 3–5 days. Harvest data were summarized by regulatory year. We analyzed data on harvest success, hunt area, hunter residence and effort, method of transportation, and harvest chronology. The annual harvest quota was established using the 2006–2012 harvest plan. During RY06–RY07 the harvest quota was 850 caribou, with no more than 25% cows. Seventy-five percent of the harvest quota (640 caribou) was allocated to the fall season (RC860 permit) and 25% (210 caribou) plus any unharvested portion of the fall quota was allocated to the winter season (RC867 permit). During RY06–RY07, the fall quota was subdivided between 3 traditional hunt areas: 1) Taylor Highway area, 2) Steese Highway and Chena Hot Springs Road area, and 3) the roadless area between these 2 areas. The winter hunt quota was divided between the 1) Taylor Highway area and 2) the Steese Highway and Chena Hot Springs Road area. During the winter hunt, the road-accessible area that had the greatest number of caribou immediately prior to the season opening was allocated 60% of the winter quota. The roadless area was included with the road-accessible area that was allocated 60% of the harvest and was closed in conjunction with that road-accessible area.

During the fall RY06 and RY07 hunts (RC860), the Taylor Highway area harvest quota was 290 caribou, the Steese Highway–Chena Hot Springs Road area harvest quota was 190 caribou, and the roadless area harvest quota was 160 caribou.

During the RY06 winter hunt (RC867) the harvest quota was 149 combined for the Taylor Highway and roadless areas, and 223 for the Steese Highway–Chena Hot Springs Road area. In

RY07 the Taylor Highway quota was 99 caribou, and the Steese Highway–Chena Hot Springs Road and roadless areas quota was 148.

We issued emergency orders to close hunting seasons when the harvest quotas for given seasons and areas were met. Further discussion of Fortymile caribou harvest management can be found in the 2001–2006 harvest plan (ADF&G, unpublished document, Tok) and the 2006–2012 harvest plan (ADF&G 2006).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

During 1990–1995, the herd size remained relatively stable at around 22,000 caribou (Table 1). Between 1995 and 2003, the herd doubled in size (annual growth rates = 4–14%). Annual increases in herd size resulted from increased adult and calf survival rates and adult pregnancy rates (Table 1; Boertje and Gardner 1998*b*, 1999, 2000*a*).

The herd declined an estimated 12% from summer 2003 to summer 2006 (RY02–RY05), primarily due to a combination of low pregnancy and survival rates associated with poor body condition due to summer drought, deep winter snow, and increased wolf predation during this period (Gross 2007).

RY06. Good survival rates among calves to autumn (34 calves:100 cows in early Oct 2006) and mild winter conditions allowed the population to increase an estimated 3% during RY06. The estimated precalving population size in May 2007 was 40,000 caribou (Table 1).

RY07. Good survival rates among calves to autumn (33 calves:100 cows in early Oct 2007) and mild winter conditions allowed the population to increase an estimated 5% during RY07. The estimated precalving population size in May 2008 was 42,000 caribou (Table 1).

A photocensus was attempted annually in June or early July during summers 2006–2008. A successful census was completed in June 2007, with 38,364 caribou counted. However, due to cool and wet conditions during summers 2006 and 2008, the herd did not group adequately for a census.

Population Composition

We use calf recruitment observed during fall composition surveys as an indicator of population trend in the FCH. During herd growth phases in the 1980s, calves averaged 18% of the population in autumn, and during growth phases in 1996–1999 and 2001–2002, calves averaged 21% of the autumn population. During stable years (1990, 1992–1995, 2000), calves averaged 17% of the population, whereas calves averaged only 10% of the population during years of population decline (1991, 2003, and 2005; Table 1).

Between 1990 and 2005, only the 2004 recruitment rate was contrary to this observed pattern. We observed 16% calves in the herd during the autumn 2004 composition survey, but observed an overall population decline the following summer. Although this level of calf recruitment

generally indicates the herd is likely to remain stable, above average mortality rates among calves and adults during winter 2004–2005 likely resulted in a net decline.

RY06. With 19% calves observed during the fall 2006 composition survey, the FCH increased an estimated 3% in RY06.

RY07. With 19% calves observed during the fall 2006 composition survey, the FCH increased an about 5% in RY07.

The bull:cow ratio was 43 bulls:100 cows in RY06 and 37:100 in RY07. The RY07 bull:cow ratio was the lowest observed since RY89; however, it will take several more years of data to determine if the herd has experienced a decline in bulls or if the lower ratio observed in 2007 was due to other factors, such as uneven sample distribution. Harvest quotas will remain conservative through 2012 to allow for continued herd growth and a stable bull:cow ratio. This harvest strategy should also maintain the ratio of large bulls in the herd.

Distribution and Movements

In May 2006 (RY05), the FCH primarily calved along the eastern edge of the Yukon–Charley Rivers National Preserve in the upper Seventymile River drainage and in the upper Middle and North Fork Fortymile River drainages. The majority of the herd spent June through mid September between Mosquito Mountain, upper Sand Creek–Healy River and Mount Harper, and the upper Goodpaster, Salcha, Chena, Seventymile, and upper North Fork Fortymile River drainages.

In May 2007 (RY06), the FCH primarily calved along the southern edge of the Yukon–Charley Rivers National Preserve in the upper Goodpaster and upper Middle Fork Fortymile River drainages. The majority of the herd spent June through mid September between Mosquito Mountain, upper Sand Creek–Healy River and Mount Harper, and the upper Goodpaster, Salcha, Charley, and Seventymile River drainages.

In May 2008 (RY07), the FCH primarily calved in the upper Healy and upper Middle Fork Fortymile River drainages. The majority of the herd spent June through mid September between Mosquito Mountain, upper Sand Creek–Healy River and Mount Harper, and the upper Goodpaster, Salcha, Charley, and Seventymile River drainages.

In RY06, during pre-rut and rut (mid Sep–Oct), the herd was concentrated in the Seventymile, Charley, Chena, and Salcha rivers and Birch Creek drainages. In RY07, during this period, the herd was concentrated in the upper South and Eisenmenger Forks of the Goodpaster River drainage, the upper Middle Fork Fortymile River and upper Kechumstuk Creek drainages, and in the areas around Jack Wade Junction on the Taylor Highway and the community of Boundary.

During winters (November–March) RY06–RY07, 5,000–15,000 caribou were located along the Top of the World Highway from Boundary, Alaska west into Yukon, Canada or were in the area just to the south. During these years, the majority of the herd wintered in small scattered groups in the drainages of the Seventymile, Goodpaster and Salcha rivers; Mosquito Fork, Middle Fork, and North Fork of the Fortymile River; and Birch Creek.

MORTALITY

Harvest

Season and Bag Limit. Both fall and winter hunts were in place for the FCH during RY06–RY07, with various unit-specific bag limits and season dates for state and federal hunts (Table 2). Gardner (2003) summarized the regulatory history of the FCH.

Alaska Board of Game Actions and Emergency Orders. We issued emergency orders to close hunting seasons once the harvest quotas were met (Table 3).

The 2006–2012 harvest plan was adopted by the Board of Game in March 2006. This harvest plan recommends an annual harvest quota of 850 caribou for Alaska, with up to 25% cows, until the herd has at least 50,000 caribou. When the herd reaches 50,000 caribou the annual harvest quota will be increased to 1,000 caribou, with up to 25% cows. The herd did not reach 50,000 caribou during this report period, so the quota was held at 850 caribou.

Also at the spring 2006 Board of Game meeting, in response to lack of population growth after the FCH peaked at approximately 44,100 animals in May 2003, the board expanded the Upper Yukon–Tanana Predation Control Area (5 AAC 92.125[b]) to include most of the FCH range. This change was intended to expand wolf control to initiate an increase in the FCH and aid in achieving both the population objective of 50,000–100,000 caribou and the harvest objective of 1,000–15,000 caribou specified in intensive management regulations.

The 2006–2012 harvest plan also recommends a 1–3 day hunt for up to 30 caribou during late October–November to be announced by emergency order in the Eagle area, if caribou are present. The board approved the proposed Eagle area hunt at its March 2007 meeting. Due to absence of caribou, the Eagle area hunt was not opened during RY06–RY07.

Harvest by Hunters. We issued 3975 and 4576 registration permits in RY06 and RY07, respectively. In RY06, 2605 hunters reported taking 852 caribou and in RY07, 3182 hunters reported taking 1012 caribou (Table 4). Total human-caused mortality of Fortymile caribou, including harvest reported on registration permits and general harvest tickets, accidental death, and illegal and unreported harvest, was estimated to be 874 in RY06 and 1042 in RY07 (Table 5). To assist herd growth during RY06–RY07, the Tr'ondëk Hwëchîn First Nation members in Yukon, Canada chose not to exercise their constitutional right to hunt the FCH; concomitantly all other federal and provincial hunting seasons for FCH were closed in Yukon.

Hunter Residency and Success. Nonresidents made up an average of 7% of the hunters during RY06–RY07 and accounted for 11% of the total harvest (Table 6). The success rate for residents (local and nonlocal combined) was 34% during RY06–RY07, whereas success for nonresidents was 47% (Table 6).

Harvest Chronology.

RY06 — During RY06, 70% of the total fall harvest (RC860) occurred during the first week of the season (Table 7). For the second year in a row, a portion of the herd was accessible along the Taylor Highway and adjacent trails at the beginning of the fall season, resulting in heavy harvest

and an early season closure on 17 August when the harvest quota was met. For the second year in a row, very few caribou were available to hunters along the Steese Highway and Chena Hot Springs Road during the entire fall season, which resulted in very low harvest and the season remained open through 30 September.

At the beginning of the winter hunting season (RC867) a portion of the herd was available to hunters in both the Taylor Highway and the Steese Highway and Chena Hot Springs Road areas and hunter success was high. The winter harvest quota of 372 caribou was reached within the first 2 weeks of the state season (Tables 2 and 8). Consequently, we closed the state season on 9 December in the Steese Highway and Chena Hot Springs Road area (quota of 223) and on 14 December in the Taylor Highway area (quota of 149) as the quotas were met.

RY07 — During RY07, 74% of the total fall harvest (RC860) occurred during the first week of the fall season (Table 7). For the third year in a row, a portion of the herd was accessible along the Taylor Highway and adjacent trails at the beginning of the fall season, resulting in heavy harvest and an early season closure of the state season on 13 August when the harvest quota of 290 caribou was met. Caribou were available to hunters throughout the fall season along the Steese Highway and Chena Hot Springs Road. This resulted in moderate harvest levels and the season remained open through 30 September because the harvest quota of 190 caribou was not met.

For the second year in a row, a portion of the FCH was available to hunters at the beginning of the winter hunting season in both the Taylor Highway and the Steese Highway and Chena Hot Springs Road areas. Hunter success was high and the winter harvest quota of 247 caribou was reached within the first 2 days of the season (Table 8). Consequently, the state season closed in the Taylor Highway area (quota of 99 caribou) on 1 December and in the Steese Highway and Chena Hot Springs Road area on 2 December (quota of 148).

Transport Methods. Types of transportation used by successful hunters in the fall depended primarily on the number of ATV trails available and whether air taxi companies worked in the area. During the RC860 fall hunts in RY06–RY07, all successful hunters in the central portion of the FCH range used boats and airplanes. This remote hunt area has no trails and cannot be reached by ground transportation.

During the RC860 fall hunting seasons in RY06–RY07, successful hunters in Unit 20E primarily used ATVs; highway vehicle was the second most common mode of transport. The Chicken Ridge trail and its spur trails were the primary trails used by hunters with ATVs to access the FCH in Unit 20E. Walk-in hunters accessed the herd from the Taylor Highway near American Summit in the Glacier Controlled Use Area (where motorized vehicles are not allowed for hunting) during RY06–RY07. American Summit provided an ideal location for hunters without ATVs or other off-road vehicles to access the FCH when caribou were in this area.

During the RC860 fall hunting seasons in RY06–RY07, successful hunters in the Steese Highway and Chena Hot Springs area in northeastern Unit 20B and southeastern Unit 25C primarily used ATVs, followed by highway vehicles. Hunters who used ATVs had low harvest success during the fall season in RY06 and moderate success in RY07.

During the RC867 winter hunting seasons, successful hunters primarily accessed the FCH using snowmachines and highway vehicles along the Steese and Taylor highways. Hunters on snowmachines had excellent success along the trail system off the Steese Highway during early December in both RY06 and RY07. The Taylor Highway had good numbers of caribou available to hunters who used highway vehicles and snowmachines in RY06 and RY07.

A variety of transportation types were used by successful hunters (Table 9). Accessibility should improve if the herd continues to increase and occupy a larger range in Alaska.

Other Mortality

Boertje and Gardner (1998*a*, 1998*b*, 1999, 2000*b*) and Gardner (2001) described in detail the factors that limited FCH growth during 1996–2000 and the management actions taken to mitigate those factors and encourage herd recovery. However, these factors, primarily wolf predation, continued to influence the FCH through RY07. ADF&G research staff continues to monitor the effects of the 1996–2000 management actions.

RY06. During RY06, estimated mortality rates of radiocollared adults (3%) and calves (27%) were below the previous 12-year (RY94–RY05) average of 10% for adults and 57% for calves (R. Boertje, ADF&G, unpublished data, Fairbanks). One radiocollared adult caribou was killed by a hunter during RY06. Wolf predation was determined to be the cause of all nonhunting mortality of radiocollared caribou (2 adults and 4 calves) that died during winter (November–April) RY06.

RY07. During RY07, estimated mortality rates of radiocollared adults (4%) and calves (33%) were again below the RY94–RY05 averages (R. Boertje, unpublished data). Two radiocollared adult caribou were killed by hunters during RY07, while wolf predation was again determined to be the cause of all nonhunting mortality of radiocollared caribou (3 adults and 5 calves) that died during winter (November–April) RY07.

HABITAT

Assessment

In 1998, for the first time in 3 decades, the FCH exceeded 1295 caribou/1000 mi^2 (500 caribou/1000 km^2). Beginning in 2001 the herd expanded its range use, apparently as a result of increased herd size. It moved farther west near the Steese Highway in fall 2001 and used winter range in Yukon, Canada during winters 2000–2001 through 2007–2008. Even so, more than 75% of the historic Fortymile range has not been used for more than 40 years and the far eastern portion of the range has not been used for more than 50 years.

During winters 1991–1992, 1992–1993, 1995–1996, 1996–1997, and 1999–2000, range conditions were excellent, as evidenced by high proportions of lichen fragments (72–81%) and a low proportion of mosses (8%) in fecal samples (Boertje 1984). Fecal samples from overgrazed winter ranges contain a relatively high proportion of mosses or vegetation other than lichens (Boertje 1984). Preliminary data collected during 2000–2004 indicated a high proportion of lichens in fecal samples (William Collins, ADF&G, personal communication), suggesting that Fortymile winter range continues to be in excellent condition. Wildfires in 2004 destroyed the

habitat plots prior to the final assessment, but habitat quality in adjacent unburned areas of Unit 20E was likely unchanged. The Nelchina herd has wintered in portions of the Fortymile winter range since 1999. B. Dale (ADF&G, personal communication) captured and weighed Nelchina herd calves each spring and found calves that wintered in the Fortymile area were significantly heavier than calves that wintered in Units 11 and 13. Also, Nelchina calves on Fortymile range gained weight over winter, except in years when snow depth was above average.

Weights of FCH 5-month-old female calves captured during October 2004–2007 were not significantly different from those weighed during October 1990–2003 (R. Boertje, personal communication). However, birthrates in spring 2003 and 2005 were among the lowest observed since 1990. Conditions were drier than average during summers 2002–2004 and deep snow conditions prevailed during most of winter 2004–2005. These conditions likely contributed to reduced caribou nutritional status in 2003 and 2005, and may be the cause of the lower birthrates observed in 2003 and 2005 (R. Boertje, personal communication). Additionally, wildfires in 2004 and 2005 occurred on about 15% of the winter range of the FCH and may have influenced habitat selection or predation risk of caribou starting in winter 2004–2005.

The Pogo mine project began in 2003 in the Goodpaster River drainage. This gold mine is expected to have limited impact on the Fortymile herd, but concern remains focused on future plans in this area. If additional roads for the Pogo mine reach to the upper Goodpaster River and Mount Harper area, careful access management will be required to ensure that the herd is not negatively impacted during calving and postcalving. Future access decisions have not been adequately addressed in the mine planning process.

Enhancement

The *Alaska Interagency Fire Management Plan* (Alaska Wildland Fire Coordinating Group 1998) was implemented in the early 1980s to limit suppression of wildfire where human resources are not at risk. Limited suppression should ensure a near-natural fire regime necessary for the long-term maintenance of caribou range in Interior Alaska. No habitat enhancement efforts in the FCH range were initiated during RY06–RY07. However, wildfires during summers 2004 and 2005 burned nearly 15% of the current FCH winter range. Caribou from the Nelchina herd occupied adjacent winter range in Unit 20E and used recent (<50 yr old) burns less than expected (Joly et al. 2003). Recent burns provide much lower biomass of terrestrial lichens than mature spruce forest with lichen understory, and caribou may avoid recent burns because of unfavorable snow conditions or deadfalls that impede movement (Joly et al. 2003). Despite the area of winter range that burned in recent years, a large portion of the historic range of the FCH remains unoccupied by caribou. Thus, availability of winter range is likely not limiting growth of the FCH. However, if the fire return interval becomes shorter or additional large areas of historic winter range burns, availability of winter range and changes in habitat use (and fire management options) should be more closely evaluated relative to herd population dynamics (Rupp et al. 2006).

One of the goals of the *Fortymile Caribou Management Plan* was to ensure adequate protection for the herd's range during and after recovery. Current habitat and development issues are mostly related to mining and military activities in the herd's calving and postcalving areas. The herd is most sensitive to disturbance during calving and postcalving. Working with the mining

community and the U.S. Air Force, we minimized the effects of mining exploration and low-flying military aircraft during calving and postcalving by maintaining a website that displayed the areas the herd was using. The website was updated when the herd distribution changed. The mining industry and military used this website during 1999–2007 to plan their activities away from the herd and have minimized their impacts during calving and postcalving.

Final language of the *Upper Yukon Area Plan* (Alaska Department of Natural Resources 2003) gave adequate protection to the Fortymile herd throughout its range and strong protection for the calving and postcalving ranges. The plan was completed in February 2003 and guided management of state lands within the FCH range during RY04–RY07.

NONREGULATORY MANAGEMENT PROBLEMS AND NEEDS

The *Fortymile Caribou Herd Management Plan* formally ended in May 2001 (ADF&G, unpublished document, Tok). Two of the plan's objectives are ongoing—habitat protection and a public awareness program. Protecting caribou habitat and informing the public about herd status and consumptive and nonconsumptive use opportunities were essential components of the plan's goal to restore the FCH to its traditional range. It was also the plan's goal to promote healthy wildlife populations for their intrinsic value. Since April 2003, habitat protection of the FCH range in Alaska is being addressed through land use plans and agreements made with the mining industry and the military.

We have several ongoing public awareness projects. Highway informational signs were placed along the Taylor and Steese highways in summer 2004. The Fortymile caribou newsletter *The Comeback Trail* was produced during RY02, RY03, and RY06 and distributed to about 4500 Alaska and Yukon residents, advisory committees, regional councils, state and federal management boards, and area schools. Additional public awareness programs would help ensure continued public support for the FCH. A cooperative state–federal program enhancing the viewing, education, and hunting opportunities of the FCH would benefit the herd and people interested in the herd.

CONCLUSIONS AND RECOMMENDATIONS

During RY04–RY05, the FCH population estimate ranged between 40,000 and 42,000 caribou, below the intensive management objective of 50,000–100,000 caribou. Based on the sex and age structure of the herd, the FCH had the potential to continue to increase. Winter range conditions were good, and >75% of the traditional range remained unused by the herd.

Our objective during RY06–RY07 was to provide conditions for the Fortymile herd to grow at a moderate annual rate of 5–10%. We did not meet this objective in RY06 (3% estimated increase), but did achieve a growth rate within the objective range in RY07, with a 5% estimated increase.

Harvest was managed using the guidelines in the 2006–2012 harvest plan. During RY06 and RY07, the annual harvest quota was 850 caribou (including up to 25% cows). This was below the intensive management harvest objective of 1,000–15,000 caribou annually. The 2006–2012 harvest plan recommends an annual harvest quota of 850 caribou for Alaska, with up to 25%

cows, until the herd has at least 50,000 caribou. When the herd reaches 50,000 caribou the annual harvest quota will be increased to 1,000 caribou, with up to 25% cows. The herd did not reach 50,000 caribou during this report period, so the quota was held at 850 caribou.

During RY06 and RY07, 2605 and 3182 hunters took 852 and 1012 caribou, respectively. Therefore, we did not meet our objective to sustain an annual harvest of 1,000–15,000 caribou. Harvest was maintained at a level that did not have a major effect on the bull:cow ratio, so the objective to maintain an October bull:cow ratio of at least 35:100 was met.

We also met the objective to provide for increased caribou hunting, viewing, and other wildlife-related recreation in Alaska and Yukon. Increases in population size has made the FCH one of the most accessible herds in the state, benefiting hunters and nonconsumptive users.

The Pogo mine is expected to have limited impact on the Fortymile herd, but concern remains regarding future access decisions. This project will continue to be monitored during RY08–RY09. The *Alaska Interagency Fire Management Plan* (Alaska Wildland Fire Coordinating Group 1998) allowed for a near-natural fire regime within the herd's range in Alaska during RY06–RY07.

The current goals, objectives, and activities will remain in place during the next report period (RY08–RY09).

LITERATURE CITED

ALASKA DEPARTMENT OF FISH AND GAME. 2006. Fortymile caribou herd harvest plan 2006–2012. <http://www.wildlife.alaska.gov/management/ planning/planning_pdfs/fortymile_ harvest_plan.pdf>. Accessed 13 Jul 2009.

ALASKA DEPARTMENT OF NATURAL RESOURCES. 2003. Upper Yukon Area Plan. <http://dnr.alaska.gov/mlw/planning/areaplans/up_yukon/pdf/uyap_full_plan.pdf> Accessed 9 Jul 2009.

ALASKA WILDLAND FIRE COORDINATING GROUP. 1998. Alaska interagency wildland fire management plan. <http://forestry.alaska.gov/pdfs/98AIFMP.pdf> Accessed 15 Jul 2009.

BOERTJE, R. D. 1984. Seasonal diets of the Denali caribou herd, Alaska. Arctic 37:161–165.

———, AND C. L. GARDNER. 1998*a*. Factors limiting the Fortymile caribou herd, 1 July 1992–30 June 1997. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-24-1 through W-24-5. Study 3.38. Juneau, Alaska, USA.

———, AND ———. 1998*b*. Reducing mortality on the Fortymile caribou herd, 1 July 1997–30 June 1998. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-27-1. Study 3.43. Juneau, Alaska, USA.

———, AND ———. 1999. Reducing mortality on the Fortymile caribou herd, 1 July 1998–30 June 1999. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-27-2. Study 3.43. Juneau, Alaska, USA.

———, AND ———. 2000*a*. Reducing mortality on the Fortymile caribou herd, 1 July 1999–30 June 2000. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-27-3. Study 3.43. Juneau, Alaska, USA.

———, AND ———. 2000*b*. The Fortymile caribou herd: novel proposed management and relevant biology, 1992–1997. Rangifer Special Issue 12:17–37.

DAVIS, J. L., R. E. LERESCHE, AND R. T. SHIDELER. 1978. Size, composition, and productivity of the Fortymile caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-17-6 and W-17-7. Study 3.13R. Juneau, Alaska, USA.

DAVIS, J. L., P. VALKENBURG, AND S. HARBO. 1979. Refinement of the aerial photo-direct count-extrapolation caribou census technique. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Project W-17-11. Job 3.25R. Juneau, Alaska, USA.

EAGAN, R. M. 1993. Delta caribou herd. Pages 122–147 *in* S. M. Abbott, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

GARDNER, C. L. 2001. Fortymile caribou herd. Pages 139–167 *in* C. A. Healy, editor. Caribou management report of survey–inventory activities 1 July 1998 through 30 June 2000. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———. 2003. Fortymile caribou herd. Pages 139–167 *in* C. A. Healy, editor. Caribou management report of survey and inventory activities 1 July 2000 through 30 June 2002. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

GROSS, J. A. 2007. Units 20B, 20C, 20D, 20E, and 25C caribou. Pages 135–157 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

JOLY, K., B. W. DALE, W. B. COLLINS, AND L. G. ADAMS. 2003. Winter habitat use by female caribou in relation to wildland fires in Interior Alaska. Canadian Journal of Zoology 81:1192–1201.

MURIE, O. J. 1935. Alaska–Yukon caribou. U.S. Department of Agriculture. North American Fauna 54.

RUPP, T. S., M. OLSON, L. G. ADAMS, B. W. DALE, K. JOLY, J. HENKELMAN, W. B. COLLINS, AND A. M. STARFIELD. 2006. Simulating the effect of various fire regimes on caribou winter habitat. Ecological Applications 16:1730–1743.

SKOOG, R. O. 1956. Range, movements, population, and food habits of the Steese–Fortymile caribou herd. Thesis, University of Alaska Fairbanks, Alaska, USA.

VALKENBURG, P., AND J. L. DAVIS. 1989. Status, movements, range use patterns, and limiting factors of the Fortymile caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grant W-23-1. Study 3.32. Juneau, Alaska, USA.

———, D. G. KELLEYHOUSE, J. L. DAVIS, AND J. M. VER HOEF. 1994. Case history of the Fortymile caribou herd, 1920–1990. Rangifer 14(1):11–22.

PREPARED BY:

Jeffrey A. Gross
Wildlife Biologist III

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

GROSS, J. A. 2009. Units 20B, 20C, 20D, 20E, and 25C caribou. Pages 136–158 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Fortymile caribou fall composition counts and population size, regulatory years 1985–1986 through 2007–2008

Regulatory year	Date of composition count	Bulls: 100 Cows	Calves: 100 Cows	% Calves	% Cows	% Small bulls	% Medium bulls	% Large bulls	% Bulls	Composition sample size	Photocensus estimate[a]	Estimate of herd size
1985–1986	10/16/85	50	36	19	54	39	23	38	27	1067	15,307	15,307[b]
1986–1987	10/13/86	36	28	17	61	35	24	41	22	1381		
1987–1988	9/28/87	40	37	21	57	13	43	44	22	2253	19,975	19,975[b]
1988–1989	10/2–3/88	38	30	18	59	29	41	30	23	1295		
1989–1990	10/13/89	27	24	16	66	34	41	25	18	1781	22,766	22,766[b]
1990–1991	9/27–28/90	44	29	17	58	42	39	19	26	1742		
1991–1992	10/10/91	39	16	10	64	41	34	25	25	1445	21,884	21,884[b]
1992–1993	9/26/92	48	30	17	56	37	36	27	27	2530		
1993–1994	10/3/93	46	29	17	57	48	36	17	26	3659	22,104	20,000[c]
1994–1995	9/30/94	44	27	19	57	45	33	22	24	2990	22,558	20,100[c]
1995–1996	10/3/95	43	32	18	57	43	31	27	25	3303	23,458	22,100[c]
1996–1997	9/30/96	41	36	20	57	46	31	23	23	4582	25,910	23,900[c]
1997–1998	9/30/97	46	41	22	53	48	28	24	25	6196	31,029	29,000[c]
1998–1999	9/29/98	40	38	21	56	49	27	24	23	4322	33,110	33,500[c]
1999–2000	9/29/99	48	37	20	54	55	29	16	26	4336	34,640	33,600[c]
2000–2001	10/01/00	45	27	16	58	48	28	24	26	6512		35,900[c]
2001–2002	9/29/01	49	38	20	53	44	32	24	27	6878		40,800[c]
2002–2003	9/28/02	43	39	21	55	42	28	30	24	6088	43,375	44,100[c]
2003–2004	9/27/03	50	17	10	60	51	29	21	30	6296		42,300[c]
2004–2005	9/28/04	45	28	16	59	31	37	32	25	4157		39,700[c]
2005–2006	10/5/05	51	18	10	59	25	23	52	30	2350		39,000[c]
2006–2007	10/5/06	43	34	19	57	27	29	44	24	4995	38,364	40,000[c]
2007–2008	10/7–8/08	37	33	19	59	30	43	27	22	5228		42,000[c,d]

[a] Number yearling, adults, and a portion of the calves counted during photocensus between mid June of the current regulatory year to early July of the following regulatory year. Census counts were not conducted in 2001, 2002, or 2004–2006 because caribou were too scattered or visual conditions were inadequate.

[b] Herd estimates were the result of the summer censuses, and population models were used to derive total estimates. Population estimate for mid June of the current regulatory year to early July of the following regulatory year.

[c] Herd estimates were derived from population models using data from summer census counts, fall composition counts, spring parturition surveys and monthly mortality surveys of collared caribou. Population estimate for 15 May of the current regulatory year.

[d] Preliminary data.

TABLE 2 Fortymile caribou seasons and bag limits managed as joint state–federal registration permit hunts, regulatory years 2004–2005 and 2007–2008

	Unit 20B Southeast of Steese Hwy		Unit 20D North of Tanana River		Unit 20E		Unit 25C East of Preacher Creek	
	State	Federal[a]	State	Federal[a]	State	Federal[a]	State	Federal[a]
Regulatory year	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit
2004–2005 through 2007–2008								
RESIDENT:	10 Aug–30 Sep 1 caribou.	No open season	10 Aug–30 Sep 1 caribou.	No open season	10 Aug–30 Sep 1 caribou.	10 Aug–30 Sep 1 caribou.	10 Aug–30 Sep 1 caribou.	10 Aug–30 Sep 1 caribou.
	1 Dec–28 Feb 1 caribou.		1 Dec–28 Feb 1 caribou		1 Dec–28 Feb 1 caribou.	1 Nov–28 Feb 1 caribou.	1 Dec–28 Feb 1 caribou.	1 Nov–28 Feb 1 caribou.
NONRESIDENT:	10 Aug–20 Sep 1 bull.	No open season	10 Aug–20 Sep 1 bull.	No open season	10 Aug–20 Sep 1 bull.	No open season	10 Aug–20 Sep 1 bull.	No open season

[a] Federal subsistence hunters are residents who live in communities or units in rural areas defined by the Federal Subsistence Board. Definition of who qualifies as a Fortymile caribou federal subsistence user differs among units: In Unit 20E the definition includes rural residents of Unit 12 (north of Wrangell–St Elias National Park and Preserve), Unit 20D, and Unit 20E, whereas in Unit 25C eligible federal subsistence users are all rural residents in the state.

TABLE 3 Emergency orders issued during regulatory years 2004–2005 through 2007–2008

Regulatory year	Effective date	Emergency order number	Permit hunt and area affected	Action taken/reason
2004–2005	26 Nov 2004	03-09-04	The part of RC867 in Unit 20E south of milepost 60 of the Taylor Highway.	Closed part of hunt. Prevent Nelchina caribou harvest.
2004–2005	3 Dec 2004	03-10-04	The part of RC867 in areas accessible from the Steese Highway and Chena Hot Springs Road in Units 20B and 25C.	Closed part of hunt early. Quota met.
2005–2006	19 Aug 2005	03-04-05	The part of RC860 in areas accessible from the Taylor Highway in Unit 20E.	Closed part of hunt early. Quota met.
2005–2006	12 Sep 2005	03-06-05	The part of RC860 in the roadless portions of Units 20B, 20D, 20E and 25C.	Closed part of hunt early. Quota met.
2005–2006	8 Dec 2005	03-08-05	The part of RC867 in Unit 20E south of milepost 60 of the Taylor Highway.	Close part of hunt. Prevent Nelchina caribou harvest.
2006–2007	17 Aug 2006	03-03-06	The part of RC860 in areas accessible from the Taylor Highway in Unit 20E.	Closed part of hunt early. Quota met.
2006–2007	30 Nov 2006	03-06-06	The part of RC867 in Unit 20E south of milepost 60 of the Taylor Highway.	Close part of hunt. Prevent Nelchina caribou harvest.
2006–2007	9 Dec 2006	03-07-06	The part of RC867 in areas accessible from the Steese Highway and Chena Hot Springs Road in Units 20B and 25C and in the roadless areas in 20D and 20E.	Closed part of hunt early. Quota met.
2006–2007	14 Dec 2006	03-08-06	The part of RC867 in the remainder of Unit 20E.	Close remaining part of hunt early. Quota met.
2007–2008	13 Aug 2007	03-03-07	The part of RC860 in areas accessible from the Taylor Highway in Unit 20E.	Closed part of hunt early. Quota met.
2007–2008	30 Nov 2007	03-05-07	The RC867 in entire hunt area.	Close hunt early. Quota met.

TABLE 4 Reported Fortymile caribou harvest by joint state–federal registration permit, regulatory years 2002–2003 through 2007–2008[a]

Regulatory year	Permits issued	Did not hunt (%)	FTR[b] (%)	Total hunters	Successful hunters (%)	Unsuccessful hunters (%)	Harvest			Total reported harvest	Harvest quota
							Bulls	Cows	Unk		
2002–2003[c]	4155	1397 (34)	138 (3)	2620 (63)	860[d] (33)	1760 (67)	663	185	12	860	950 total quota; 235 cows
2003–2004[c]	5718	2135 (37)	143 (3)	3440 (60)	799[e] (23)	2641 (77)	612	181	6	799	850 total quota; 210 cows
2004–2005[f]	4217	1540 (37)	180 (4)	2497 (59)	846[g] (34)	1651 (66)	592	243	11	846	850 total quota; 210 cows
2005–2006[f]	4438	1786 (40)	169 (4)	2483 (56)	741[h] (30)	1742 (70)	557	182	2	741	850 total quota; 210 cows
2006–2007[f]	3975	1295 (33)	75 (2)	2605 (66)	852[i] (33)	1753 (67)	601	247	4	852	850 total quota; 210 cows
2007–2008[f,j]	4576	1361 (30)	33 (1)	3182 (70)	1012[k] (32)	2170 (68)	746	262	4	1012	850 total quota; 210 cows

[a] Data from RC860, RC863, RC865, RC866 and RC867 harvest reports.
[b] Failed to report.
[c] Includes RC863, RC865, RC866 and RC867.
[d] An additional 16 hunters reported harvesting Fortymile caribou on general harvest reports.
[e] An additional 15 hunters reported harvesting Fortymile caribou on general harvest reports.
[f] Includes RC860 and RC867.
[g] An additional 12 hunters reported harvesting Fortymile caribou on general harvest reports.
[h] An additional 4 hunters reported harvesting Fortymile caribou on general harvest reports.
[i] An additional 12 hunters reported harvesting Fortymile caribou on general harvest reports.
[j] Preliminary harvest data.
[k] An additional 20 hunters reported harvesting Fortymile caribou on general harvest reports.

TABLE 5 Fortymile caribou harvest, regulatory years 2002–2003 through 2007–2008

Regulatory year	Reported on registration permit [ab]				Reported on general harvest report	Estimated			Yukon harvest	Total
	M	F	Unk	Total		Unreported	Illegal	Total		
2002–2003	663	185	12	860	16	5	5	10	1	887
2003–2004	612	181	6	799	15	5	5	10	0	824
2004–2005	592	243	11	846	12	5	5	10	0	868
2005–2006	557	182	2	741	4	5	5	10	0	755
2006–2007	601	247	4	852	12	5	5	10	0	874
2007–2008[c]	746	262	4	1012	20	5	5	10	0	1042

[a] Data from RC863, RC865, RC866 and RC867 harvest reports in RY02–RY03.
[b] Data from RC860 and RC867 harvest reports in RY04–RY07.
[c] Preliminary harvest data.

TABLE 6 Fortymile caribou hunter residency and success of hunters who reported residency, regulatory years 2002–2003 through 2007–2008[a]

Regulatory year	Successful						Unsuccessful						Unknown success	Total hunters
	Local[b] resident	Nonlocal resident	Nonresident	Unknown residency	Total[c]	(%)	Local[b] resident	Nonlocal resident	Nonresident	Unknown residency	Total	(%)		
2002–2003	182	616	57	5	860	(33)	225	1402	124	5	1756	(67)	4	2620
2003–2004	102	609	85	3	799	(23)	226	2235	163	3	2627	(77)	14	3440
2004–2005	109	660	77	0	846	(34)	155	1375	110	1	1641	(66)	9	2496
2005–2006	133	539	68	1	741	(30)	169	1458	114	0	1741	(70)	3	2485
2006–2007	141	623	88	0	852	(33)	203	1431	118	0	1752	(67)	1	2605
2007–2008[c]	119	779	114	0	1012	(32)	269	1791	110	0	2170	(68)	0	3182

[a] Data from RC860, RC863, RC865, RC866 and RC867 harvest reports and general season harvest reports for the Fortymile caribou herd.
[b] Residents of Unit 12 north of Wrangell–St Elias, Unit 20E, Unit 20D, and residents of Circle and Central.
[c] Preliminary harvest data.

TABLE 7 Fortymile caribou autumn harvest by month/day, regulatory years 2002–2003 through 2007–2008[a]

Regulatory year	Harvest by month/day (%) 8/10–8/16 (%)	8/17–8/23 (%)	8/24–8/30 (%)	8/31–9/6 (%)	9/7–9/13 (%)	9/14–9/20 (%)	9/21–9/27 (%)	9/28–9/30 (%)	*n*
2002–2003	146 (23)	75 (12)	133 (21)	251 (39)	11 (2)	15 (2)	9 (1)	6 (1)	646
2003–2004	110 (21)	77 (14)	92 (17)	84 (16)	42 (8)	126 (24)	3 (1)	0 (0)	534
2004–2005	129 (24)	80 (15)	126 (24)	87 (17)	47 (9)	51 (10)	4 (1)	3 (1)	527
2005–2006	272 (57)	85 (18)	41 (9)	46 (10)	26 (5)	4 (1)	1 (<1)	0 (0)	475
2006–2007	336 (70)	38 (8)	33 (7)	36 (8)	19 (4)	15 (3)	2 (<1)	1 (<1)	480
2007–2008[b]	444 (74)	24 (4)	18 (3)	44 (7)	38 (6)	18 (3)	3 (1)	10 (2)	599

[a] Data from RC860, RC863, RC865 and RC866 harvest reports for the Fortymile caribou herd that indicated a harvest date.
[b] Preliminary harvest data.

TABLE 8 Fortymile caribou winter harvest by month/day, regulatory years 2002–2003 through 2007–2008[a]

Regulatory year	Harvest by month/day 11/1–11/16 (%)	11/17–11/30 (%)	12/1–12/15 (%)	12/16–12/31 (%)	1/1–1/15 (%)	1/16–1/31 (%)	2/1–2/15 (%)	2/16–2/28 (%)	Total
2002–2003	4 (2)	7 (3)	183 (91)	1 (1)	1 (1)	5 (2)	0 (0)	0 (0)	201
2003–2004	30 (12)	6 (2)	199 (82)	7 (3)	0 (0)	0 (0)	0 (0)	0 (0)	242
2004–2005	23 (7)	21 (7)	224 (72)	24 (8)	4 (1)	1 (<1)	0 (0)	12 (4)	309
2005–2006	68 (26)	5 (2)	42 (16)	42 (16)	33 (13)	19 (7)	17 (6)	38 (14)	264
2006–2007	63 (17)	27 (7)	279 (75)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<1)	370
2007–2008[b]	48 (12)	15 (4)	342 (84)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	405

[a] Data from RC867 harvest reports for the Fortymile caribou herd that indicated a harvest date.
[b] Caribou harvested in November, were taken by federally qualified hunters, hunting on federal land only, under federal subsistence regulations.
[c] Preliminary harvest data.

TABLE 9 Fortymile caribou harvest by transport method, regulatory years 2002–2003 through 2007–2008[a]

Regulatory year	Harvest by transport method									
	Airplane (%)	Horse (%)	Boat/Airboat (%)	3- or 4-Wheeler (%)	Snowmachine (%)	ORV (%)	Highway vehicle (%)	Walking (%)	Unk (%)	Total
2002–2003	64 (7)	0 (0)	26 (3)	341 (40)	132 (15)	36 (4)	229 (27)	2 (<1)	30 (3)	860
2003–2004	103 (13)	0 (0)	47 (6)	276 (35)	158 (20)	34 (4)	116 (15)	44 (6)	21 (3)	799
2004–2005	69 (8)	1 (<1)	43 (5)	319 (38)	199 (24)	34 (4)	135 (16)	12 (1)	34 (4)	846
2005–2006	75 (10)	1 (<1)	63 (9)	274 (37)	97 (13)	58 (8)	164 (22)	4 (1)	5 (1)	741
2006–2007	83 (10)	5 (1)	45 (5)	303 (36)	232 (27)	26 (3)	136 (16)	6 (1)	16 (2)	852
2007–2008[b]	102 (10)	3 (<1)	39 (4)	376 (37)	288 (28)	37 (4)	148 (15)	7 (1)	12 (1)	1012

[a] Data from RC860, RC863, RC865, RC866, and RC867 harvest reports for the Fortymile caribou herd.
[b] Preliminary harvest data.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNITS: 20F, 21B, 21C, 21D, 24A, 24B, and 25D (48,000 mi^2)

HERDS: Galena Mountain, Ray Mountains, Wolf Mountain, Hodzana Hills

GEOGRAPHIC DESCRIPTION: Galena Mountain, Kokrines Hills, Hodzana Hills, and Ray Mountains

BACKGROUND

Named for their distinct calving areas, the Galena Mountain, Wolf Mountain, Ray Mountains, and Hodzana Hills caribou herds occur north of the Yukon River in the Kokrines Hills, Ray Mountains, and Hodzana Hills. Galena Mountain is northeast of Galena and west of the Melozitna River. The Galena Mountain herd (less than 125 animals) typically calves east of Galena Mountain and winters west of the mountain. The Wolf Mountain herd (300–500 animals) calves and winters to the north and east of Wolf Mountain in the Melozitna and Little Melozitna River drainages. The Wolf Mountain herd and a portion of the Galena Mountain herd are occasionally sympatric on a portion of their ranges near Black Sand Creek in Unit 21C during calving season. The Ray Mountains herd (approximately 1850 animals) calves in the Ray Mountains around Kilo Hot Springs and winters to the north in the Kanuti and Kilolitna River area, and to a lesser degree in the Tozitna drainage to the south.

Small groups of caribou in the Hodzana Hills, northeast of the Ray Mountains, were previously considered part of the Ray Mountains herd. Since 2003, efforts have been made by the Alaska Department of Fish and Game (ADF&G) and federal Bureau of Land Management (BLM) to gather better information about this group of caribou, now known as the Hodzana Hills caribou herd (Hollis 2007). Local residents were aware of these caribou for many years, but ADF&G did not survey them until 1977. The Hodzana Hills herd resides and calves mainly in the hills at the headwaters of the Dall, Kanuti, and Hodzana rivers.

Aerial surveys of the Galena and Wolf Mountain herds are difficult during fall and winter due to small group size and poor sightability in the dense black spruce forests where they occur.

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

Similarly, fall aerial surveys of the Ray Mountains and Hodzana Hills herds are difficult due to frequent fog, clouds, and high winds.

The origin of these herds is unknown. Some residents suggested they were reindeer from a commercial operation in the Kokrines Hills that ended around 1935. However, evidence suggests these animals are caribou because 1) reindeer physical characteristics are not apparent, 2) reindeer genes were not found when tested (Cronin et al. 1995), and 3) reindeer calve earlier than these 3 caribou herds (Saperstein 1997; Jandt 1998). Traditional ecological knowledge suggests that these herds are simply relict populations of once vast herds that migrated across western Alaska.

These caribou herds are rarely hunted because they are relatively inaccessible during the hunting season, and few people outside the local area are aware of them. The combined average of reported and known unreported harvest from all 4 herds over the last 10 years was <10 caribou per year. All seasons were closed in the area of the Galena Mountain caribou herd in regulatory year (RY) 2004 (RY = 1 Jul–30 Jun; e.g., RY04 = 1 Jul 2004–30 Jun 2005) due to declines observed in that herd (Table 1).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Ensure harvest does not result in a population decline.
- Provide increased opportunity for people to participate in caribou hunting.

MANAGEMENT OBJECTIVES

- Harvest up to 50 cows and up to 75 bulls from the Ray Mountains herd.
- Harvest up to 10 cows and up to 25 bulls from the Wolf Mountain herd.
- Harvest up to 10 cows and up to 25 bulls from the Galena Mountain herd.

METHODS

Caribou from these herds are monitored through cooperative radiotelemetry studies by ADF&G, U.S. Fish and Wildlife Service, and BLM. Radiocollars placed on cows and short yearlings are used to locate the herds for composition counts, locate calving areas, and delineate seasonal ranges. The number of radiocollared caribou varies. During RY06–RY07 there were 5 active collars in the Galena Mountain herd, 9 in the Wolf Mountain herd, 12 in the Ray Mountains herd, and 8 in the Hodzana Hills herd.

We conducted aerial surveys with helicopters (Robinson R-22 or R-44) and fixed-wing aircraft (Piper PA-18 or Bellanca Scout) following techniques outlined by Eagan (1993). Surveys conducted using helicopters allowed for composition data to be collected. Fixed-wing aircraft were typically used during RY98–RY07 to survey the Galena Mountain and Wolf Mountain herds; therefore, only numerical counts were completed during those surveys.

We monitored hunting mortality from hunter harvest reports and hunter interviews. Harvest reports submitted by hunters were entered into the statewide harvest database. These data were summarized for each regulatory year, and included total harvest, harvest location, hunter residency and success, harvest chronology, and the types of transportation used.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Galena Mountain Herd. The Galena Mountain herd has been difficult to census comprehensively, but the population has probably declined from 250–500 prior to RY02 to less than 125 caribou by RY05. The highest number of caribou seen during RY06–RY07 was 95 animals in January 2006 (Table 1). The population probably declined because of predation and movement from the Galena Mountain herd to the Wolf Mountain herd (Stout 2001). Because these caribou reside in dense black spruce forests it is also likely that some caribou were missed during surveys. The Galena Mountain herd has had radiocollared animals since 1991. We have found that having more caribou radiocollared did not increase the number of caribou found, but did demonstrate that during the rut caribou occupy dense black spruce habitat where sightability is low (Stout 2001). Conducting surveys or censuses in winter or during postcalving aggregations will provide the best estimates of population size for this herd. Regardless, it appears the Galena Mountain herd is declining to a point where recovery is unlikely without substantial management intervention or infusion of caribou from another herd.

Wolf Mountain Herd. The first comprehensive fall composition survey of the Wolf Mountain herd was in October 1995, when 346 caribou were counted (Table 2). During a photo census on 17 July 2002, we counted 516 caribou. The 2002 count may have been high because Galena Mountain herd animals were mixed with the Wolf Mountain herd at the time of the survey. In May 2006 we counted 95 caribou and in June 2007 we counted 268 caribou. Based on the 17 July 2002 count and low counts during RY03–RY07, I estimated the Wolf Mountain herd had 300–400 caribou in RY06–RY07. Since the Wolf Mountain herd is spread out most of the year, surveys or censuses during summer or postcalving aggregations will provide the best estimates of population size for this herd.

Ray Mountains Herd. The Ray Mountains herd was first thoroughly surveyed by ADF&G and BLM in fall 1983 and was surveyed by BLM periodically during the next 2 years. In fall 1983, 400 caribou were counted (Robinson 1988). In 1987 the population estimate was 500 (Robinson 1988) based on a survey of all known upland ranges except the Caribou Mountain area, which is in the range of the Hodzana Hills herd. Composition counts during a radiotracking flight and photo census in October 2000 indicated a minimum herd size of 1736. The 2001 survey yielded a minimum herd size of 1685 caribou. From the June 2004 photo census, we counted 1858 caribou (M. Keech, ADF&G, personal communication 2004, 2008). In October 2004 we observed 1403 caribou during a composition count. The October 2005 composition count yielded 795 caribou, and 1022 were found in the April 2006 survey. Composition data are not available for the October 2004 and April 2006 surveys due to poor weather conditions that only allowed for a total count. The October 2006 and 2007 surveys yielded 785 and 780 caribou respectively. Surveys or

censuses during summer or postcalving aggregations will provide the best estimates of population size for this herd.

Hodzana Hills Herd. For many years, small groups of caribou to the northeast of the Ray Mountains were considered part of the Ray Mountains herd. Efforts over the past 6 years by ADF&G and BLM to gain better information on these animals included radiocollaring caribou east of the Dalton Highway in the Hodzana Hills. In October 2003, 306 caribou were classified in 4 groups located in the upper drainages of the Kanuti and Hodzana rivers. Radio collars were placed on 4 caribou in that herd in October 2003. In June 2004, 242 caribou were counted in the Hodzana Hills, 1115 were classified in October 2005 and 320 were counted in April 2006. Compositions counts in October 2006 and September 2007 yielded 389 and 361 caribou respectively. We will continue surveys to improve our understanding of movements and calving locations.

Population Composition

Because some surveys of the 4 herds were conducted with fixed-wing aircraft, not all surveys yielded composition data. During RY06–RY07, only the Ray Mountains and the Hodzana Hills herds have composition data (Tables 3 and 4). Surveys of the Wolf Mountain herd only yielded total caribou observed, while calving surveys of the Galena Mountains herd allowed for a rough estimate of composition (Table 5).

The most recent fall calf:cow ratio data collected for the Ray Mountains and Hodzana Hills herds were within the range of other Interior herds at 28:100 and 27:100, respectively. Calf:cow ratios in the Fortymile herd during 1985–1994, a period of relative stability, averaged 29:100 (range 16–37:100; Boertje et al. 1995). The Delta caribou herd calf:cow ratio during 1970–1993 averaged 29:100 (range 2–65:100; Valkenburg 1994).

Distribution and Movements

Galena Mountain Herd. Seasonal movements of the Galena Mountain herd during RY06–RY07 appear to be consistent with earlier investigations. Galena Mountain caribou usually migrate toward alpine areas east of Galena Mountain in April and are found on the alpine slopes of the southern Kokrines Hills in Unit 21C during calving season. From June to September most caribou are in alpine areas west of the Melozitna River. In September a few bulls have been seen along the Yukon River and also north of Galena. During October the caribou migrate from alpine areas across Galena Mountain toward the Holtnakatna Hills and Hozatka Lakes in Unit 21D, where they winter. In October 1995 radiocollared caribou from the Galena Mountain herd were in the Holtnakatna Hills during composition counts. In 1996 caribou were scattered from the Holtnakatna Hills eastward to the Melozitna River, where some were mixed with Wolf Mountain caribou (Saperstein 1997).

Wolf Mountain Herd. Seasonal movements of the Wolf Mountain herd during RY06–RY07 were consistent with previous observations. A general migration pattern for the Wolf Mountain herd was surmised based on tracks observed during surveys in the early 1980s. This pattern was confirmed and detailed through radiotracking studies (Stout 2003). The herd calved on the south-facing slopes of the Kokrines Hills south of Wolf Mountain in Unit 21C, spent most of the

summer in the surrounding alpine habitat near Wolf Mountain, then moved northward toward Lost Lake on the Melozitna River in October. Generally, the Wolf Mountain herd can be found on or around Wolf Mountain, in the Kokrines hills, in the Hot Springs Creek drainage, or in the Melozitna River drainage downstream from Lost Lake (Stout 2003).

Ray Mountains Herd. Seasonal movements of the Ray Mountains herd in RY06–RY07 were consistent with movements seen in prior investigations. Prior to October 1994 there were no radiocollared caribou in the Ray Mountains, and movements of the herd were not well known. Robinson (1988) found them north of the Ray Mountains and in the upper Tozitna River drainage in Unit 20F. Based on the trails found, he suspected this herd made seasonal migrations between the 2 areas. During late October 1991, several hundred caribou were seen along the Dalton Highway near Old Man. Groups of 10–20 bulls were regularly seen near Sithylemenkat Lake in Unit 24B during March 1992, and during this time 200 caribou were seen in the Kanuti Lake area. We do not know if these caribou were from the Ray Mountains herd or the Western Arctic caribou herd (WAH).

Since radiocollaring began in October 1994, caribou were located during winter primarily on the northern slopes of the Ray Mountains and during calving season on the southern slopes of the Ray Mountains in the upper Tozitna River drainages. Summer range is the alpine areas of the Ray Mountains, frequently in the Spooky Valley area around Mount Henry Eakins and occasionally in the alpine areas south of the upper Tozitna River (Jandt 1998).

Hodzana Hills Herd. Since 2003 the caribou that reside in the Hodzana Hills have typically been found in the headwaters of the Hodzana, Dall, and Kanuti rivers, which lie on the border of Units 24A and 25D. In October 2006, these caribou were found in the upper Hodzana River, with a few groups south of Caribou Mountain on the west side of the Dalton Highway. Caribou seen along the Dalton Highway in the area of Finger Mountain in the past that were thought to be Ray Mountains caribou are now believed to have been Hodzana Hills caribou.

Body Weights and Genetics

During October 1994, female calves from the Galena Mountain herd were among the heaviest (143.4 lb) in Alaska compared to calf weights reported by Valkenburg et al. (1996). Wolf Mountain and Ray Mountains calves were also relatively heavy (Valkenburg et al. 1996).

In contrast, caribou calves from the Ray Mountains were relatively light ($\bar{x}$ = 114.1 lb; M. Keech, personal communication 2005) in March 2002 compared to 1994 weights reported (134.4 lb), indicating that body condition of the 2002 cohort was considerably less than condition of the 1994 cohort. It is unknown whether that decline was due to a short-term event (i.e., previous summer weather) or was a density-dependent decline in condition.

Analysis of mitochondrial DNA by Cronin et al. (1995) indicated that none of the samples from Galena Mountain, Wolf Mountain, or Ray Mountains herd caribou contained any unique reindeer genes (Hollis 2007).

MORTALITY

Harvest

Some areas covered by this report, particularly Units 24 and 21D north of the Yukon River and west of the trans-Alaska pipeline, are seasonally occupied by caribou from the WAH and Central Arctic herds. Seasons and bag limits in those areas reflect harvest recommendations for those herds.

Season and Bag Limit during RY06–RY07

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Ray Mountains Herd: Unit 20F, North of the Yukon River. 1 caribou.	10 Aug–31 Mar (General hunt only)	10 Aug–30 Sep
Galena Mountain Herd: Unit 21B, that portion north of the Yukon River and downstream from Ukawutni Creek.	No open season	No open season
Wolf Mountain Herd: Remainder of Unit 21B. 1 caribou.	10 Aug–30 Sep	10 Aug–30 Sep
Galena Mountain Herd: Unit 21C, that portion within the Dulbi River drainage and that portion within the Melozitna River drainage downstream from Big Creek	No open season	No open season
Wolf Mountain Herd: Remainder of Unit 21C. 1 caribou.	10 Aug–30 Sep	10 Aug–30 Sep
Galena Mountain Herd: Unit 21D, that portion north of the Yukon River and east of the Koyukuk River. 2 caribou.	Winter season to be announced	No open season
Western Arctic Herd: Remainder of Unit 21D. RESIDENT HUNTERS: 5 caribou per day; however, cow caribou may not be taken 16 May–30 Jun.	1 Jul–30 Jun	

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
NONRESIDENT HUNTERS: 5 caribou per day; however, cow caribou may not be taken 16 May–30 Jun.		1 Jul–30 Jun
Ray Mountains Herd: Unit 24A, that portion south of the south bank of the Kanuti River. 1 caribou	10 Aug—Mar 31	Aug—Sept 30
Unit 24B, that portion south of the south bank of the Kanuti River, upstream from and including that portion of the Kanuti Kilolitna River drainage, bounded by the southeast bank of the Kodosin Nolitna Creek, then downstream along the east bank of the Kanuti Kilolitna River to its confluence with the Kanuti River. 1 caribou.	10 Aug–31 Mar	10 Aug–30 Sep
Ray Mountains/Hodzana Hills Herd: Unit 25D, that portion drained by the west fork of the Dall River, west of the 150°W long. 1 bull.	10 Aug–31 Mar	10 Aug–30 Sep

Alaska Board of Game Actions and Emergency Orders. In March 1991 the Alaska Board of Game gave ADF&G emergency order authority to open a caribou hunt in a portion of Unit 21D when WAH are present. A bag limit of 2 caribou was established. This action allowed hunters the opportunity to take caribou while protecting the smaller Galena Mountain herd that may be intermixed with the WAH. This special winter season is not opened unless the Galena Mountain herd constitutes 10% or less of the total number of caribou north of the Yukon River and east of the Koyukuk River in Unit 21D. This hunting season was not opened during RY98–RY07.

The Board of Game adopted several changes in regulations for the Galena Mountain herd at the March 2004 meeting. The changes were designed to eliminate harvest in the range of the Galena Mountain herd due to conservation concerns. The new regulations closed the fall season in portions of Units 21B, 21C, and 21D beginning in RY04.

Harvest by Hunters. During RY06–RY07, only 4 caribou (4 bulls) were reported taken from the 4 herds. Three caribou were harvested from the Ray Mountains herd and 1 from the Hodzana Hills herd, all in RY07. During RY06–RY07 no caribou were reported harvested from the Galena or Wolf Mountain herds (Table 6).

Hunter access to the Ray Mountains herd is limited to lengthy snowmachine trips during the winter or to a few ridgetop landing areas. The Hodzana Hills caribou are accessible only by aircraft and occasionally from the Dalton Highway. The Galena Mountain herd is most accessible for hunting when it crosses the Galena–Huslia winter trail during winter. However, that area is closed to prevent overharvest. The Wolf Mountain herd is rarely accessible for hunting because of the scarcity of aircraft landing areas. Moose hunters on the Melozitna River have incidentally taken Wolf Mountain caribou in September, but only very rarely. The 3 caribou harvested in the Ray Mountains herd were by nonlocal residents in September and access to the area was by aircraft. The 1 caribou harvested in the Hodzana Hills herd was by a nonresident in August and access was by aircraft (Table 7).

The total combined harvest reported for these herds continues to be less than 10 caribou per year (Table 6). In addition, 1–2 caribou are taken (but not reported) each year along the Yukon River near Ruby, and 3–5 unreported caribou are taken along the Yukon River in the Rampart–Tanana section (Osborne 1995). These caribou, usually bulls, are occasionally found on remaining snowfields near the river in August or wander to the river during September. An additional 5–7 caribou are probably taken each year by hunters from Tanana who use snowmachines (Osborne 1995).

Other Mortality

Fall calf percentages (Tables 3 and 4) indicate that natural mortality of caribou calves continued to be high in the Ray Mountains and Hodzana Hills herds during RY06–RY07. Predation was likely the main limiting factor, but no studies to determine mortality factors have been completed for these herds. Black bears were probably the primary predators on the calving ground of the Wolf and Galena Mountain herds (Paragi and Simon 1993). Grizzly bears are found throughout the calving ranges of all 4 herds, and calf mortality studies in other areas indicate that grizzlies are important predators of caribou calves (Boertje et al. 1995). It is possible that high moose populations since the 1980s have supported high numbers of wolves and bears that incidentally prey on the Galena Mountain caribou, contributing to a decline in that herd.

CONCLUSIONS AND RECOMMENDATIONS

The mountains between Galena and the upper Hodzana River on the north side of the Yukon River contain 4 recognized caribou herds. These herds are relatively small compared to most other herds in Alaska and generally inhabit distinct geographical areas. However, the calving areas of the Galena and Wolf Mountain herds occasionally have partial overlap. Because the herds only occasionally overlap during calving season and only a portion of the Galena mountain herd overlaps with the Wolf mountain herd during this time, we classify these as 2 distinct herds. Although open hunting seasons for caribou existed for most of these herds, few animals were harvested due to limited access. Poor survival due to predation is likely the primary factor restricting herd growth. Survey and inventory information for wolves and bears indicated predator numbers were increasing during RY96–RY99 (Stout 1999, 2000) and stable during RY02–RY07 (Hollis 2007). Prior to RY03, habitat apparently did not restrict growth because lichen ranges were lush (Stout 2003). Large body size and weight of calves and adults for the Ray Mountains herd and Galena Mountain herd previously indicated good nutrition (Osborne 1995),

although fall calf weights in the Ray Mountains were not consistent with this observation (M. Keech, personal communication 2005).

The decline in the Galena Mountain herd was not due to harvest; therefore, the first management goal, to ensure harvest does not result in a population decline, was met. However, the second goal, to provide increased opportunity for people to participate in caribou hunting, was not achieved for the Galena Mountain herd. All other management objectives were met. Harvest of bulls and cows did not exceed desired levels for any of the herds. In past reports, the Hodzana Hills herd and the Ray Mountain herd were treated as one herd. Since investigations have shown that these are 2 distinct herds, the Hodzana Hills herd should have a separate management objective. For the next reporting period, the following objective will be added:

- Harvest up to 10 cows and up to 25 bulls from the Hodzana Hills herd.

To allow harvest from the WAH in Unit 21D east of the Koyukuk River and to protect the Galena Mountain and Wolf Mountain caribou herds, we need to maintain a restricted season for the smaller herds when the WAH is not present. Maintaining radio collars in the Galena and Wolf Mountain herds will help us to distinguish these caribou from the WAH. In addition, radio collars will help us to obtain better population estimates. Other management work on these herds will remain a low priority because of low harvest and relatively few animals in these herds.

LITERATURE CITED

BOERTJE, R. D., C. L. GARDNER, AND P. VALKENBURG. 1995. Factors limiting the Fortymile caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-24-3. Project 3.38. Juneau, Alaska, USA.

CRONIN, M. A., L. RENECKER, B. J. PIERSON, AND J. C. PATTON. 1995. Genetic variation in domestic reindeer and wild caribou in Alaska. Animal Genetics 26:427–434.

EAGAN, R. M. 1993. Delta herd. Pages 122–147 *in* S. M. Abbott, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

HOLLIS, A. L. 2007. Units 20F, 21B, 21C, 21D, and 24 caribou. Pages 158–173 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

JANDT, R. R. 1998. Ray Mountains caribou: distribution, movements and seasonal use areas, 1994–1997. BLM-Alaska Open File Report #67, Bureau of Land Management.

OSBORNE, T. O. 1995. Galena Mountain, Ray Mountains, and Wolf Mountain caribou. Pages 146–156 *in* M. V. Hicks, editor. Caribou management report of survey and inventory activities 1 July 1992–30 June 1994. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

PARAGI, T. E., AND P. N. SIMON. 1993. Review of herd productivity (1983–93) and a reconnaissance on the calving grounds of the Galena Mountain caribou herd, Alaska, Koyukuk–Nowitna National Wildlife Refuge Complex, U.S. Fish and Wildlife Service.

ROBINSON, S. R. 1988. Status of the Ray Mountains caribou herd. Pages 149–160 *in* R. D. Cameron and J. L. Davis, editors. Proceedings third North American caribou workshop. Alaska Department of Fish and Game. Wildlife Technical Bulletin 8. Juneau, Alaska, USA.

SAPERSTEIN, L. B. 1997. Distribution, movement, and population status of the Galena Mountain caribou herd, Alaska. Progress Report, FY-97-08, Koyukuk–Nowitna National Wildlife Refuge Complex, U.S. Fish and Wildlife Service.

STOUT, G. W. 1999. Units 21B, 21C, and 21D brown bear. Pages 235–240 *in* M. V. Hicks, editor. Brown bear management report of survey and inventory activities 1 July 1996 through 30 June 1998. Alaska Department of Fish and Game. Project 4.0. Juneau, Alaska, USA.

———. 2000. Units 21B, 21C, and 21D wolf. Pages 195–205 *in* M. V. Hicks, editor. Wolf management report of survey and inventory activities 1 July 1996 through 30 June 1999. Alaska Department of Fish and Game. Project 14.0. Juneau, Alaska, USA.

———. 2001. Units 20, 21, and 24 caribou. Pages 190–203 *in* C. Healy, editor. Caribou management report of survey and inventory activities 1 July 1998 through 30 June 2000. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

———. 2003. Units 20, 21, and 24 caribou. Pages 190–203 *in* C. Healy, editor. Caribou management report of survey and inventory activities 1 July 2000–30 June 2002. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

VALKENBURG, P. 1994. Investigation of regulating and limiting factors in the Delta caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-24-2. Study 3.37. Juneau, Alaska, USA.

———, J. M. VER HOEF, AND R. L. ZARNKE. 1996. Investigations and improvement of techniques for monitoring recruitment, population trend, and nutritional status in the Western Arctic caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grants W-24-1 W-24-2, W-24-3, and W-24-4. Study 3.40. Juneau, Alaska, USA.

PREPARED BY:

Anthony L. Hollis
Wildlife Biologist I

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

HOLLIS, A. L. 2009. Units 20F, 21B, 21C, 21D, 24A, 24B, and 25D caribou. Pages 159–175 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Galena Mountain caribou composition counts, 1991–2007

Month/ Year	Bulls:100 cows	Calves:100 cows	Calves	Cows	Bulls	Total caribou observed
12/91[a]						260
10/92	40	7	9	123	49	181
10/93	32	25	41	165	53	259
10/94	22	40	46	115	25	186
10/95	28	19	40	211	59	310
10/96	37	13	19	151	56	232
12/98[a]						313
12/99[a]						89
01/01[a]						65
06/01[a]						105
07/02[a]						102
09/04	20	11	7	64	13	84
12/04[a]						95
04/05[a]						78
11/05	10	16	9	58	6	73
01/06[a]						95
06/07[a]						61

[a] Fixed-wing survey, no composition classifications.

TABLE 2 Wolf Mountain caribou composition counts, 1991–2007

Month/ Year	Cows	Calves (%)	Bulls	Total caribou observed
06/91	117	18 (12)	11	146
06/92[a]				595
05/94	337	121 (26)	16	474
01/95[a]				194
10/95	192	51 (15)	103	346
03/96[a]				561
10/96	167	37 (14)	62	266
05/97[a]				423
01/98[a]				163
06/01[a]				489
04/02[a]				455
07/02[a]				319
07/02[b]		27 (5)		516
06/03[a]				271
05/04[a]				146
06/05[c]				13
05/06[a]				95
06/07[a]				268

[a] Fixed-wing survey, no composition classifications.
[b] Photocensus (fixed wing).
[c] No significant caribou groups found.

TABLE 3 Ray Mountains caribou composition counts and estimated population size, 1991–2008

Survey date (month/year)	Bulls: 100 cows	Calves: 100 cows	Calves %	Cows %	Small bulls %	Medium bulls %	Large bulls %	Total bulls %	Composition sample size	Count or estimate of herd size
06/91		31						13[a]		446
06/91			19							303[b]
10/91[c]										140[d]
10/94[c]										652
10/94	37	19	12	64	4	8	11	24	629	629
01/95[c]										684
06/95[e]										1731
10/95	34	12	8	69	3	9	11	23	994	994
10/96	28	15	10	70	3	8	9	20	1387	1387
07/97[c]										1575
10/97	33	13	9	68	5	6	12	23	1114	1114
10/98	26	32	20	63	6	3	7	16	1756	1756
10/00[e]	38	19	12	64	10	6	9	24	1736	1800
09/01	30	15	11	68	10	5	5	21	1685	1800
09/02	51	31	17	55	11	15	2	28	140	
10/03	33	18	12	66	10	6	7	22	921	
06/04[e]									1705	1858
10/04[c]									1403	
10/05	35	20	7	69	10	6	8	24	795	
04/06[c]									1022	
10/06	27	10	7	73	8	6	6	20	815	
10/07	26	25	17	66	2	5	10	17	785	
09/08	47	28	16	57	12	8	7	27	780	

[a] Includes 50 unclassified adults.
[b] Includes 245 unclassified adults.
[c] Fixed wing survey. No composition classifications.
[d] Caribou Mountain portion only.
[e] Photocensus.

TABLE 4 Hodzana Hills caribou surveys, 2003–2008

Month/Year	Cows	Calves (%)	Bulls	Total caribou observed
10/03	173	43 (14)	90	306
06/04				242
10/04				136
06/05				318
10/05	661	111 (10)	343	1115
04/06				320
10/06	247	20 (5)	122	389
09/07	201	38 (11)	122	361
09/08	232	64 (16)	99	395

TABLE 5 Galena Mountain caribou summer calving surveys, 1991–2007

Month/Year	Cows	Calves (%)	Bulls	Total caribou observed
6/91	97	11 (8)	27	135
6/92	191	13 (5)	37	241
5/93	65	12 (13)	16	93
6/93	130	24 (13)	40	194
5/94	56	13 (12)	40	109
6/94	104	34 (18)	53	191
1995–2006[a]				
6/07[b]				61

[a] No counts completed.
[b] No composition data available.

TABLE 6 Ray Mountains, Galena Mountain, Wolf Mountain, and Hodzana Hills caribou reported harvest, regulatory years 1990–1991 through 2007–2008

Regulatory year	Ray Mountains		Galena Mountain		Wolf Mountain		Hodzana Hills[a]	
	Bulls	Cows	Bulls	Cows	Bulls	Cows	Bulls	Cows
1990–1991	3	0	0	0	1	0		
1991–1992	2	0	0	0	1	0		
1992–1993	5	0	0	0	2	0		
1993–1994	9	0	0	0	0	0		
1994–1995	2	0	1	0	2	0		
1995–1996	0	0	0	0	0	0		
1996–1997	0	0	1	0	0	0		
1997–1998	0	0	0	0	0	0		
1998–1999	0	0	0	0	0	0		
1999–2000	0	1	0	0	1	0		
2000–2001	2	0	2	0	0	0		
2001–2002	1	2	0	0	0	0		
2002–2003	2	0	0	0	0	0		
2003–2004	2	0	0	0	0	0		
2004–2005	2	1	0	0	0	0		
2005–2006	0	0	0	0	0	0	0	0
2006–2007	0	0	0	0	0	0	0	0
2007–2008	3	0	0	0	0	0	1	0

[a] Hodzana Hills caribou were considered part of the Ray mountain harvest prior to 2005–2006.

TABLE 7 Galena Mountain, Wolf Mountain, Ray Mountains, and Hodzana Hills caribou hunter residency and success, regulatory years 1990–1991 through 2007–2008

Regulatory year	Successful				Unsuccessful				Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Total	Local resident[a]	Nonlocal resident	Nonresident	Total	
1990–1991	0	4	0	4	3	23	3	29	33
1991–1992	0	3	0	3	2	28	0	30	33
1992–1993	0	5	2	7	1	7	2	10	17
1993–1994	1	6	1	8	0	15	2	17	25
1994–1995	0	3	2	5	2	18	0	20	25
1995–1996	0	0	0	0	2	10	0	12	12
1996–1997	0	1	0	1	1	11	1	13	14
1997–1998	0	0	0	0	1	5	2	8	8
1998–1999	0	0	0	0	4	0	2	6	6
1999–2000	0	1	1	2	0	4	2	6	8
2000–2001	3	1	0	4	3	13	2	18	22
2001–2002	1	2	0	3	0	20	8	28	31
2002–2003	1	0	1	2	4	4	3	11	13
2003–2004	0	2	0	2	1	13	1	15	17
2004–2005	3	0	0	3	9	8	2	19	22
2005–2006	0	0	0	0	10	1	1	12	12
2006–2007	0	0	0	0	19	13	0	32	32
2007–2008	0	3	1	4	8	11	2	21	25

[a] Residents of Units 20, 21B, 21C, 21D, and 24.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNIT: 21D, 22A, 22B, 22C, 22D, 22E, 23, 24A, 24B, 24C, 24D and 26A

HERD: Western Arctic

GEOGRAPHIC DESCRIPTION: Northwest Alaska

BACKGROUND

The Western Arctic caribou herd (WAH) ranges over approximately 140,000 mi^2 (363,000 km^2) of northwestern Alaska (Figures 1 and 2). During spring, caribou travel north toward the calving grounds and summer range (Figure 3). Summer range encompasses the calving grounds and consists of the Brooks Range and its northern foothills west of the trans-Alaska pipeline (Figures 1 and 2). During summer, movement is initially westward toward the Lisburne Hills and then switches eastward through the Brooks Range (Figure 4). Caribou from this herd are more dispersed during fall than at any other time of year as they move south and west toward wintering grounds (Figure 5). In most years during the mid 1980s through 1995 much of the WAH wintered in the Nulato Hills as far south as the Unalakleet River drainage (Figures 1 and 2). In many years since 1996 much of the WAH has wintered on the eastern half of the Seward Peninsula.

In 1970 the WAH numbered approximately 242,000 caribou and was thought to be declining (P. Valkenburg, personal communication). By 1976 it had declined to about 75,000 animals. From 1976 to 1990 the WAH grew 13% annually, and from 1990 to 2003 it grew 1–3% annually. In 2003 the WAH numbered $\geq$490,000 caribou but by 2009 it had declined to 401,000 caribou.

At its peak in 2003, density of the WAH over its total range was 3.5 caribou/mi^2 (1.3 caribou/km^2). Density estimates for caribou are misleading, though, because they exhibit a "clumped" distribution in both space and time. Seasonal densities provide a more useful measure for evaluating effects of caribou on range and on each other but only reduce rather than correct for the effects of clumping. For example, although almost all of the WAH was on its summer range during the first 2–3 weeks of July 2007 for a density of 11.2 caribou/mi^2, caribou actually

[1] This report also contains information collected outside the reporting period at the discretion of the reporting biologist.

used <25% of this total area. Additionally, WAH range overlaps with that of two other northern Alaska caribou herds as well as Seward Peninsula reindeer. Density estimates need to consider these other *Rangifer* populations as well.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Protect and maintain the WAH and its habitat.
- Provide for subsistence and recreational hunting on a sustained yield basis.
- Provide for viewing and other uses of caribou.
- Perpetuate associated wildlife populations, including carnivores.

MANAGEMENT OBJECTIVES

The following management objectives compose the seven basic elements of the Western Arctic Caribou Herd Cooperative Management Plan (Western Arctic Caribou Herd Working Group 2003):

- Encourage cooperative management of the herd and its habitats among state, federal, and local entities and all users of the herd.
- Manage for a healthy population using strategies adapted to population levels and trends while recognizing that caribou numbers naturally fluctuate.
- Assess and protect important habitats of the WAH.
- Promote consistent, understandable, and effective state and federal regulations for the conservation of the WAH.
- Seek to minimize conflict between reindeer herders and the WAH.
- Integrate scientific information, traditional ecological knowledge of Alaska Native users, and knowledge of all users into management of the herd.
- Increase understanding and appreciation of the WAH through use of scientific information, traditional ecological knowledge of Alaska Native users, and knowledge of all other users.

METHODS

These terms used in this report are defined as follows:

"Adult caribou" is any caribou >12 months old.

"BLM" is the Bureau of Land Management.

"BOG" refers to the Alaska Board of Game

"Calf" is any caribou <12 months old.

"Caribou" in the generic sense refers to individuals belonging to the WAH. Acronyms used for other caribou herds are: TCH for Teshekpuk Caribou herd; CAH for Central Arctic herd; MCH for Mulchatna Herd; NAP for Northern Alaska Peninsula herd, and PCH for Porcupine Caribou herd.

"c.i." is the abbreviation for "confidence interval."

"Collar year" is the period 1 October–30 September of the subsequent year. It is defined based on the time when radio collars are deployed on WAH caribou.

"Conventional telemetry" refers to techniques using radio collars with very high frequency (VHF) transmitters and antennas mounted on airplanes to locate caribou. When referring to radio collars, the terms "VHF" and "conventional" are used interchangeably.

"Department" refers to the Alaska Department of Fish and Game.

"Fall" is defined as 16 August–30 November.

"FSB" refers to the Federal Subsistence Board.

"FWS" is the U.S. Fish and Wildlife Service.

"GPS" is Global Positioning System, a satellite-based system of recording latitude and longitude of location information.

"Guide" is a commercial operator who accompanies a hunter in the field and provides professional services to assist in the taking of trophy wildlife.

"Light weight satellite collar" refers to model ST-10, ST-18 or ST-20 collars manufactured by Telonics, Inc. (Mesa, AZ). Model ST-3 or ST–14 satellite collars were not included in this definition.

"Local hunter" is anyone that resides within the range of the WAH.

"Maternal cow" refers to a female caribou accompanied by a calf or having $\geq$1 hard antler during June.

"NPS" is the National Park Service.

"Nonlocal hunter" includes residents of Alaska that live outside the range of the WAH as well as nonresident and alien hunters.

"Photo census" is the aerial direct count photo extrapolation technique (Davis et al. 1979).

"Recruitment survey" is used interchangeably with "short yearling survey." These surveys are conducted during late March through May to estimate the ratio of short yearlings:100 adult caribou.

"Satellite collar" is a radio collar that contains both a VHF transmitter and a PTT (platform terminal transmitter). The terms "satellite collar" and "PTT" are used interchangeably.

"Short yearling" is any caribou 10–11 months old.

"SNWR" is the Selawik National Wildlife Refuge

"Spring" is defined as 1 April–5 June.

Teck Alaska, Incorporated is the new name for the company that operates the Red Dog Mine, road, and port site in partnership with NANA Regional Native Corporation. In past reports, it has been referred to by its previous names, including TecCominco and NANA-TecCominco.

"Transporter" is a commercial operator who provides only transportation services to hunters.

"Winter" is 1 November–31 March.

Population Status and Trend Methods. Our understanding of WAH population status and trend is based on conventional, satellite and GPS telemetry information along with reports from the public. Implementation and early objectives of the conventional telemetry program in the WAH were previously reported (Dau 2005). The department initially deployed PTTs in the WAH primarily to assist in locating conventionally collared caribou, and to provide more information on the distribution of cows during calving than possible using conventional telemetry techniques alone. As the PTT database has expanded through time and the number of satellite-collared WAH caribou has increased, we have increasingly used this information to evaluate seasonal movement patterns. Although we rely heavily on telemetry information to monitor the WAH, we have never collared >0.03% of the herd. We have typically conducted ≥15–20 VHF relocation flights annually since the late 1980s.

During this reporting period, VHF and satellite telemetry techniques were used to estimate population size, adult mortality, calf production and recruitment, sex and age composition, movement patterns, and distribution. Telonics Inc. (Mesa, AZ) manufactured all radio collars deployed in the WAH. Configuration of conventional and satellite collars, PTT duty cycles, VHF relocation techniques, types of data collected, allocation of collars between bulls and cows, and sources of error in telemetry data have been previously described (Dau 1997, 1999).

Beginning in 2009 (after this reporting period), agencies began deploying GPS collars in the WAH. The NPS deployed 39 GPS collars programmed to record 1 location every 8 hrs daily, and to upload location data once every 4 days. Additionally, the department deployed 2 GPS collars programmed to record 1 location every 5 days and to upload locations once every 3 days. In 2010, the NPS deployed an additional 15 GPS collars with the same duty cycle and upload periods. All NPS GPS collars were equipped with Telonics Cr-2a break away devices programmed to release in 5 years.

As in the past, during this reporting period we attempted to complete each collar year with ≥100 functional transmitters on living caribou. To meet this goal we typically begin each collar year with 115–140 potentially active collars in the herd. 'Potentially active' collars are those that have been located within the previous 2 years. This invariably includes some collars that have exhausted their batteries unbeknownst to us. We have not attempted to radiocollar a representative cross-section of ages and sexes in the population. This is partly because the age structure of the WAH is unknown, and because it is not possible to determine the specific age of individuals at the time they are collared. Instead, we attempt to maintain only ~15 collared bulls in the total marked sample annually; also, we only deploy collars on mature bulls so that skeletal growth does not add to seasonal enlargement of their neck during rut and choke them. Collars are

randomly deployed on cows ≥2 years old annually irrespective of age or maternal status. Only cows in very poor physical condition are not collared.

We began the 2006–2007 collar year with 115 potentially active collars on living caribou (102 cows and 13 bulls). Of these, 22 collars on cows and 3 on bulls were equipped with a functional PTT. We began the 2007–2008 collar year with 142 potentially active collars on living caribou (121 cows and 21 bulls), of which 24 cows and 7 bulls also had a functional PTT. Initial sample sizes of conventional- and PTT-collared caribou are inconsistent between consecutive WAH management reports because collars are retroactively censored from the initial sample after we determine their batteries were likely exhausted or that a caribou died prior to the start of a collar year.

During the reporting period all radio collars were deployed during September in Unit 23 at Onion Portage on the Kobuk River. The rationale and methods for this technique have been previously described (Dau 1997). Many residents of northwest Alaska object to chemical immobilization and helicopter capture techniques. Therefore, to avoid using these techniques, we have not removed or replaced radio collars on WAH caribou since at least the mid 1980s. The Onion Portage project is broadly supported by residents of Unit 23 and the surrounding regions within the range of this herd. Even so, we limit our time there to 1 week each year to minimize our impact on local hunters and nonlocal users who visit this area to watch and photograph caribou. Additionally, we limit the number of agency staff on the project to only those required to meet our objectives.

In 2006 and 2007 we deployed model ST-20 (A36-10 option) PTTs, and in 2008 we deployed model TAW-4610 transmitters. These configurations enclosed both the PTT and VHF transmitters in a single canister. Both of these models provide more battery power for the VHF transmitter than ST-18 PTTs; however, the Mark 9 VHF transmitter requires more power to operate than earlier model VHF transmitters. Therefore, to maintain a minimum 36-month VHF transmitter life expectancy, we specified a 12-hr ON/12-hr OFF duty cycle in conventional transmitters contained in satellite collars (ON 8:00 a.m–8:00 p.m. daily). No duty cycle was used for conventional VHF collars in 2006; however, a 16 hr on/8 hr off duty cycle was employed in some VHF collars in 2007. Dau (1997) reported the history and objectives of the WAH PTT program, configuration of satellite collars, PTT duty cycles, and use of data. We standardized all PTT location data to a 1-day-on/5-days-off duty cycle for the entire year when depicting annual movement patterns because duty cycles vary among seasons and individual PTTs.

During 2006 we deployed 33 radio collars: 17 conventional collars (11 cows and 6 bulls) and 16 satellite collars (14 cows and 2 bulls). In 2006, 8 PTTs deployed on cows were provided by the SNWR and the rest were purchased by the department. Through 2005, all satellite collars provided by the SNWR were equipped with a breakaway device (Telonics Cr-2a) programmed to release 3 years after the manufacture date. Beginning in 2006, the breakaway device on SNWR PTTs was programmed to release in 7 yrs.

During 2007 we deployed 48 radio collars: 24 conventional collars (all on cows) and 24 satellite collars (12 cows and 12 bulls). Six satellite collars were provided by the NPS, 7 were provided by the SNWR, and 11 were provided by the department.

During 2008 we deployed 26 radio collars: 6 conventional collars (all on cows) and 20 satellite collars (12 cows and 8 bulls). Twelve satellite collars were provided by the BLM and 8 were provided by the department.

Population Size and Composition Methods. Since 1986 we have determined population size using the aerial photo-direct count extrapolation (photocensus) technique (Davis et al. 1979). This herd was photographed during 11–12 July 2007, the overlap lines were placed on photos during December 2007, and the photographs were completely counted by mid-May 2008. Numerous radiotracking flights were conducted between the July photography and completion of the photo counts in May to estimate the number of live caribou that were missed during the photography.

We also censused this herd in July 2009 (after this reporting period). Photographs were taken on 3 July. As in all WAH censuses, we radiotracked extensively during the months following the census photography to determine whether any collared caribou that were not found during the photography were alive at that time. We placed overlap lines on the photos in December 2009. As in 2007, Don Williams was contracted to count all of the photos from the 2009 census. He completed counting them in March 2010 and I finalized the estimate that month.

Population composition for the WAH was estimated from annual calving surveys during June, fall composition counts during October–November 2006 and 2008, and annual short yearling surveys during April–May. We conduct calving surveys to delineate calving areas; monitor initial calf production; and contribute to our annual estimate of adult caribou mortality. Additionally, the neonate:cow ratio provides an indirect way to assess body condition of mature cows at the time of conception during the previous fall (Cameron and Ver Hoef 1994).

Since the mid 1990s we have attempted to conduct calving surveys during 3–10 June, which roughly corresponds with our best understanding of when peak calving occurs based on observations of neonates and antler characteristics of cows. However, poor weather has sometimes extended calving surveys into and even slightly past mid June. In 2006, calving surveys were conducted in C-185 and PA-18 airplanes during 8–11 and 12–14 June. During 2007, calving surveys were conducted using a PA-18 airplane during 5–9 June, and in 2008 during 11–13 June. Calving survey techniques, criteria to determine maternal status and geographic coverage were previously described (Dau 1997).

Caribou collared at Onion Portage tend to move *en masse* through their first year. Therefore, during the first year of deployment, only a small proportion ($\leq$4) of newly collared individuals are used for collecting composition information to avoid oversampling that segment of the population. Satellite collar information indicates that once newly collared caribou go into the following June, individuals collared the preceding fall are randomly mixed throughout the herd.

Fall composition surveys were conducted on 18 October and 16–17 November 2006, and during 23–26 October 2008 using techniques previously described (Dau 1997). In both years survey dates were determined by the availability of an R-44 helicopter and suitable weather.

Spring composition (short yearling or recruitment) surveys were conducted on 20, 25, and 27–28 April, and on 24–25 May, 2006. During 2007, they were conducted on 5, 23, and 24 April, and

on 2 May. During 2008, recruitment surveys were conducted on 14, 20, 2,1 and 26 April, and on 8–9 and 14 May. In all years we used survey techniques previously described (Dau 1997). The strengths and weaknesses of this technique have been previously reported (Dau 2005).

The period over which we monitor recruitment (June through the following May) does not correspond directly with the period over which we estimate adult mortality (October through the following September). As a result of these differences, recruitment is expressed as the year of birth when numeric decline of calves in the population is considered throughout the first year of life. In this case, the recruitment estimate for any specific year is shifted 1 year earlier to track its year of birth. Separately, when recruitment is compared to estimates of adult mortality, values are expressed as the year following birth which corresponds to the year when recruitment observations were made.

Distribution and Movements. Distribution and movements of the herd were monitored through rangewide conventional telemetry surveys, and through PTT locations. Rangewide surveys were conducted during spring (Jan–May), summer (Jun) and fall (Aug–Dec), often in conjunction with composition surveys. Flights were based out of Barrow, Kotzebue, Nome, and Fairbanks using survey techniques previously described (Dau 1997).

We extensively revised the master PTT database during October–December 2006. We flagged data to indicate initial year of deployment and known mortalities in the field.

Mortality. Mortality rates for adult WAH caribou were estimated from cows with conventional or satellite collars on a collar-year basis. Estimated mortality includes all causes of death, including hunting. Portions of 3 collar years (2005–2006, 2006–2007 and 2007–2008) span this reporting period. Radiocollared bulls were not included in the sample of collared caribou to estimate mortality because we collar only large, adult individuals that may be approaching the end of their natural lifespan and sample sizes of collared bulls have historically been small. We began using expandable collar sections on bulls in 2001 which seems to have substantially reduced loss of collars through slippage from animals.

Mortality rates reported in consecutive management reports can be inconsistent. This is because we retroactively adjust the sample of collared cows as we learn their fate. For example, radiocollared cows not located for 2 years are retroactively censored from the sample of potentially active collars going back to the year they were last located. Also, when a hunter returns a collar to ADF&G that had been harvested a number of years prior to that time, or we learn that a caribou survived after its radio collar exhausted its batteries, we adjust our sample size accordingly. Inconsistencies in mortality estimates are most pronounced for the most recent 1–3 years included in these reports.

I examined seasonal patterns of mortality using years when sample sizes of collared individuals with time of death known to season were greatest. Even so, sample sizes of bulls were small. To compare differences between sexes I standardized initial sample sizes to 100 individuals separately for bulls and cows. For cows, this had almost no effect on any results because initial sample sizes were usually close to 100 individuals to begin with for the years 1983–84 and all years after 1985–86. However, I was only able to use the years 1992–93 through 2007–08 for bulls, and the multiplier used for individual years ranged 4–11. Therefore, any conclusions

regarding seasonal patterns of mortality for bulls should be viewed with caution. Because the duration of individual seasons varied, I standardized all estimates of mortality to number of deaths per week. For the purpose of examining seasonal patterns in mortality, I defined seasons as:

Spring	1 April–5 June (66 days)
Summer	6 June–31 August (87 days)
Fall	1 September–15 November (76 days)
Winter	16 November–31March (136 days)

Note that these seasonal periods are generalizations that do not necessarily apply to individual years or to movements of all individual caribou.

Harvest. We collected harvest information using three systems: 1) registration permits for residents of Nome; 2) statewide harvest tickets for nonlocal hunters (beginning in the 1998–1999 regulatory year, the Division of Wildlife Conservation resumed administering the statewide caribou harvest ticket system as for other big game); and 3) community-based harvest assessments for selected communities within the range of the WAH.

Community-based harvest assessments have been conducted in selected villages within the range of the WAH since 1985 (Table 1). I used an analysis of covariance based on per capita community harvest levels to estimate harvests by hunters who live within the range of the WAH (Sutherland 2005). This approach considered the human population size of individual communities and their accessibility to caribou. This model has been previously described (Dau 2007). Harvests of WAH caribou in Game Management Units 21 and 24 were not incorporated into the model because they were considered inconsequential. The human population of communities was based on estimates for the year 2007 (Alaska Department of Fish and Game 2000).

In previous reports, caribou harvest was determined for Unit 26A communities and Anaktuvuk Pass villages located within zones where WAH caribou mingle with TCH and CAH, by first estimating total community caribou harvest and then proportioning the harvest for each herd based on our understanding of caribou distribution and movements within preferred hunting areas (e.g., Dau 2007). Although there is uncertainty associated with assigning harvest levels to individual caribou herds where they mix, we felt this approach was better than ignoring herd mixing altogether. In 2009 (after this reporting period) kernel density analyses of PTT- and GPS-collared WAH and TCH caribou were compared to the spatial distribution of subsistence hunting effort around Barrow to better evaluate the proportion of WAH animals in the total community harvest estimate (Parrett et al., in prep.). In 2010 we used the same approach for Nuiqsut and Atqasuk. Based on these methods, the WAH proportion of total caribou harvest taken by Unit 26A communities for 2006–2007 and 2007–2008 used for this report were as follows:

Barrow – 0.03	Nuiqsut – 0.01
Point Lay – 0.40	Wainwright – 0.03
Atqasuk – 0.02	Anaktuvuk Pass – 0.80

Disease. We collected blood samples from caribou while deploying radio collars at Onion Portage. Blood was collected from all caribou that were radiocollared as well as from additional individuals. Caribou were captured, restrained, and released as previously reported (Dau 1997). We collected blood from 14 bulls and 31 cows in 2006; from 23 bulls and 38 cows in 2007; and from 33 bulls and 41 cows in 2008. Body condition (very skinny, skinny, average, fat, very fat), abnormalities, and presence of a calf were recorded for caribou from which a blood sample was collected. Since 2001, serum samples have been analyzed mainly to assess haptoglobin levels, which indicate inflammation (Dau 2001), and exposure to *Brucella suis* bacteria. However, in 2007, we tested for a number of other pathogens, including *Chlamydia* and Q fever.

In 2007, we also collected 10 WAH caribou during the Onion Portage collaring project to comprehensively assess their health. Dr. Kimberlee Beckmen conducted the necropsies and collected tissues that were later analyzed for metal levels and cultured for selected viruses and bacteria. Cell structure was examined through histology (Dr. K. Burek, Alaska Veterinary Pathology Services, Wasilla, AK). We extracted an incisor to determine age. This was the first comprehensive health assessment conducted on WAH caribou since before the late 1980s.

We provided tissue samples from the 33 WAH caribou and 13 TCH caribou, all collected during 1993 or 2003, to Dr. P. Groves at the University of Alaska, Fairbanks, to evaluate the genetic relatedness of these herds. DNA was extracted from samples using MoBio UltraClean DNA BloodSpin kits following standard protocols. Each sample was amplified at each loci using the polymerase chain reaction with one of each pair of primers fluorescently labeled with 6-FAM, NED or VIC dyes. The products of these reactions were sized using an ABI 3100 Genetic Analyzer, ABI GeneScan 500 ROX size standard and GeneMapper software. The resulting data were analyzed using GenAlEx6.1 (Peakall and Smouse, 2006) and GenePop 4.0 (Rousset, 2008) software.

We have also provided blood samples of WAH caribou to two other studies investigating the genetic relatedness of caribou from herds in Alaska (K. Mager, University of Alaska, Fairbanks) and across North America (S. Cote, Univ. of Laval, Quebec Canada) that were identified on the basis of repeated use of discreet calving grounds. These investigations are still underway and results will be reported in subsequent reports as they become available.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Two censuses of this herd were conducted since the last report: one in 2007 and another in 2009 (Table 2, Figure 6). The July 2007 photo census produced a minimum estimate of 377,000 caribou. This represents a 6% average annual rate of decline from 2003 when the herd numbered 490,000 caribou. The July 2009 census indicated the herd numbered at least 401,000 caribou. Since annual estimates of adult mortality and recruitment suggest this herd did not increase from 2007 to 2009 (see Mortality section), I suspect we underestimated herd size in 2007. However, unlike the 1999 census when an obvious problem was detected in photography (very small images of caribou), there is no simple explanation for a low count in 2007. We accounted for all radiocollared caribou during the 2007 census so are confident we did not miss some segment of the herd in an unsearched portion of its range. The most likely source of error in the 2007 census

is that we were forced to shoot a portion of the herd well after midnight on the 1st day of photography. As a result, some photos had poor lighting with deep shadows that could have obscured caribou. Additionally, we may have missed some small groups that did not contain collared caribou during the 2nd day of photography in 2007. In 2009, the WAH was more completely aggregated than during any previous census for this herd, we accounted for all of the radio collared caribou, lighting was excellent and photo quality was unsurpassed. The WAH has undoubtedly declined since 2003. However, assuming the 2007 estimate was biased somewhat low, the average annual rate of decline from 2003 to 2009 was probably 3-4% rather than 6% as indicated in Table 2.

Considering that the WAH has numbered >400,000 caribou since about 1990, department staff and many hunters have anticipated a density-dependent decline of this herd for years. However, at this point it isn't clear whether the WAH has entered a phase of density-dependent decline that could persist for years, or if it experienced 1 or 2 years of high density independent mortality attributable to winter icing events following the 2003 census. This herd may still be capable of stability or slow growth. We plan to census this herd again in July 2011.

Census data have provided the foundation for management of the WAH since 1970. In addition, the department has supplemented census counts with annual estimates of adult cow mortality and recruitment to fill in gaps between years when censuses were conducted, and to help understand what factors could be driving population size and trend. Pritchard et al. (in prep.) report that randomly collaring 2+ year old cows overestimates adult cow mortality by about 3% and underestimates recruitment by 3%. This may be offset somewhat by not collaring caribou in obviously poor body condition although they comprise a portion of the population. Additionally, we probably misclassify some 10- and 22-month-old caribou during spring composition surveys because we conduct them from a Piper PA-18 airplane. For these reasons, these relationships should be viewed as indices of adult cow mortality and recruitment rather than cardinal estimates of either parameter. We may adjust annual estimates of adult cow mortality and recruitment using 'years since collared' as a covariate in subsequent reports; however, for this report, no correction factors are employed.

The WAH experienced high adult cow mortality in 2004–2005 (22%), 2005–2006 (29%) and 2007–2008 (30%; Table 3; Figure 7). The high mortality in 2005–2006 was likely caused by a December 2005 icing event (a density independent event). In past reports I showed estimated adult cow mortality in relation to 'recruitment,' which I defined as the number of 10-month-old caribou:100 cows. Recruitment should consider only female calves as now shown in Figure 8. Regardless of whether you consider all 10-month-old calves or only female 10-month-old calves to reflect recruitment, the main point is that adult cow mortality has slowly increased while recruitment has declined since the early 1980s.

At its peak in 2003 WAH density over its total range was 3.5 caribou/mi^2 (1.3 caribou/km^2). However, this is a conservative measure of density because it does not include reindeer or caribou from the TCH or CAH, all of which overlap on seasonal ranges particularly from late summer through winter.

Population Composition

Calf production and survival.

Antler status and distention of cows' bellies during calving surveys suggest that WAH calving probably peaks during early June in most years. However, we have no May–June time-series data to determine date of peak calving for recent years. Calving probably peaked early during 1990 based on the westerly geographic distribution of collared cows, their westerly direction and high rate of movement, and their lack of hard antlers during that years' calving survey. The earliest reported peak calving for the WAH is 26 May, in 1960 (Lent 1966). During 1987–2006 there has been no correlation between median date of observation and the June calf:cow ratio (Pearson rank correlation =-0.12, P = 0.60, n = 21). This suggests that we probably have not systematically conducted annual calving surveys early or late in relation to the actual date of peak calving. Although we have no indication our estimates of parturition are biased through time, they probably are conservative because we do not record udder status for collared cows (Whitten 1995) and undoubtedly misclassify some cows as nonmaternal if they have lost their antlers and their neonate.

During June calving surveys, we observed 65 calves:100 cows in 2006, 73 calves:100 cows in 2007, and 70 calves:100 cows in 2008 (Table 4). Historical estimates of calf production suggest parturition rates were more variable 1960–1970 than in recent years (Figure 9). However, sampling approaches varied prior to 1987 when conventional telemetry techniques were adopted to locate calving caribou. Therefore, measurement error may have contributed to this early variability.

The strong negative correlation between the calf:cow ratio and the proportion of cows with velvet antlers during calving previously reported (Dau 2005) continued through this reporting period (Spearman rank correlation = –0.89, P<0.00, n = 21 years). The median proportion of cows with velvet antlers during years when the calf:cow ratio was ≥70:100 (4.0%, n =9) was significantly lower than during years when this ratio was <70:100 (14.4%, n =12, Kruskal-Wallis test statistic 10.69, P=0.001). This suggests low WAH parturition rates are real and not artifacts of sampling error. During 1987–1992, the calf:cow ratio was >70 calves:100 cows in each year we were able to conduct a survey (fog prevented surveys in 1991). This ratio has been ≥70:100 in only 4 years since 1993 (Table 4). Despite the lower calf:cow ratios observed since 1993, the overall trend in calf production has not declined since that time (Table 4, Figure 9).

The fall calf:cow ratio trended up during 1976–1982 and down during 1992–2008 despite a relatively high value in 2008 (Table 5, Figure 10). No fall composition information was collected during 1983–1990 that could enable us to determine the inflection point of these trends. Since 1992 the fall calf:adult ratio has ranged 24–33:100 (Table 5). This ratio is less vulnerable to misclassification than the calf:cow ratio because calves are easy to distinguish from adults. In contrast, inexperienced observers may misclassify young bulls as cows if they focus on antler and body characteristics rather than the presence of a vulva. Even so, spatial and temporal segregation of bulls and cows likely confounds even fall calf:adult estimates because we do not sample the entire WAH and the degree of sexual segregation varies among years and with timing of surveys.

We observed 11 short yearlings:100 adults in spring in 2007 and 14:100 in spring 2008 (Table 6, Figures 8 and 11). Recruitment has slowly declined at 0.37% per year since the early 1980s (Table 6, Figures 8 and 11). This trend would not be evident without a long-term data set.

Unweighted least squares linear regression indicates the June, fall, and spring calf:cow ratios have declined at similar rates during 1982–2008 (correlation coefficients =-0.39, -0.55 and -0.65, respectively; Figure 11). There was no significant difference in the variance of these relationships (Bartlett's Test chi-square = 2.80, P = 0.25) or their slopes (F test = 0.38, P = 0.68). However, their intercepts were significantly different (F test = 243.75, P<0.00). The individual linear relationships between the calf:cow ratio and birth year was not significant for June (n = 22, P = 0.17), only marginally significant for fall (n = 13, P = 0.09), and significant for the spring ratio (n =26, P=0.0009).

Calf:cow ratios were estimated during each of these three seasons in 12 years between 1992 and 2008. There has been no correlation between the June calf:cow ratio and subsequent fall ratio (Spearman rank correlation = 0.14, P=0.65), or with the following spring ratio (Spearman rank correlation = 0.09, P=0.77). In contrast, the fall and subsequent spring ratios were correlated (Spearman rank correlation =0.66, P=0.02). In other words, calf production in June has little effect on the proportion of calves in the population the subsequent fall; however, the fall calf:cow ratio does influence this ratio the following spring. Calf production *per se* has probably had little effect on the population dynamics of this herd since at least the mid 1980s.

Bull:cow ratios. Like the fall calf:cow ratio, the fall bull:cow ratio increased during 1976–1982 and decreased since 1992 (Table 5, Figure 12). Since 1992 telemetry-based fall surveys indicate the bull:cow ratio has ranged 38–64:100 with a median of 50 bulls:100 cows (Table 5). Sexual segregation and our inability to sample the entire population during fall probably account for more annual variability in this parameter than actual changes in population composition.

Distribution and Movements

Historical Summary. Our historical understanding of WAH distribution has been previously described (Dau 2001). We have conducted spring and fall rangewide telemetry surveys since spring 1995. We have located an average of 75% (SD = 10, n = 12) of all potentially active collars during spring and 75% during fall (SD=9, n = 12). Often, collars missed during one seasonal survey are located during the subsequent survey mixed with caribou that had been previously found. This suggests that long telemetry receiver scan times, shifts in VHF duty cycles, weak transmitter batteries, topography, receiver programming errors and infrequent relocation flights are responsible for "missed" collars rather than incomplete coverage of the herds' range. The distribution of collars located during rangewide surveys is probably a reasonably accurate approximation of overall WAH distribution; however, we recognize that VHF telemetry coverage of WAH range is inversely related to distance from Kotzebue where most tracking flights originate.

General Movement Pattern: Pregnant cows and some nonmaternal caribou begin migrating from winter range toward the calving grounds in April (Figure 3). Typically, most pregnant cows reach the calving grounds between mid May and the first few days of June. Bulls, nonmaternal cows, and immature caribou lag behind pregnant cows during the spring migration (see also Lent 1966) perhaps in part to exploit the northward progression of snowmelt and green-up. Most cows

give birth in the Utukok uplands during late May through early June (Figures 1 and 2; see section below). By mid June, usually before the emergence of mosquitoes, large postcalving aggregations begin forming as cows with neonates move west toward the Lisburne Hills (Figure 4). As mosquitoes begin to appear in mid to late June, bulls and nonmaternal caribou move into the western North Slope and DeLong Mountains. Mosquito harassment intensifies and oestrid flies emerge in early July. During the first half of July, insect harassment causes WAH caribou to form aggregations sometimes numbering >100,000 individuals in this area. Even during the period of maximum insect harassment, WAH caribou begin moving east through the Brooks Range and its foothills toward Howard and Anaktuvuk Passes (Figure 4). By early to mid August insect harassment begins to diminish. Some caribou disperse north and west onto the North Slope, some going as far as Cape Lisburne and Barrow, while other caribou remain in the mountains between Howard and Anaktuvuk Passes. Prior to 2000, the fall migration began in mid August as caribou in the vanguard moved southwest toward Kotzebue and Norton Sounds (Figure 5). By late September, before some WAH caribou on the North Slope had even begun to migrate, caribou in the vanguard of the migration had already approached the southernmost portions of winter range. Since 2000, though, the fall migration hasn't begun until early to mid September. The fall migration extends through mid to late November. Regardless of where WAH caribou are, directed and lengthy migratory movements generally cease by this time and they become relatively sedentary until April when the spring migration begins.

Calving grounds. As with most caribou herds in North America (Skoog 1968), the WAH has exhibited strong fidelity to its calving grounds, in the Utukok hills. For example, the areas identified by Lent (1966) as calving areas in 1960 and 1961 are within the 95% kernel delineated from 1987–2008 calving data (Figure 13). Although kernel analyses from 1987–2008 show spatial variability in the distribution of calving among years, in most years most calving occurs somewhere within the area depicted in Figure 13. When deviations from typical calving distributions have occurred, as in 2000 and 2001, they may have been attributable to late spring snow and weather conditions.

In 2007 we observed 84 collared cows during calving surveys (Table 4). Only 4 cows (5%), all of which were maternal, were outside the area shown in Figure 13. In 2008 we observed 76 collared cows all of which were within the 95% kernel (Figure 13).

Summer Range. Conventional telemetry relocation flights associated with calving surveys and photo censuses, as well as PTT data, all indicate that the vast majority of the WAH uses the western North Slope and Brooks Range during summer. The size of this area is about 43,000 mi^2 (111,400 km^2; Figures 1, 2, and 4). The importance of summer range to the WAH has been previously discussed (Dau 2003). In recent years I have observed and received reports of up to several thousand WAH caribou, primarily bulls and immature cows, near Serpentine Hot Springs, Cape Espenburg, and the Bendeleben Mountains on the Seward Peninsula during summer as well.

Fall movements. During this reporting period, fall movements of WAH caribou were similar to those previously described (Dau 2007; Figure 5).

As in previous reporting periods, residents of Unit 23 continued to express concerns about guides and transporters placing large numbers of nonlocal hunters in fall movement corridors and

deflecting caribou from important subsistence hunting areas. We combined caribou satellite collar movement data with camp location data to evaluate the potential for hunting camps and associated activity to deflect caribou from established movement corridors. Data obtained from the Division of Occupational Licensing yielded very little specific information regarding the location of camps for guided or dropped off hunters. Therefore, in 2006–2008, federal and state enforcement officers and biologists recorded locations of hunting camps observed during September. Despite this concerted effort to map spatial patterns of hunting activity during fall, there were still substantial gaps in both space and time in our collective coverage of camp locations. These gaps in combination with substantial variability in the timing and distribution of caribou both among and within years make it impossible to evaluate the effects of nonlocal hunting activity on caribou movements during fall.

In most years since roughly 2000, observations by department staff, hunters, and commercial operators have suggested that caribou have been 2 to 6 weeks late initiating fall migrations. Many people believe that this delay is attributable to warmer summer and early fall ambient air temperatures during recent years. I plotted median weekly latitude of satellite-collared caribou and median weekly ambient air temperature for the period 16 August–23 November (fall migration) for each year during 1999–2005 (Dau 2007). These plots show substantial annual variability in: 1) onset of directed, southerly movement; 2) period and rate of maximum movement; 3) duration of southerly movement; and 4) maximum southern extent of distribution. There is no clear pattern in any of these results to indicate that the fall migration has shifted later in time. This may be partly attributable to small samples of satellite-collared caribou in this herd, and variability both within and among years in weather parameters.

I also used stepwise linear regression to examine the relationship between fall weather conditions and movements of caribou (Dau 2007). In all models, air temperature and windchill were positively correlated with median caribou latitude. Additionally, in 2004 snow depth was negatively correlated with latitude. Although based on very small numbers of caribou and years, this approach suggests warm fall weather could delay caribou migrations.

Winter Range. Winter range is the most difficult of all WAH seasonal ranges to delineate. The area identified as winter range on Figures 1 and 2 represents where most of the herd wintered in most years since the mid 1980s. Of course, caribou seasonal ranges are not mutually exclusive and, during winter, WAH caribou may occur throughout their total annual range albeit at very low densities in some areas (Figure 14; Tables 7 and 8). Although VHF and satellite radio collars have been deployed in the WAH only since 1979 and 1987, respectively, and sample sizes of collared caribou have always been small in relation to the size of the herd, telemetry data illustrates the importance of the Nulato Hills, Kotzebue Sound, and eastern portions of the Seward Peninsula as winter range for this herd.

Most of the WAH wintered in the northern Nulato Hills (subarea 8, Figure 15) or lower Kobuk and Selawik drainages (subarea 4, Figure 15) during the winter of 2006–2007 (Tables 7 and 8). In contrast, during the winter of 2007–2008 most of the WAH wintered in the eastern portion of its range (subareas 4, 5, and 7; Figure 15). During the winter of 2008–2009, most of the WAH wintered on the Seward Peninsula (subarea 7) and in Kotzebue Sound (subarea 4).

The estimates of winter range density reported in Table 8 do not include reindeer or caribou from the TCH or CAH that also use WAH winter range. Therefore, these estimates represent minimum densities. This would primarily affect densities reported for the central Brooks Range, the foothills of the Brooks Range east of the Utukok River, and the Seward Peninsula. However, during the winter of 2008–2009, a substantial proportion (33–50%) of the TCH wintered in subarea 9.

Satellite Collars. The objectives and some limitations of the WAH satellite collar program were previously described (Dau 2007). As of 31 March 2009, the master PTT data set included >250,000 locations. However, this includes many locations of low accuracy and is based on only 122 individual caribou. Therefore, PTT data should be used cautiously as a representation of the entire WAH.

Genetics. We were unable to genetically differentiate between 13 TCH and 33 WAH caribou using microsatellite loci (P. Groves, unpublished report). These results may have been affected by small sample sizes.

MORTALITY

Our estimates of adult mortality are conservative because they exclude bulls that generally experience higher mortality rates than cows. Also, we do not collar emaciated, injured, or clinically diseased cows even though these individuals compose part of the population. Additionally, we collar very few yearling cows. Although these factors would elevate the WAH mortality curve, they should not affect its temporal trend (Dau 1997). Age-related bias in the sample of collared WAH caribou is probably small for several reasons: we collar caribou every year, we deploy approximately the same number of collars annually, and we do not select cows on the basis of age or maternal status. Also, most collared cows die before batteries in the collar are exhausted: During 2000–01 through 2008–09, 169 caribou with active collars died (82%) versus 37 that exhausted their batteries while still alive; the average collar life for those cows that outlived their VHF battery was 6 years (SD = 3). Other factors are probably more problematic than aging of collared individuals (e.g., small sample sizes of collared caribou and our inability to frequently cover the entire range of this herd during radio tracking surveys). We believe our estimates of adult cow mortality provide a reasonably accurate index of trends through time for the entire herd. However, if this data is used to model WAH population dynamics, even a small bias in adult cow mortality could have large effects on resulting estimates of population size or trend. The mortality rates for the 2005–2006 and 2007–2008 collar years were the highest ever recorded (29% and 30%, respectively; Table 3, Figure 7). The value for 2005–2006 is slightly lower than previously reported (Dau 2007) because the sample this estimate was based on erroneously included some cows collared with ST-14 satellite collars. The mortality estimates for these two collar-years could be biased high for some unknown cause; however, we have no evidence to suggest this is the case for either year. During December 2005, northwest Alaska experienced several days of above freezing temperatures and rain. This created a heavy, dense ice crust that persisted throughout the rest of the winter. I suspect this heavy crust substantially contributed to the high mortality in 2005–2006 as well as the obviously poor body condition of bulls and cows in spring 2006. In contrast, I do not know why the 2007–2008 mortality rate could have been so high. I found an unusually high number of wolf-killed caribou during that winter on the Seward Peninsula but have no way to correlate that with that years' mortality estimate.

Perhaps even more important than high mortality during 2005–2006 and 2007–2008 is that cow mortality was high during 3 of the last 5 years (Table 3, Figures 7 and 8). Adult cow mortality has equaled or exceeded 20 deaths per 100 collared cows only 5 times since 1984. Three of these high mortality years occurred in the last 5 collar years: 2004–2005, 2005–2006 and 2007–2008 (22, 29, and 30 deaths:100 collared cows, respectively). Indeed, the 2008–2009 mortality estimate will probably equal or exceed 20% within the next 2 years as we retroactively censor collared cows from the sample as we determine that their collars exhausted their batteries. In previous reports (e.g., Dau 2007) I noted that annual estimates of adult mortality showed no statistically significant linear trend through time. Now, after correcting errors in WAH mortality data and adding recent years, there is a significant—albeit slow—linear increase in adult cow mortality through time (slope = 0.44, $R^2 = 0.39$, F = 14.64, P = 0.0009).

Figure 8 illustrates that adult mortality has slowly increased while recruitment has slowly decreased since the early to mid 1980s. These trends are consistent with our estimates of population size (Figure 6). As previously reported (Dau 2007), uncertainty associated with estimates of adult mortality and calf recruitment could shift either of these relationships up or down. However, the opposing trends in these relationships are more important than their annual values *per se*'. The high adult cow mortality during some recent years seems to be the biggest departure from the previous period of sustained population growth. High cow mortality in recent years is probably largely responsible for the recent decline of this population.

We conducted several Kaplan-Meier Product-Limit survival analyses on VHF and PTT telemetry data for the years 1981–2008. Survival functions were significantly different for bulls and cows (median survival = 2 yrs and 4 yrs, respectively; all P-values = 0.00 for the Gehan-Wilcoxon, Cox-Mantel, Logrank, Peto-Wilcoxon and Cox's F tests; Figure 16). This is undoubtedly influenced by our bias in collaring old bulls vs. randomly collaring cows >2 yrs old. I excluded bulls from the sample to determine whether collar type has affected cow survival. I defined 'heavy collars' as model ST-3 or ST-14 satellite collars, and 'light collars' as model 600 conventional VHF collars as well as models ST-10, ST-18, ST-20 and TAW-4610 satellite collars. Median survival was significantly different for the 2 groups (4 yrs vs. 3 yrs for light vs. heavy collars, respectively, all P-values <0.03). Within the group of 'light' collars, there was no significant difference in estimated survival for VHF collars vs. all models of satellite collars (median survival = 5 yrs for each group; all P-values >0.40). Caveats of survival analyses are that transmitter battery life and age of the caribou at the time it was first collared could influence estimates of survival. Note that unlike classic Kaplan-Meier survival analyses, in this analysis each step denotes an additional year since the time of collaring rather than additional year since birth.

Conclusions regarding seasonal mortality patterns for bulls should be viewed with caution given small sample sizes for radiocollared bulls. This has been exacerbated by our inability to determine time of death even to year for some caribou through conventional radiotelemetry techniques, and our preference to deploy satellite collars on cows. Despite small samples of collared bulls, seasonal differences in mortality are still evident (Figure 17). Bull mortality attributable to hunting and natural factors is highest during fall. This is not surprising given hunter preferences for quality meat and trophies at this time of year. Additionally, the natural mortality rate for bulls is highest during fall as well. This may be partly attributable to unreported wounding losses caused by hunters being erroneously attributed to natural mortality.

Additionally, bulls seem more vulnerable to wolf and bear predation during fall than during other times of the year. Although some bulls die of injuries sustained during rut, my observations suggest they probably die weeks or months later of abscesses so likely fall into the winter period. We recorded no harvests of bulls during spring or summer. Of course, hunters take some bulls during both of these seasons; however, the number taken is too small to be detected through telemetry data.

Seasonal differences in mortality rates were less pronounced for cows than bulls (Figure 18). Cows died from natural causes at essentially the same rate during fall and winter (0.24 and 0.25 deaths/wk, respectively). This was somewhat higher than natural mortality rates during spring (0.16 deaths/wk) and summer (0.20 deaths/wk). The harvest rate for cows was highest during winter (0.05 deaths/wk) followed by fall and spring (0.03 and 0.02 deaths/wk, respectively). No collared cows were reported harvested during summer. As with bulls, we know that some cows are taken each summer by people that live in communities within WAH summer range; however, the number taken is too small to be detected through telemetry data.

Seasonal mortality rates for bulls and cows are consistent with Kaplan-Meier survival functions in that bulls exhibited higher mortality throughout most of the year. Spring was the only exception when bulls exhibited 0.10 deaths/week and cows 0.18 deaths/week.

Harvest

Season and Bag Limit. On state-managed lands the following seasons and bag limits were in effect throughout the reporting period.

2006–2007 and 2007-2008 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Units 21D, 22A, 24A remainder, 24B remainder, 24C, 24D, and 26A		
Units 21D, 22A, 22B remainder, 24A remainder, 24B remainder, 24C, 24D, and 26A		
Resident Hunters: 5 caribou per day		
Bulls	No closed season	
Cows	1 Jul–15 May	
Nonresident Hunters: 5 caribou total per year		
Bulls		No closed season
Cows		1 Jul–15 May

2006–2007 and 2007-2008 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 22B west of Golovnin Bay and west of Fish and Niukluk Rivers excluding Libby River		
Resident Hunters: 5 caribou per day	1 Oct–30 Apr	
Nonresident Hunters: 5 caribou per year		1 Oct–30 Apr
Unit 22C Resident Hunters: 5 caribou per day	May be announced	
Nonresident Hunters: 5 caribou per year		May be announced
Unit 22D that portion in the Pilgrim River Resident Hunters: 5 caribou per day	1 Oct–30 Apr	
Nonresident Hunters: 5 caribou per year		1 Oct–30 Apr
Unit 22D that portion in the Kougarok, Kuzitrin, American, Agiapuk River drainages Resident Hunters: 5 caribou per day Bulls Cows	 No closed season 1 July–15 May	
Nonresident Hunters: 5 caribou per year Bulls Cows		 No closed season 1 July–15 May

2006–2007 and 2007-2008 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 22D Remainder Resident Hunters: 5 caribou per day	May be announced	
Nonresident Hunters: 5 caribou per year		May be announced
Unit 22E that portion east of and including the Sanaguich River Resident Hunters: 5 caribou per day Bulls Cows	 No closed season 1 July–15 May	
Nonresident Hunters: 5 caribou per year Bulls Cows		 No closed season 1 July–15 May
Unit 22E remainder Resident Hunters: 5 caribou per day	May be announced	
Nonresident Hunters: 5 caribou per year		May be announced
Unit 23 Resident Hunters: 5 caribou per day Bulls Cows	 No closed season 1 July–15 May	
Nonresident Hunters: 2 caribou per year in 2006–2007, but 1 caribou bag per year in 2007–2008 Bulls Cows		 No closed season 1 July–15 May

Federal hunting seasons were identical to state seasons during this reporting period. However, the bag limit under federal subsistence regulations was 15 caribou per day in Unit 23, 10 caribou per day in Unit 26A, and 5 caribou per day in other units used by the WAH.

Board of Game (BOG) Actions and Emergency Orders. During this reporting period no emergency orders (EOs) were issued for caribou hunting within the range of the WAH.

Based on actions taken during the March 2006 statewide BOG meeting, the nonresident caribou bag limit in Unit 23 was reduced to 2 caribou per year in 2006–2007, and then 1 caribou per year in 2007–2008.

There were 7 proposals submitted during the 2007 fall BOG meeting in Bethel to increase the nonresident caribou bag limit in Unit 23: all failed. There was also a proposal to modify the dates of the Noatak Controlled Use Area to be in effect 15 September–30 October. This proposal failed as well. The rationale for not passing any of these proposals was to provide the Unit 23 User Conflict Working Group more time to try to develop a comprehensive approach to reduce conflicts throughout Unit 23, and to avoid doing anything that might increase conflicts in the meantime. During the fall 2007 meeting, the BOG established a new controlled use area north of Anaktuvuk Pass in Unit 26A. This CUA prohibits the use of aircraft for hunting caribou during 15 August–15 October except between publicly-owned airports.

During a special teleconference meeting during July 2008, the BOG considered a proposal to 1) increase the nonresident caribou bag limit to 2 per year in selected portions of Unit 23 and 2) change the dates of the Noatak Controlled Use area to 9 September–30 September. The board did not pass this proposal because the proposal was submitted out of cycle (i.e., not for a Region V BOG meeting) and may not have received adequate vetting by the public, and because there was strong opposition to increasing the nonresident caribou bag limit at public meetings held in Kiana and Noatak where this was discussed.

Human-Induced Harvest. The total harvest of WAH caribou was approximately 9,500 caribou in 2006–2007 and 10,200 caribou in 2007–2008 (Table 9). These harvest levels were substantially lower than those reported in previous years. This is largely because during this reporting period caribou were less available to communities within the range of this herd, partly because of the late onset of fall migrations and perhaps because of the decline in population size, than in previous years. As a result, estimated subsistence harvests declined. Additionally, harvests by nonlocal hunters were lower in 2007–2008 than in previous years although this had little effect on the overall number taken. The total annual harvest constituted about 3% of the population each year using the 2007 population estimate of 377,000 caribou. Despite the decline in estimated number of caribou harvested, this harvest rate is similar to previous years (Dau 2007) because of the corresponding decline in population size. These harvest estimates do not include caribou killed but not retrieved. Each year some harvested caribou are left in the field when suspected to be diseased or found to be heavily parasitized. Additionally, some caribou are unintentionally wounded and later die. The number of caribou killed but not retrieved is unknown and virtually impossible to estimate; however, observations of department staff throughout the range of this herd suggest this number could be substantial in some years.

Fixed kernel analysis of PTT location data for WAH and TCH caribou in relation to known hunting areas for the communities of Barrow, Atqasuk and Nuiqsut indicate that we have overestimated the proportion of WAH caribou taken by these communities in previous reports. This reduced our estimates of overall annual WAH harvest levels by <0.25% which is inconsequential relative to other sources of error in this estimate; however, this will substantially increase annual harvest estimates for the TCH.

Permit Hunts. All caribou hunting by residents that live north of the Yukon River and within the range of the WAH is administered through the registration permit hunt RC900. Registration permits are available at license vendors throughout the range of this herd. The permits are free, and there is no limit to the number of permits issued each year. Comparisons of registration harvest data and community harvest assessments indicated only about 10% of the actual harvest was reported through this system (Georgette 1994). The exception to this is the community of Nome, where compliance with reporting requirements is believed to be much better (K. Persons, personal communication). As a result of low compliance with reporting requirements, the department has not requested harvest information from registration permit holders outside of Unit 22 since the year 2000.

Nonresidents and residents that live outside the range of the WAH must carry a statewide caribou harvest ticket when hunting. Alaska Bureau of Wildlife Enforcement officers indicate that compliance with this requirement is almost 100% (C. Bedingfield, J. Rodgers and D. Hildebrand, personal communication). We think this system is reasonably accurate for monitoring caribou harvested by nonlocal hunters.

Hunter Residency and Success. The department harvest model (Sutherland 2005) estimated that hunters living within the range of this herd took roughly 8,800 (95% c.i.=6,801–12,664) WAH caribou in 2006–2007 and 9,800 (95% c.i.=1,199–9,297) in 2007–2008 (Table 9). As in past years most of the subsistence harvest of WAH caribou came from Unit 23 (78% in 2006–2007 and 77% in 2007–2008).

There has been no clear trend in numbers of nonlocal hunters who have pursued the WAH since 1998–1999 (Table 10). This is surprising because many nonlocal hunters who came to Unit 23 during this reporting period indicated that declines in the Mulchatna caribou herd (MCH) had caused them to shift their effort to the WAH. It may be that other factors, such as the economy or limited availability of commercial operators, are limiting numbers of nonlocal hunters. As in the past, most WAH caribou taken by nonlocal hunters were harvested in Unit 23 (80% in 2006–2007 and 77% in 2007–2008).

In an attempt to reduce numbers of nonresident hunters in Unit 23 and thus reduce conflicts among users, the BOG reduced the nonresident bag limit from 5 to 2 caribou/yr in 2006–2007, and further reduced it to 1 caribou/yr in 2007–2008. From 1998–1999 through 2005–2006, when the Unit 23 nonresident bag limit was 5 caribou/yr, 98% of nonresident hunters took $\leq$2 caribou per year. I grouped all years when the nonresident bag limit was 5 per year and compared the median and mean number of caribou taken per nonresident hunter with the years when the bag limit was 2 or 1 caribou per year. The median number of caribou taken by nonresidents for each period was 1 per year. The bag limit reduction caused a small but statistically significant ($T = 2.6$, $P = 0.01$) decline in the mean number of caribou taken per nonresident hunter from 0.97 (n =

813, SD = 0.64) to 0.89 (n = 2,079, SD = 0.76). The statistical significance of this difference is largely attributable to the very large sample sizes of hunters in each period.

Combining harvest data from all GMUs and the years 1998–1999 through 2007–2008, only 7% of nonlocal resident hunters took >3 caribou per year. Three hundred forty one nonlocal resident hunters (10% of the total number of nonlocal resident hunters) reported taking at least 1 cow during this time. In contrast, only 2% of nonresident hunters reported taking a cow during this same period. Success rates were 58% for nonlocal resident hunters and 73% for nonresident hunters.

Harvest Chronology. Subsistence harvest patterns are primarily affected by seasonal movements and availability of caribou, and secondarily, by traveling conditions for hunting. For example, Point Hope and North Slope villages harvest Western Arctic caribou mainly during July and August while the WAH is on its summer range. In contrast, Shaktoolik and Unalakleet hunters primarily take WAH caribou during September through March. In Unit 23, harvests are typically high during the fall migration, and also when caribou winter near communities. Even so, caribou harvests all but cease during periods of freeze-up and breakup, when travel by boat or snowmachine is difficult. Unlike many subsistence activities that are seasonally specific, subsistence hunting of caribou occurs whenever they are available and accessible.

During early fall, most subsistence hunters select large bulls because these animals provide the highest quality meat. Once bulls enter rut and become unpalatable, typically after 7–10 October, most subsistence hunters take cows until approximately March or April. In decades past, subsistence hunters resumed harvesting bulls in roughly mid-to-late December (W. Uhl, personal communication). During the rest of the year, subsistence hunters take caribou of both sexes based on availability and the body condition of individual animals.

Despite no closed season on bulls, most caribou taken by nonlocal hunters are harvested between August 25 and October 7 (85% for 1998–1999 through 2007–2008, combined). In 2006–2007, 89%, and in 2007–2009, 87%, of the nonlocal harvest was taken between these dates. The temporal concentration of nonlocal hunters in Unit 23 during this time combined with intense subsistence hunting during the same period is why conflicts among users have occurred in this unit for many years.

Transport Methods. Most subsistence hunters harvest WAH caribou using snowmachines during late October–early May, and boats or 4-wheelers during the rest of the year. Few local hunters use aircraft to hunt caribou. Guides now rely heavily on 4-wheelers for hunting. This practice dramatically increased during the mid 1990s in Unit 23, and most guides now cache 4-wheelers at remote camps.

Transport methods used by nonlocal caribou hunters have been surprisingly consistent through time (Table 11). During this reporting period, most nonlocal hunters accessed hunting areas by airplane (76% in 2006–2007 and 78% in 2007–2008). Boats were the next most commonly used transport method but were used to a lesser degree during each year of this reporting period than in the past.

Other Mortality

Disease. We have collected blood annually from caribou during the Onion Portage project to screen for exposure to selected pathogens and measure haptoglobin levels since 1992. During 2006, 9% of caribou had an elevated haptoglobin level. This was within the range of levels seen in previous years. In contrast, during 2007, 25% of the individuals sampled had an elevated haptoglobin level. This is the highest level recorded for this herd. We saw nothing during the health assessment necropsies to suggest this would be the case and do not know why so many caribou had an elevated haptoglobin level. Overall, about 9% of all caribou tested during 1992–2007 have had an elevated haptoglobin level. There has been no temporal trend in the percentage of caribou with an elevated haptoglobin level (Table 12).

Levels of exposure to brucellosis continued to be low during this reporting period (Table 12). The primary impact of this disease on caribou populations is reduced reproductive success (Dieterich 1981). The low proportion of WAH cows exposed to this disease in recent years suggests brucellosis is not affecting population dynamics of the WAH at this time.

The department collected 10 caribou, including males and females of various ages, during the Onion Portage project in September 2007 to assess their health. Based on necropsies, gross characteristics of the collected caribou suggested that WAH animals were at least as healthy as any other herd for which health assessments have been conducted. This impression was subsequently confirmed through laboratory tests. Parasite loads were low as was exposure to bacteria and viruses. No levels of heavy metals (Arsenic, Barium, Chromium, Lead, Mercury, Nickel, Vanadium, Tin, and Titanium) were at levels considered toxic for caribou. This is consistent with results of previous studies (Alaska Department of Public Health 2001). Although several caribou were slightly low for some essential minerals, there was no indication that mineral deficiency is a problem for this herd. Histopathology revealed no disease problems at the cellular level that likely go beyond the individual caribou sampled. The mean Kitchner body condition score for WAH caribou was similar to that for the Northern Alaska Peninsula Herd (NAP) and higher than for the MCH. Percentage bone marrow fat was substantially higher in WAH animals than for caribou collected from the NAP and MCH.

Results of 2007 health assessments, serology samples since 1992, opportunistic observations by staff, and hundreds of caribou body condition reports from hunters all suggest that neither disease nor a chronic decline in body condition likely caused this population to decline during 2003 to 2007.

HABITAT

Assessment

The department did not monitor WAH range condition during this reporting period. However, the department provided satellite location data to an NPS employee (K. Joly) who is pursuing a multi-year investigation of winter habitat use by WAH caribou as part of Ph. D. dissertation at the University of Alaska, Fairbanks. Satellite collar locations were also used to show avoidance of burned winter range habitats by caribou (Joly et al., 2003).

Enhancement

There were no WAH habitat enhancement activities during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

WAH Cooperative Management

The Western Arctic Caribou Herd Working Group (WG) was organized in 1997. The purpose of the working group is to ensure the conservation of the Western Arctic caribou herd, safeguard the interests of all users of the herd, and integrate indigenous knowledge with Western science. The working group consists of 20 voting chairs representing multiple stakeholders. It is a nonregulatory body that emphasizes shared decision-making. The Bureau of Land Management, U.S. Fish and Wildlife Service, NPS, and ADF&G support the WG.

During this reporting period, the WG held 1 meeting each year. The WG, through department staff, produced an annual newsletter, *Western Arctic Caribou Trails*, that was mailed to about 9,000 post office box holders within the range of the WAH. The WG technical committee met in conjunction with WG meetings each year to discuss interagency cooperation. During this reporting period the WG submitted comments to the State of Alaska Department of Natural Resources regarding revision of the Northwest Area Plan.

During July 2008, the Department of Public Safety (DPS) Wildlife Enforcement Division received reports that Point Hope hunters had shot numerous caribou and failed to completely salvage a substantial number of them. At the time weather was poor and it took the troopers almost 2 weeks to investigate the reports. Two troopers on 4-wheelers and 1 trooper in an R-44 helicopter spent a week based out of Point Hope searching the area and interviewing residents of the community. Initial press releases from DPS stated that about 120 caribou had been killed and roughly half of them had not been fully salvaged. The story, which included photos of a month-old calf standing next to the carcass of a bloated bull (erroneously reported to be its mother), was widely distributed by the media and within 2 days had created a furor throughout Alaska and beyond. After DPS staff met with residents of Point Hope to discuss the situation, Point Hope hunters conducted their own search of the area using 4-wheelers and a North Slope Borough helicopter. They found only 9 caribou that had not been fully salvaged and stated that these had been left behind because the caribou had been sick. Troopers conducted numerous interviews with residents of Point Hope through the fall of 2008. In March 2009, eight hunters from Point Hope were charged with failure to completely salvage all of the caribou they had taken. The charging documents stated that at least 37 caribou at 25 kill sites had not been completely salvaged. As of June 2009, this case has not been tried.

During the last WAH population decline in the 1970s, department staff and University of Alaska researchers alleged that wasteful hunting practices by local hunters was a major cause of the decline. That, combined with draconian restrictions on hunting by all users, fueled a management crisis that took decades to repair. Indeed, a primary reason for forming the WAH Working Group during the 1990s was to prevent another situation like that which occurred in the 1970s from being repeated.

The issue of ‘waste’ should be addressed soon by the department, DPS, and the WAH Working Group. Everyone agrees that waste is wrong. But, even though the law is clear regarding what must be salvaged from harvested wildlife, there are differences among subsistence users, agency staff, and recreational hunters regarding what is fit for human consumption and, hence, what constitutes ‘waste.’ The WAH will eventually decline to lower levels; indeed, it may have begun

to decline already. If it becomes necessary to restrict hunting, it will be critical for agencies and users alike to endorse an approach to prevent waste that is perceived to be fair, and that will effectively conserve caribou. There is no better entity to facilitate this discussion than the WAH Working Group.

Genetics

A log-likelihood ratio exact test indicated there is no significant difference in the genotypes of WAH and TCH caribou ($P>0.40$; P. Groves, personal communication.). The range of TCH genotypes are contained within that of the WAH. These results are not surprising given that individuals from both herds mix to some degree during the fall rut in many years, and that sample sizes for each herd were small.

An independent Ph.D. project investigating genetic overlap between WAH and TCH caribou along with Alaskan reindeer is currently in progress (K. Hibbard-Rode, University of Alaska, Fairbanks). In 2007 we provided whole blood samples from 26 WAH caribou in support of this project. Preliminary results from this study are consistent with those above: WAH and TCH caribou are not genetically distinct (K. Hibbard-Rode, personal communication).

Additionally, in 2009 we provided tissue sample to Dr. S. Cote, a researcher at the University of Laval, Sainte-Foy, Quebec, Canada. Dr. Cote is examining the genetic relatedness of caribou herds throughout North America.

Resource development

The WAH has had little contact with large-scale resource development structures throughout its entire range. It probably has one of the most pristine total ranges of any herd in North America. The Red Dog Mine, Road and Port Site are located wholly within the northwestern portion of WAH range but appear to have had only limited, localized effects on movements and distribution of WAH caribou. This is partly because Teck Alaska, Inc. policies have attempted to minimize impacts on subsistence resources, including caribou, and users. It is also partly because locally-hired truck drivers and other employees have voluntarily acted to minimize impacts of vehicle traffic between the mine and port site on wildlife.

A number of new developments within the range of the WAH are currently being considered. These are:

1. Oil and gas development in NPR-A. Roughly 80% of the WAH calving grounds is within the NPR-A South Planning Area. This area contains important insect relief habitat during summer as well. Caribou from this herd also use the Northeast and Northwest Planning Areas during summer as well but to a much lesser degree than the South Planning Area.

2. Coal development. Vast, high-grade coal deposits occur in a broad band beneath the northern foothills of the Brooks Range. Coal underlies virtually the entire WAH calving grounds. The Arctic Slope Regional Corporation began another exploration project based at the Deadfall Syncline in March 2007 to assess the economic feasibility of developing this resource. The expected duration of this project is 5

years. If coal is eventually extracted from this site, road or railroad transport to the Red Dog Mine and Port Site currently appears to be the most likely option for getting it to a deep water port. This would also allow the Red Dog Mine to reduce its fuel costs by providing a less expensive alternative to diesel fuel.

3. Expansion of the Red Dog Mine. Test drilling for additional lead and zinc deposits as well as methane has been conducted in this area for several years. Teck Alaska, Inc. is researching transport of waste water and lead-zinc product from the mine through pipelines to their Port Site (W. Hall, personal communication). A third pipeline would transport fuel from the port to the mine. All pipelines would be buried in a lateral expansion of the road bed. This could reduce fugitive dust (Ford and Hasselback 2001) and traffic levels on the road, both of which would benefit wildlife.

4. New transportation.

    a. The state, in cooperation with Teck Alaska, Inc., is considering building a road linking the community of Noatak to the Red Dog Mine-Port Site road. This would reduce the cost of transporting fuel to this community and enable employees who live in Noatak to commute to Red Dog.

    b. Construction of a new airport near the community of Noatak capable of handling large jet service (e.g., Boeing 737s). This is being considered to reduce risks associated with jet service to the Red Dog Mine in a mountainous area.

    c. Extension of the Prudhoe Bay-Kuparuk oil field road system to Nuiqsut.

    d. Building of a new, 100-mi road from Pump Station 2 to Nuiqsut.

    e. Building of a road or railroad from the Dalton Highway to the Ambler-Bornite area. Two additional roads would then connect to the Red Dog Road and Nome-Council road system.

    f. Building of a road from the Dalton Highway to Umiat to facilitate development of natural gas deposits.

    g. In 2008 and 2009, the Northwest Arctic Borough conducted a series of scoping meetings regarding a project to build a road that would connect Kiana, Noorvik, Selawik, and Kotzebue. This project is not currently funded.

5. Hard rock mining.

    a. Nova Gold has conducted assessment work since the summer of 2003 to evaluate the feasibility of establishing a mine in the Ambler Mining District (near the old Bornite Mine).

b. Construction of the Rock Creek mine near Nome is almost complete; however, further construction has been at least temporarily stopped for economic reasons.

c. Alaska Gold began test drilling for gold in the Squirrel and Omar Rivers in summer 2007. No activities were conducted at this site in 2008.

d. Alaska Gold is also conducting test work to determine whether to reopen the Independence Mine at the confluence of the Kugruk and Independence Rivers on the Seward Peninsula.

e. An unknown company conducted prospect work based out of the Bear Creek Mine in the Buckland drainage during the summers of 2006 and 2007.

More information about potential industrial development within the range of the WAH is provided by Schoen and Senner (2002).

School programs

In 2006, 8 students from the Shungnak High School participated in the Onion Portage caribou project with 2 teachers and several chaperones. In addition to working with agency staff, the students learned subsistence skills from their chaperones. In 2007, 10 students from Kiana and 7 students from Kotzebue High School participated in this project. During the winter of 2007–2008, we provided satellite collar data to one of the Kotzebue students (R. Magdanz) who had come to Onion Portage for a science fair project. This student won the state science fair for Alaska and presented his project in Las Vegas at the international science fair. Student involvement in this project has been a positive experience for students, school district staff and agency staff since its inception in 1991.

Conflicts between the WAH and reindeer industry

As in the past (Dau 2001, 2003, 2005), the Seward Peninsula reindeer industry continued to lose deer to the WAH during this reporting period. Most of the reindeer herds on the eastern portion of the Seward Peninsula have been totally lost to the WAH. As a result, fewer reindeer have been seen accompanying WAH caribou in recent years compared to the 1990s. Only the Davis (Nome), Kakaruk (Teller) and Ongtowasruk (Wales) herds are still commercially viable as of spring 2009. Small herds numbering from several dozen to several hundred deer also occur near Koyuk, White Mountain, Brevig Mission, and the Imuruk Basin. The department posts a Web page showing real-time locations of satellite-collared WAH caribou on the Seward Peninsula to help herders avoid conflicts with caribou.

User conflicts

Conflicts among nonlocal hunters, guides, transporters and local hunters continued in portions of WAH range during this reporting period. These conflicts were most pronounced in Unit 23 but also occurred near Anaktuvuk Pass. This complex issue involves all hunters, not just caribou hunters, and is affected by a variety of factors (Dau 2005). The limiting factor driving conflicts in Unit 23 is not inadequate numbers of wildlife, certainly not with regard to WAH caribou.

Rather, the limiting factors are access points and space to accommodate all users. During 2008, an interagency (ADF&G, NPS, FWS, BLM, and DNR) working group that includes representatives of Advisory Committees, the federal RAC, Federal Subsistence Board, Board of Game, Big Game Commercial Services Board, Northwest Arctic Borough, Kotzebue IRA, NANA Corporation, guides, transporters and local organizations was formed to address user conflicts in Unit 23. The group has met 3 times in Kotzebue since its establishment and various subcommittees of the group have met additional times via teleconference. The group is funded by state and federal agencies through early 2010.

CONCLUSIONS AND RECOMMENDATIONS

The WAH is still very large despite substantial decline from 2003 to 2009. At this point, it is not clear whether the herd experienced 1 or 2 years of episodic decline (the high mortality experienced during 2004–2005 and 2005–2006 could easily account for this decline) and is still capable of stability or slow growth. Alternatively, long term, converging trends in adult cow mortality and recruitment suggest this herd could be entering a phase of persistent decline. We intend to photograph the herd in July 2011 to further assess its trajectory. At this point, there is no evidence that any single factor (e.g., human harvests, predation, environmental contaminants, range degradation, or disease) is currently limiting the size of this herd.

Our recent level of investment in harvest assessment has been adequate during recent years, when the herd was large and stable, to document levels of human demand when access to caribou was limited only by their distribution rather than population size. However, if the herd has not already started to decline, we anticipate it will do so soon. Therefore, Subsistence Division and DWC are working to develop a more comprehensive, statistically-based community harvest assessment program than has been conducted in recent years. The department should continue to monitor harvest of WAH caribou by nonlocal hunters through the statewide caribou harvest ticket system.

Seward Peninsula reindeer continue to be lost to the WAH, albeit more slowly now than in past years when reindeer were present on the eastern portion of the Seward Peninsula. The department should continue to provide real-time information regarding caribou movements and distribution to herders within the constraints of staff, weather, aircraft, and budgets.

In September 2007, the department began a health assessment program to monitor disease in this herd. We intend to collect 10–15 caribou at least once every 1–2 years. Collections will be made during spring and fall.

A number of large-scale developments are being considered for northwest Alaska. Potential impacts of individual projects on caribou and users should not be evaluated in isolation. Instead, the cumulative effects of all existing and proposed development should be considered collectively over the short and long term to predict impacts on people and caribou.

Conflicts between local subsistence hunters, nonlocal sport hunters, and commercial operators have intensified in portions of WAH range since 1992. The primary factor driving these conflicts is inadequate space to accommodate all users. A cooperative, interagency approach to reduce conflicts on a unitwide basis may be more likely to actually reduce conflicts than multiple efforts of individual agencies working only on their respective lands.

The department should continue to support the WAH Working Group and help identify management issues to address. It has been 5 years since the Cooperative Management Plan was updated. The plan is general and robust but, even so, should be updated within the next 1–2 years.

LITERATURE CITED

ALASKA DEPARTMENT OF FISH AND GAME. 2000. Community Profile Database. Division of Subsistence, Anchorage, Alaska.

ALASKA DEPARTMENT OF PUBLIC HEALTH. 2001. Public health evaluation of exposure of Kivalina and Noatak residents to heavy metals from Red Dog Mine. Department of Health and Social Services, Anchorage, Alaska. 24 pp.

BRAUND, S. R. & ASSOCIATES, AND INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH. 1991. North Slope Subsistence Study—Barrow, 1987, 1988, and 1989. Technical Report No. 149. Prepared for the U.S. Department of Interior, Minerals Management Service.

———. 1993. North Slope Subsistence Study - Wainwright, 1988 and 1989. Technical Report No. 147. Prepared for the U.S. Department of Interior, Minerals Management Service.

BROWER, H. K. AND R. T. OPIE. 1996. North Slope Borough subsistence documentation project: data for Anaktuvuk Pass, Alaska for the period July 1, 1994 to June 30, 1995. North Slope Borough Department of Wildlife Management Report[2]. Barrow, Alaska. 36 pp.

———, AND ———. 1997. North Slope Borough subsistence documentation project: data for Nuiqsut, Alaska for the period July 1, 1994–June 30, 1995. North Slope Borough Department of Wildlife Management Report[3]. Barrow, Alaska. 44 pp.

CAMERON, R. D. AND J. VER HOEF. 1994. Predicting parturition rate of caribou from autumn body mass. Journal of Wildlife Management 58(4):674–679.

DAU, J. 1997. Caribou survey-inventory management report. Units 21D, 22A, 22B, 23, 24, 26A. Pages 158–185 *in* M.V. Hicks, editor. Caribou. Alaska Department Fish and Game. Federal Aid Wildlife Restoration Survey-Inventory Activities 1 July 1994–30 June 1996. Grant W–24–3 and W–24–4. Study 3.0. Juneau. AK

———. 1999. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 1996–June 30 1998. M.V. Hicks, editor. Pages 160–185. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–24–5 and W–27–1. Project 3.0. Juneau, AK, USA.

———. 2001. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 1998–June 30 2000. C. Healy, editor. Pages 181-218. Alaska Department

[2] Available from North Slope Borough Department of Wildlife Management, Box 69, Barrow, Alaska 99723 USA.
[3] Available from North Slope Borough Department of Wildlife Management, Box 69, Barrow, Alaska 99723 USA.

Fish and Game. Federal Aid in Wildlife Restoration, Grants W–27–2 and W–27–3. Project 3.0. Juneau, AK, USA.

———. 2003. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 2000–June 30 2002. C. Healy, editor. Pages 204–251. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–27–4 and W–27–5. Juneau, AK, USA.

———. 2005. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 2000–June 30 2002. C. Healy, editor. Pages 204–251. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–27–4 and W–27–5. Juneau, AK, USA.

———. 2007. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 2000–June 30 2002. C. Healy, editor. Pages 204–251. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–27–4 and W–27–5. Juneau, AK, USA.

DAVIS, J. L., P. VALKENBERG AND S. J. HARBO. 1979. Refinement of the aerial photo-direct count-extrapolation caribou census technique. Federal Aid in Wildlife Restoration Grant W– 17–11, Job 3.25R, Juneau, AK. 23pp.

DAVIS, J. L. AND P. VALKENBERG. 1985. Qualitative and quantitative aspects of natural mortality of the Western Arctic Caribou Herd. Final Report. Federal Aid in Wildlife Restoration Project W-17-11, W-21-2, W-22-1-3, Job 3.24R. 71 pp.

DIETERICH, R. A. 1981. Brucellosis. *In* Alaskan Wildlife Diseases. R.A. Dieterich, editor. Pages 53-55. University of Alaska, Fairbanks, AK, USA.

FORD AND HASSELBACH. 2001. Heavy metals in mosses and soils on six transects along the Red Dog Mine haul road, Alaska. Unpublished report. National Park Service, Kotzebue, AK. 73 pp.

FULLER, A. S. AND J. C. GEORGE. 1997. Evaluation of subsistence harvest data from the North Slope Borough 1993 census for eight North Slope villages: for the Calendar Year 1992. Report by Department of Wildlife Management, North Slope Borough, Barrow, Alaska.

GEORGETTE, S. 1994. Summary of Western Arctic Caribou Herd overlays (1984–92) and comparison with harvest data from other sources. Unpublished manuscript. Alaska Department of Fish and Game, Division of Subsistence, Fairbanks, AK 99701 USA.

GROVES, P. 2009. Teshekpuk Lake and Western Arctic Caribou Herds: a genetic comparison using microsatellite DNA. Unpub. rep. 6 pp.

HEPA, R. T., H. K. BROWER AND D. BATES. 1997. North Slope Borough subsistence harvest documentation project: data for Atqasuk, Alaska for the period July 1, 1994 to June 30,

1995. Department of Wildlife Management, North Slope Borough, Barrow, Alaska 99723 USA.

JOLY, K., P. BENTE AND J. DAU. 2003. The Response of overwintering caribou to burned habitat in northwest Alaska. Arctic 60 (4):401-410.

LENT, P. 1966. The caribou of Northwestern Alaska. *in* Environment of the Cape Thompson Region, Alaska. N.J. Wilimovsky and J.N. Wolfe, editors. Pages 481-517. U.S. Atomic Energy Commission, Div. of Tech. Information. Springfield, VA, USA.

PARRETT, L., S. PEDERSEN, J. DAU, G. CARROLL, B. PERSON, A. PRITCHARD AND D. YOKEL. In Prep. Development of a GIS-based method to refine annual herd-specific caribou harvest estimates for Barrow, Alaska, using 2003-2007 caribou harvest and satellite telemetry Data.

PEAKALL, R. AND P.E. SMOUSE. 2006. Genalix 6: genetic analysis in Excel. Population genetic software for teaching and research. Molecular Ecology Notes 6(1):288-295.

PEDERSEN, S. 1989. Point Lay subsistence land and resource use. *In* Impact Assessment, Inc.: Point Lay Case Study. Technical Report No. 139. U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region, Anchorage, Alaska 99518 USA.

———. 1995. Nuiqsut. *In* J. Fall and C. Utermohle, editors. An investigation of the sociocultural consequences of Outer Continental Shelf development in Alaska. Technical report no. 160. U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region, Anchorage, Alaska USA.

———. 2001. Subsistence harvest levels and spatial dimensions of caribou, moose, brown bear and muskox hunting in Nuiqsut during regulatory year 2000. Division of Subsistence, Arctic Region, Alaska Department of Fish and Game, Fairbanks, Alaska 99701 USA.

———. 2005. Open file reports: Barrow, Nuiqsut and Atqasuk community caribou harvest estimates 2002–2003 and 2003–2004. Division of Subsistence, Arctic Region, Alaska Department of Fish and Game, Fairbanks, Alaska 99701 USA.

——— AND R. OPIE. 1990. Subsistence caribou harvest levels and land use in Anaktuvuk Pass, 1989–90. Division of Subsistence, Arctic Region, Alaska Department of Fish and Game and North Slope Borough Department of Wildlife Management, Fairbanks, Alaska 99701 USA.

——— AND ———. 1991. Subsistence caribou harvest levels and land use in Anaktuvuk Pass, 1990–91. Division of Subsistence, Arctic Region, Alaska Department of Fish and Game and North Slope Borough Department of Wildlife Management, Fairbanks, Alaska 99701 USA.

——— AND ———. 1993. Subsistence caribou harvest levels and land use in Anaktuvuk Pass, 1991–92. Division of Subsistence, Arctic Region, Alaska Department of Fish and Game

and North Slope Borough Department of Wildlife Management, Fairbanks, Alaska 99701 USA.

——— , S. GEORGETTE, A. AHMASUK, K. PERSONS, E. SHIEDT AND E. TRIGG. 2006. Subsistence Wildlife Harvests in Three Northwest Alaska Communities, 2004-2005. Alaska Dept. of Fish and Game, Kawerak, Inc. and Maniilaq Assoc., unpub. report. 34 pp.

PRITCHARD, A., K. JOLY AND J. DAU. In prep. Quantifying potential biases in survival and parturition estimates from telemetry data from unknown age caribou.

ROUSSET, F. 2008. Genepop'007: a complete re-implementation of the genepop software for Windows and Linux. Molecular Ecology Resources **8**(1): 103-106.

SCHOEN, J. W. AND S. E. SENNER. 2002. Alaska's western Arctic: a summary and synthesis of resources. Audobon Alaska, Anchorage, Alaska.

SKOOG, R.O. 1968. Ecology of caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. Thesis. University of California, Berkeley, CA. 699pp.

SUTHERLAND, R. 2005. Harvest estimates of the Western Arctic caribou herd, Alaska. Proc. 10th N. Am. Caribou Workshop, Girdwood, AK, USA 4-6 May 2004. Rangifer Special Issue No.16:177-184.

WESTERN ARCTIC CARIBOU HERD WORKING GROUP. 2003. Western Arctic Caribou Herd Cooperative Management Plan. Nome, Alaska. 33pp.

WHITTEN K. R. 1995. Antler loss and udder distention in relation to parturition in caribou. Journal of Wildlife Management 59(2):273–277.

PREPARED BY:

Jim Dau
Wildlife Biologist III

SUBMITTED BY:

Peter Bente
Survey-Inventory Coordinator

Please cite any information taken from this section, and reference as:

DAU, J. 2009. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24 and 26A caribou management report. Pages 176–239 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau.

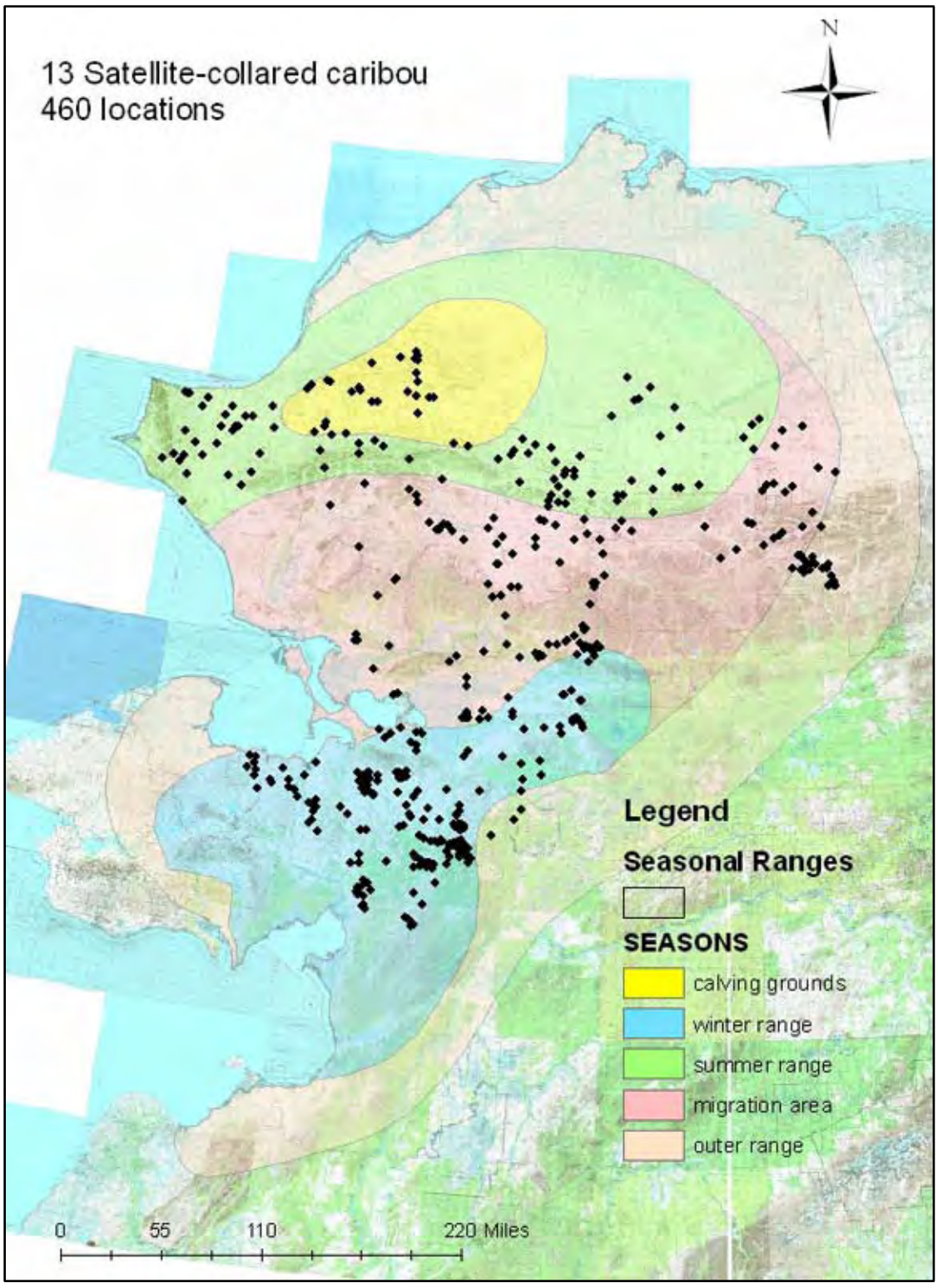


FIGURE 1 Seasonal ranges of the Western Arctic caribou herd with locations of satellite-collared caribou collected during the 2006–2007 regulatory year (data excludes first year caribou was collared; all collars standardized to 1 location every 6 days)

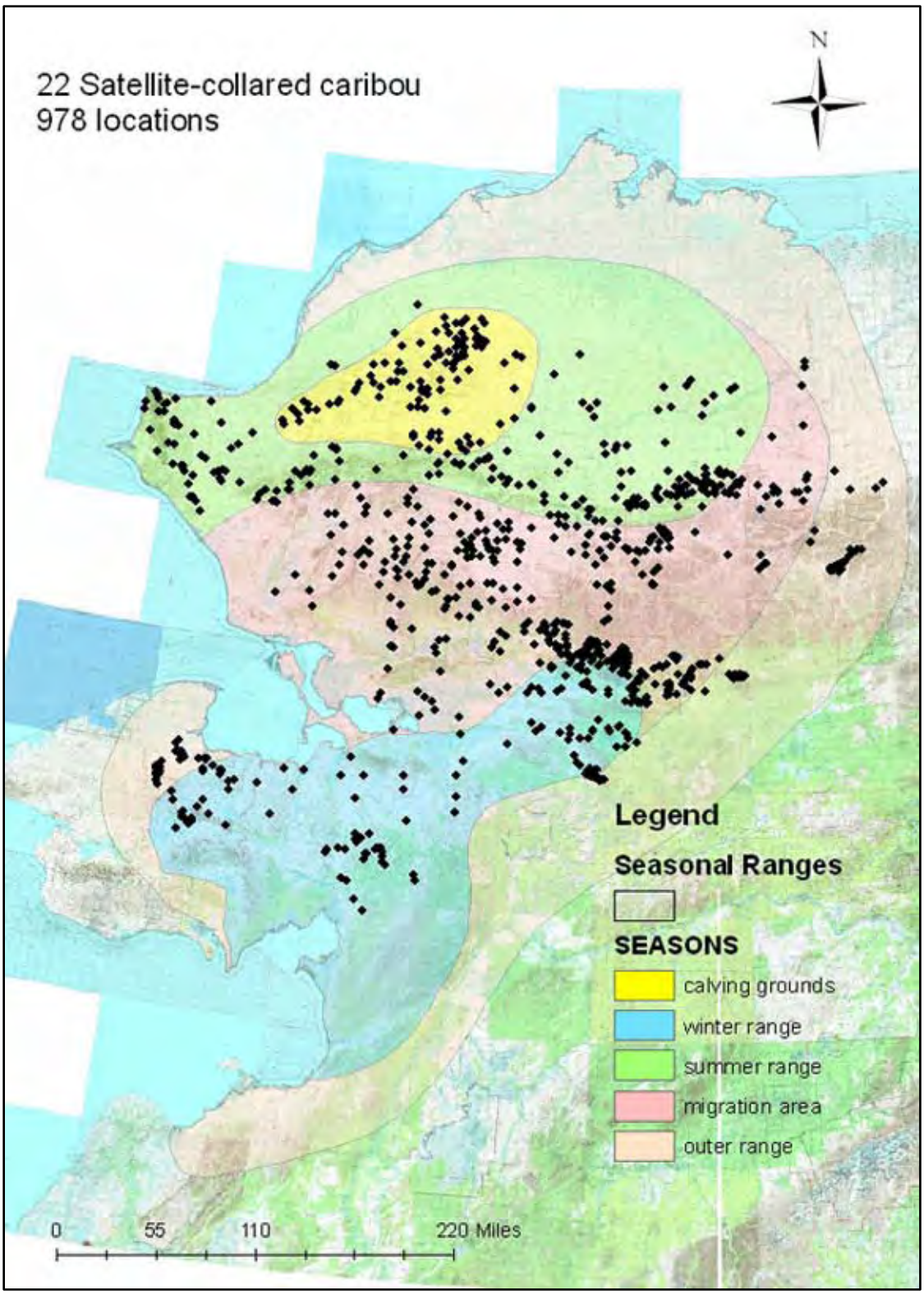


FIGURE 2 Seasonal ranges of the Western Arctic caribou herd with locations of satellite-collared caribou collected during the 2007–2008 regulatory year (data excludes first year caribou was collared; all collars standardized to 1 location every 6 days)

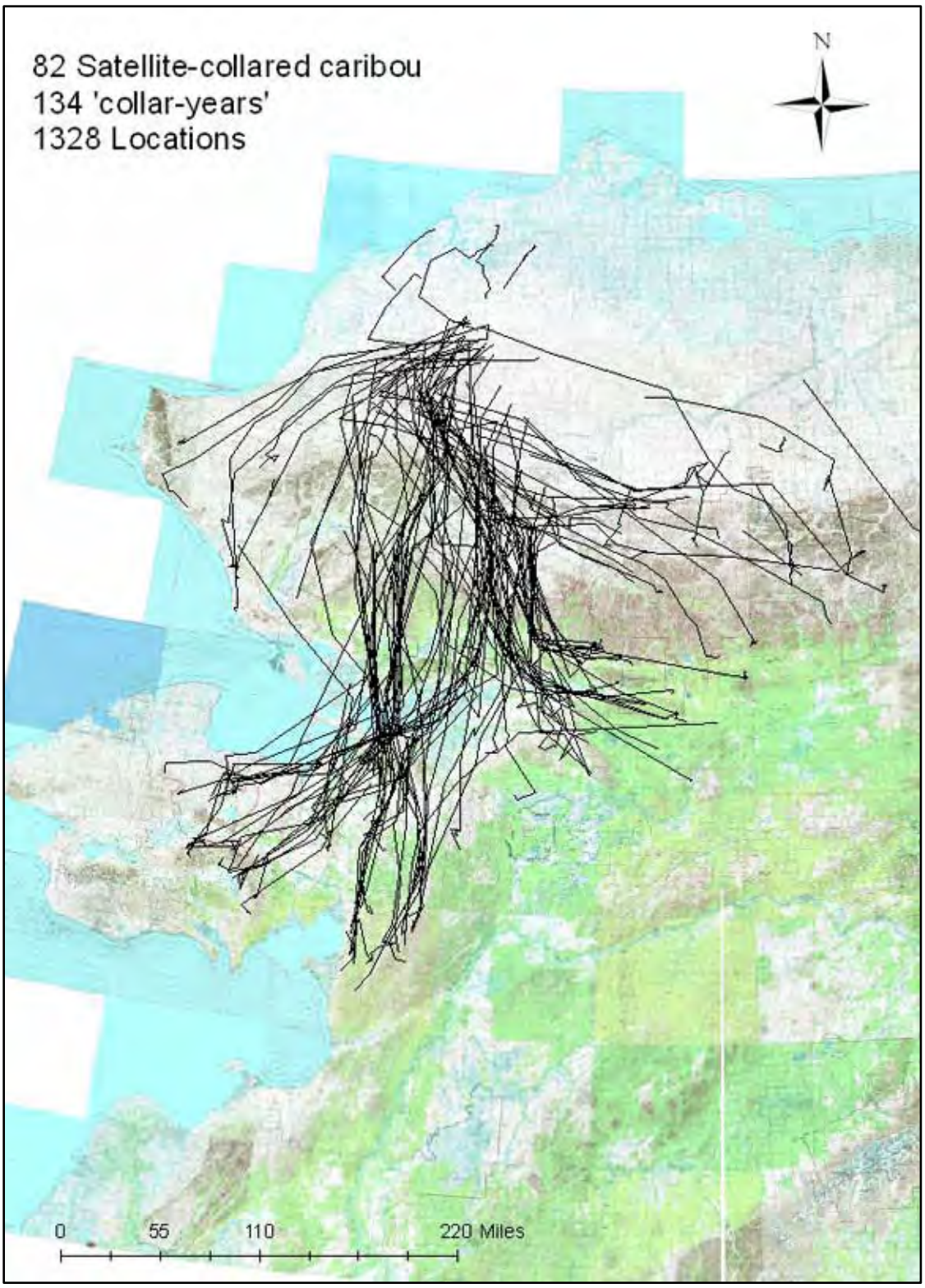


FIGURE 3 Spring (1 April–5 June) movements of satellite-collared Western Arctic herd caribou, 1988–2008 (data excludes first year caribou was collared; all collars standardized to 1 location every 6 days)

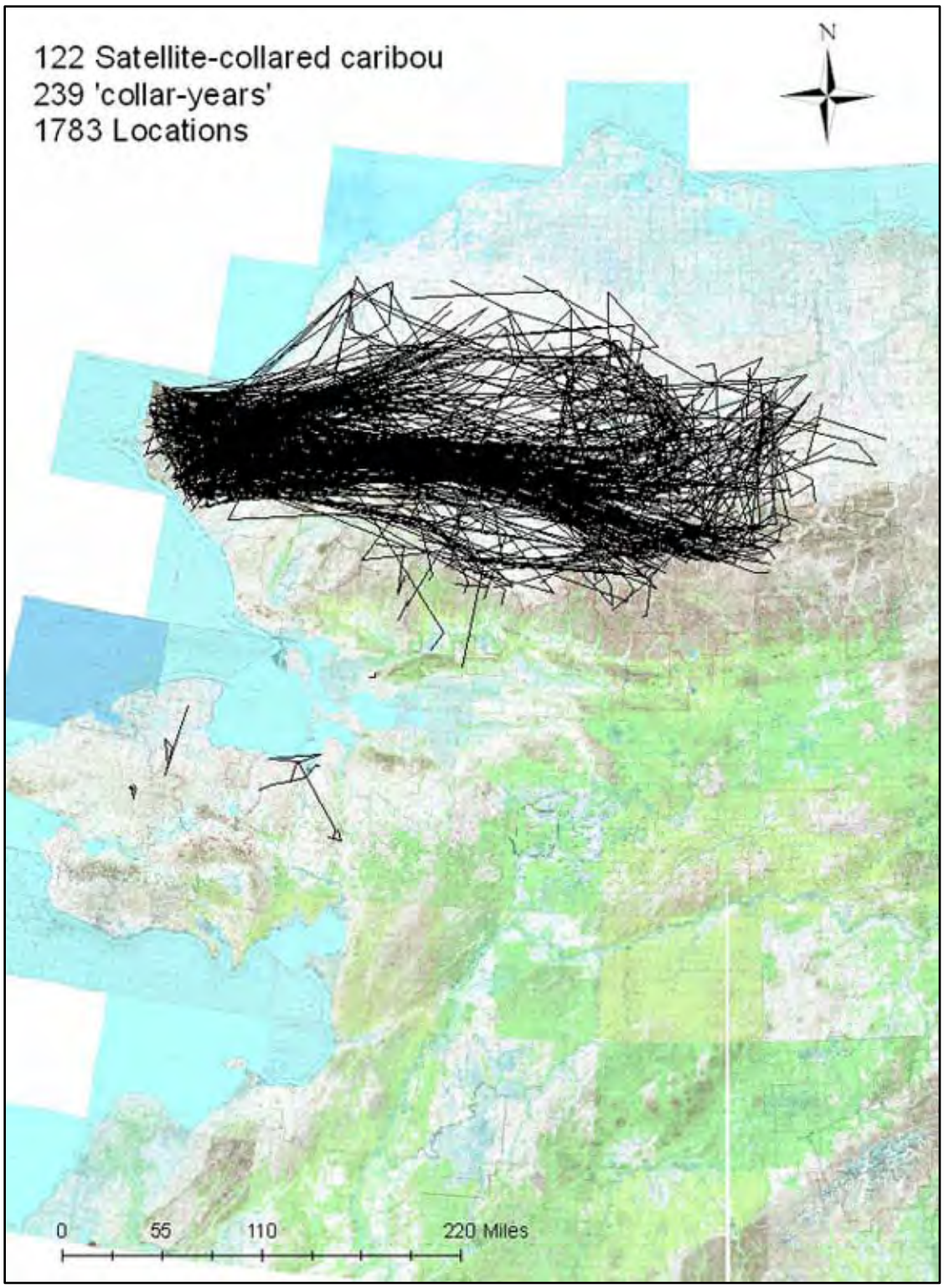


FIGURE 4 Summer (15 June–15 August) movements of satellite-collared Western Arctic herd caribou, 1988–2008 (data excludes first year caribou was collared; all collars standardized to 1 location every 6 days)

FIGURE 5 Fall (16 August–30 November) movements of satellite-collared Western Arctic herd caribou, 1988–2008 (data excludes first year caribou was collared; all collars standardized to 1 location every 6 days)

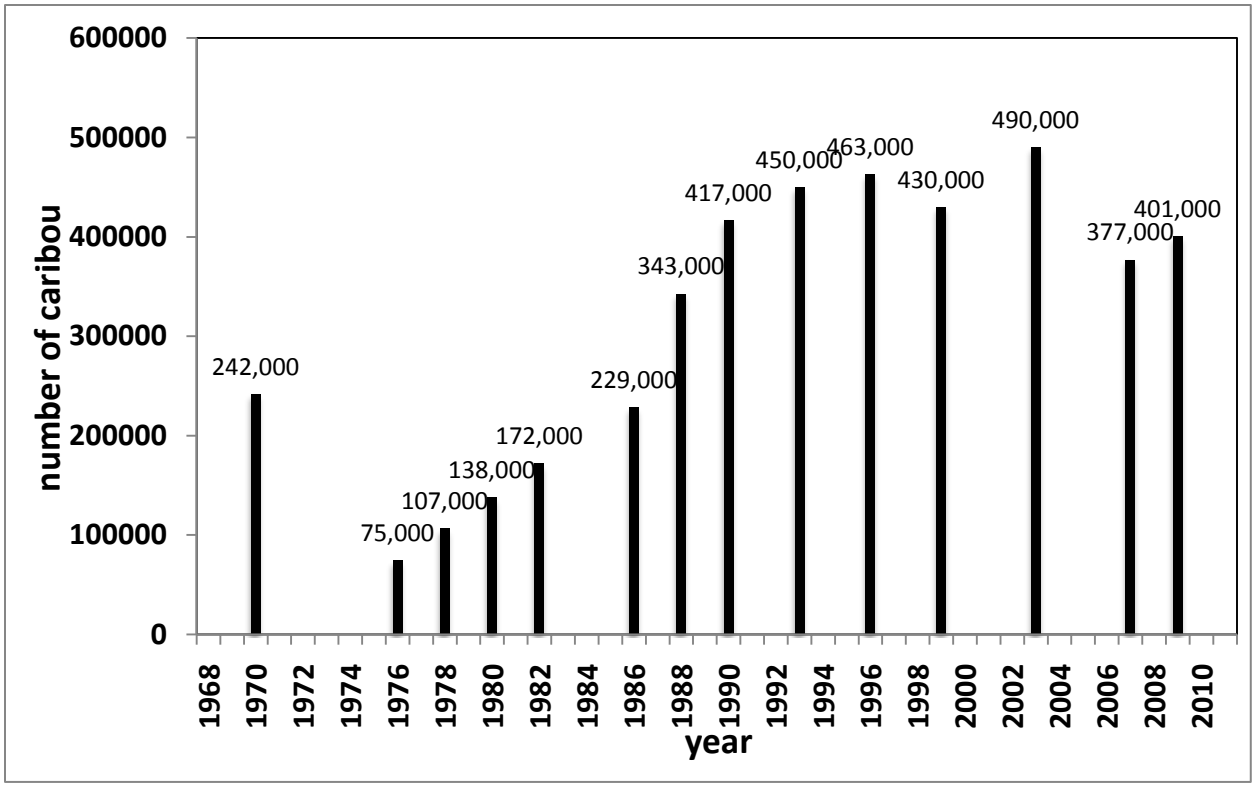


FIGURE 6 Western Arctic caribou herd photo census results, 1970–2007

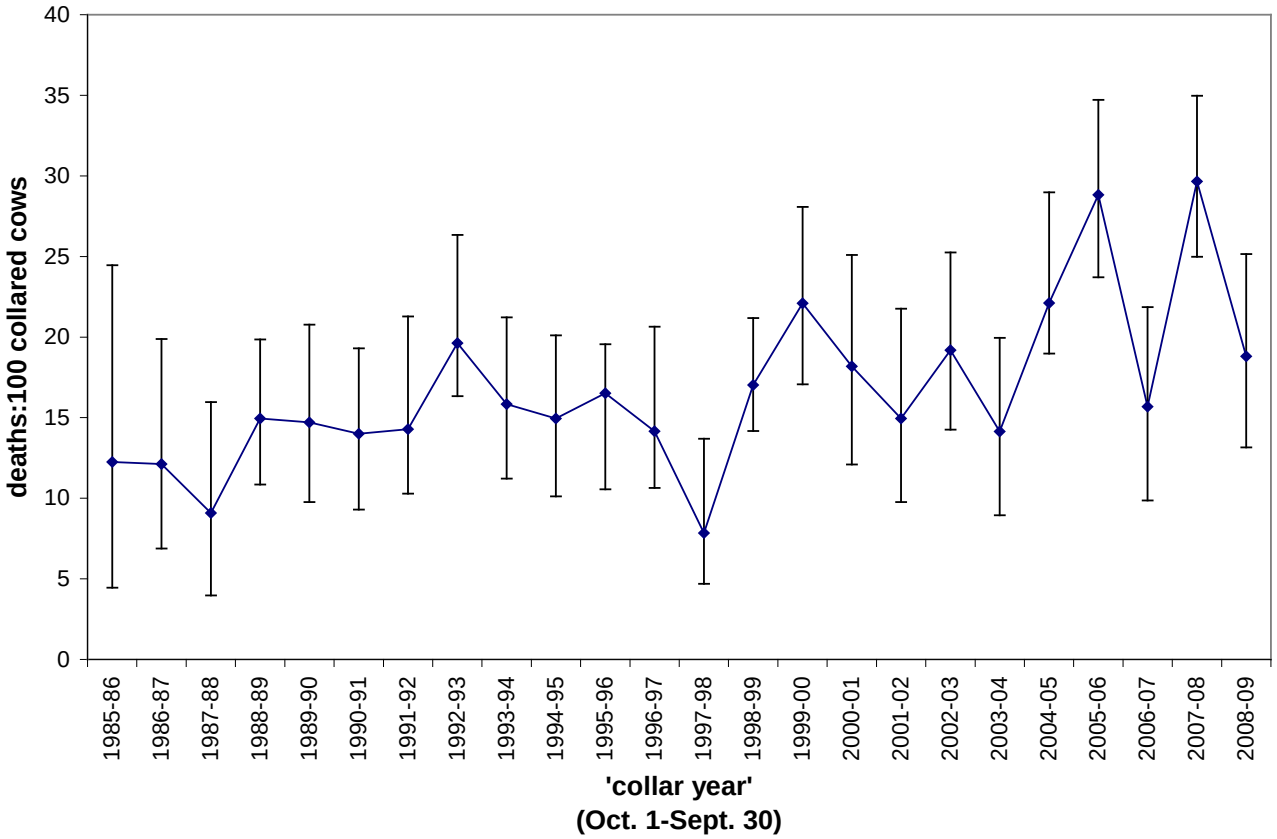


FIGURE 7 Adult cow mortality for the Western Arctic caribou herd, 1984–1985 through 2008–2009 (brackets indicate 80% binomial confidence intervals); estimates based on radiocollared cows (excluding ST-3 and ST-14 satellite collars)

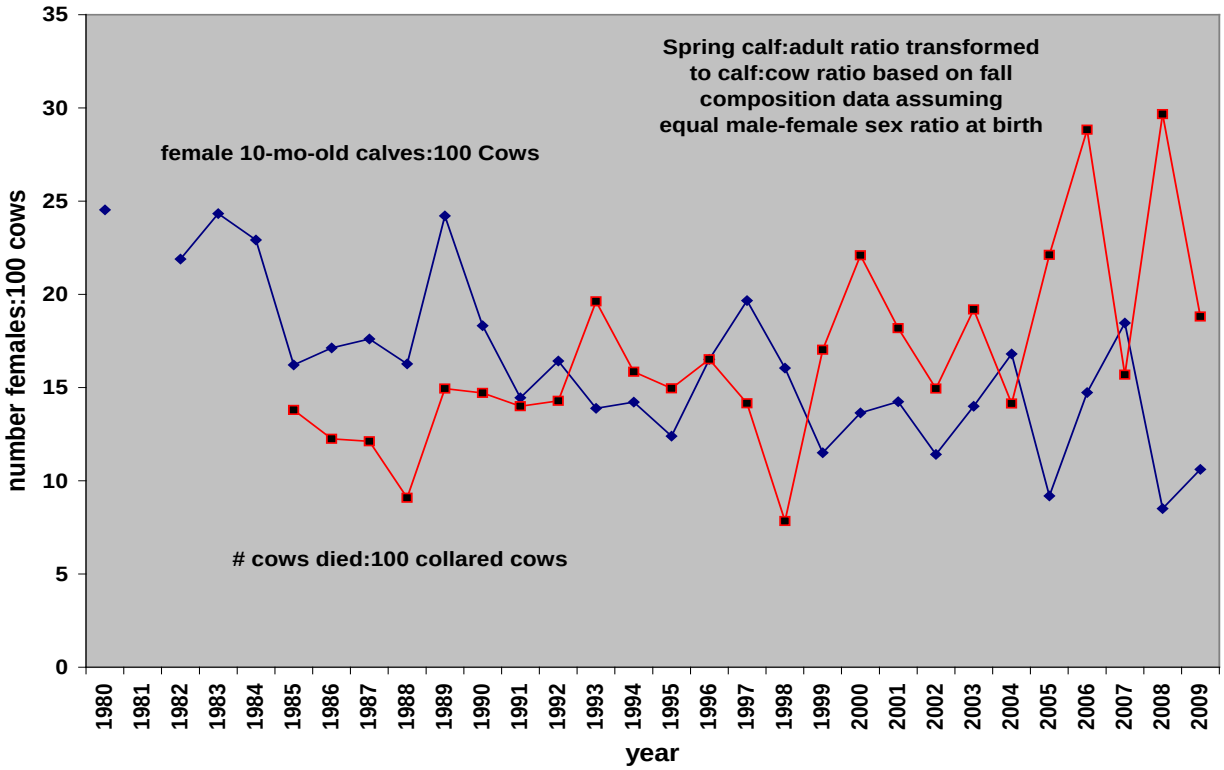


FIGURE 8 Indices of adult cow mortality and female calf recruitment for the Western Arctic caribou herd, 1980–2009

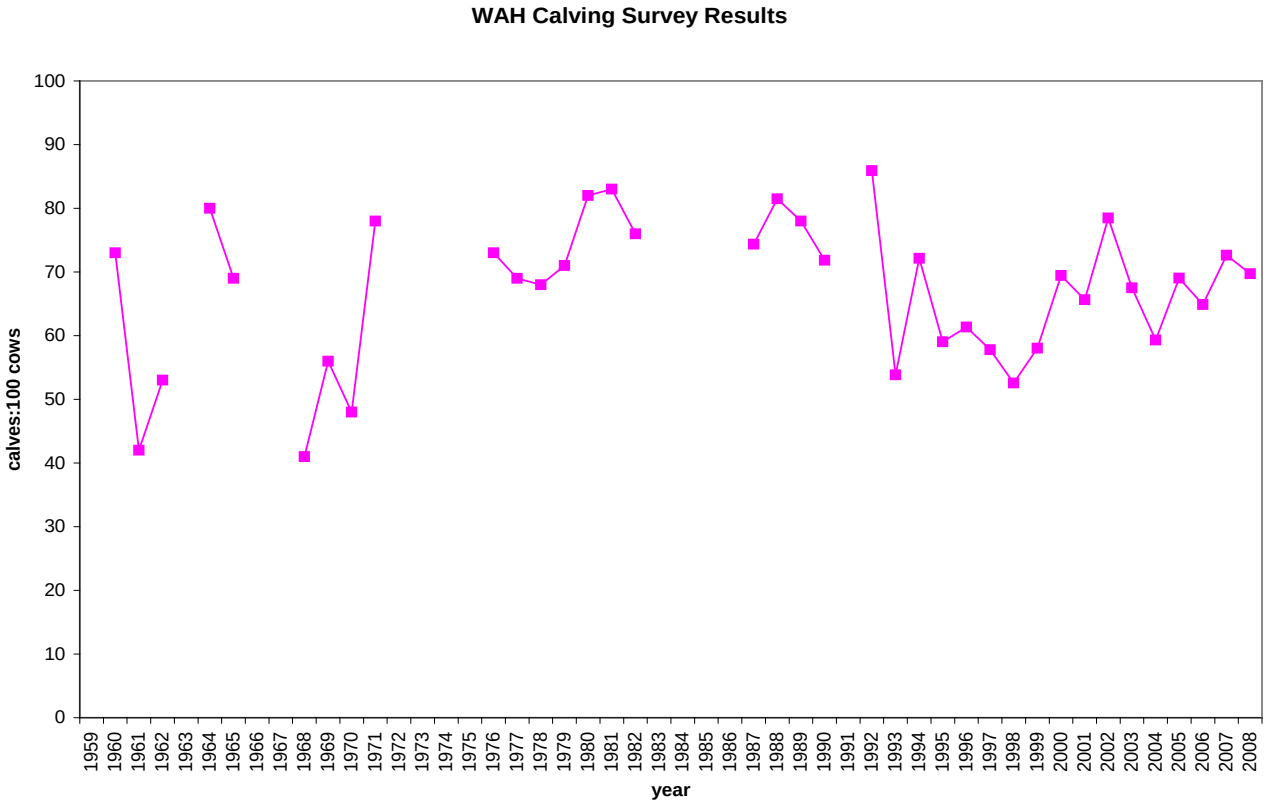


FIGURE 9 Western Arctic caribou herd calving survey results, 1960–2008 (telemetry-based surveys initiated in 1987)

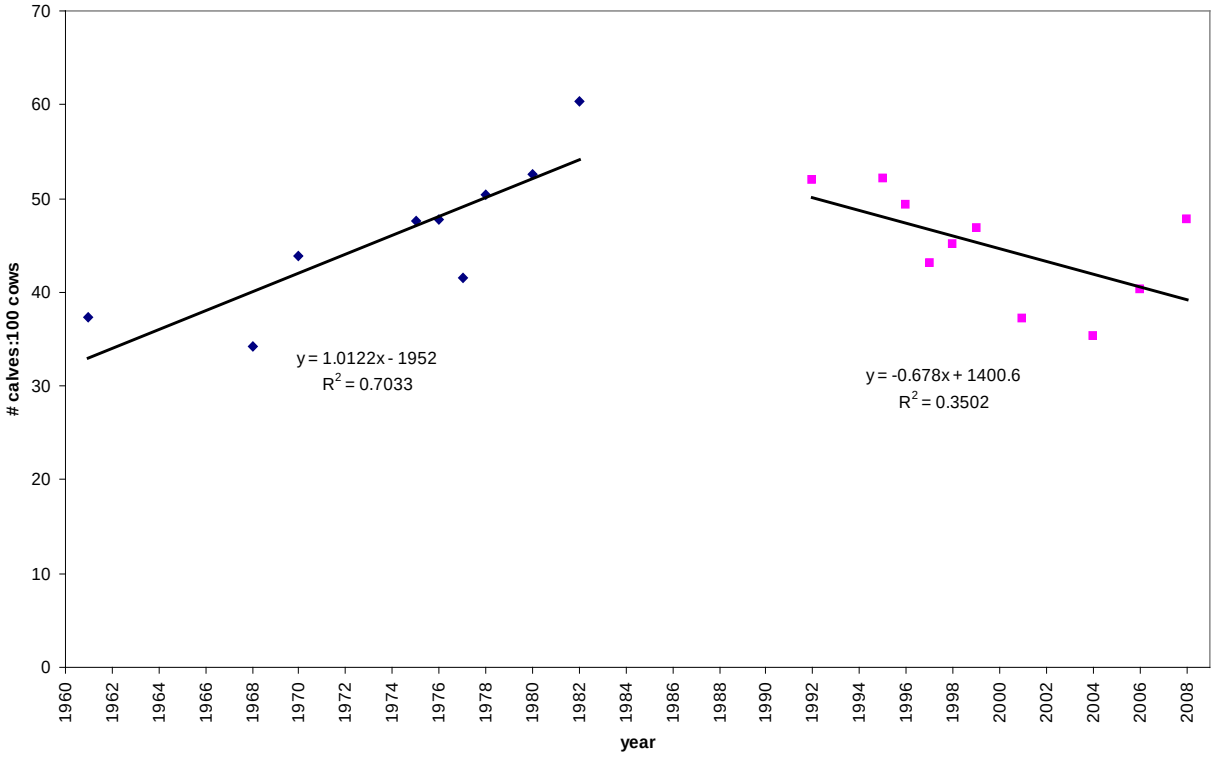


FIGURE 10 Fall calf:cow ratios for the Western Arctic caribou herd, 1961–2008

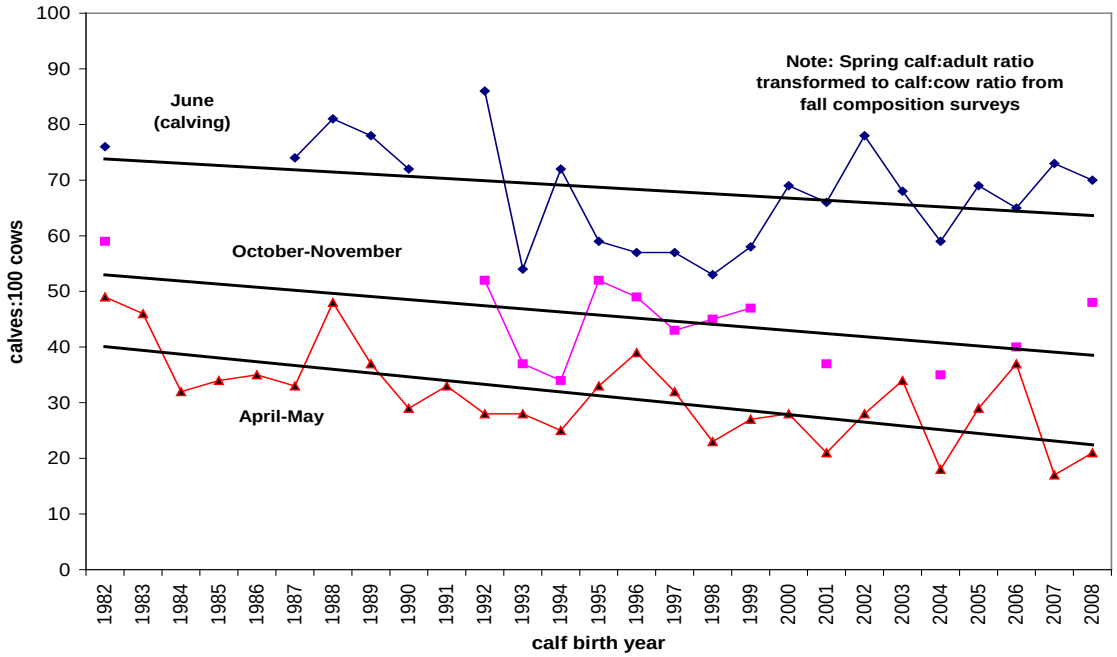


FIGURE 11 Unweighted least squares linear regression of calf:cow ratios during June, the subsequent fall (October–November) and following spring (April–May) for the Western Arctic caribou herd, 1982–2008 (NOTE: In this graph the recruitment estimate for any specific year is shifted 1 year earlier to reflect year of birth; for example, for calves born in 1992 we observed 86 calves:100 cows during June 1992, 52 calves:100 cows during October 1992, and 28 calves:100 cows during April 1993. In contrast, in Figure 8, recruitment is plotted in the year the estimate was made to best correspond with the period over which adult mortality is monitored.)

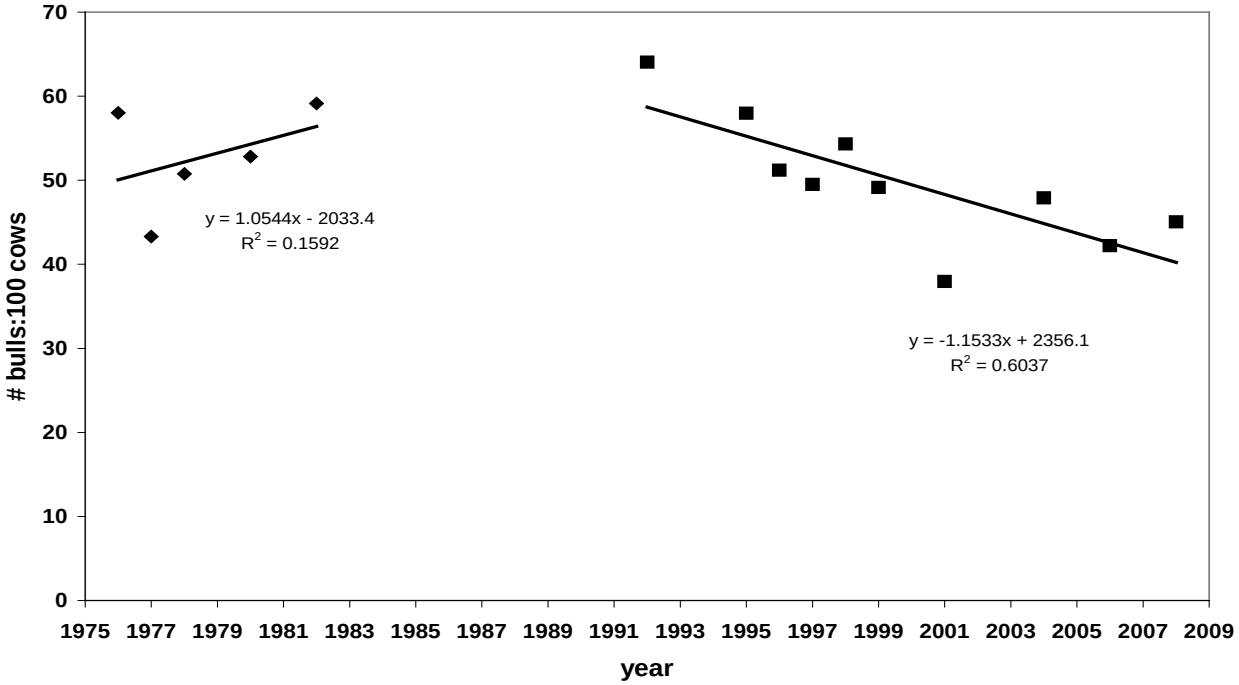


FIGURE 12 Fall bull:cow ratios for the Western Arctic caribou herd, 1976–2008

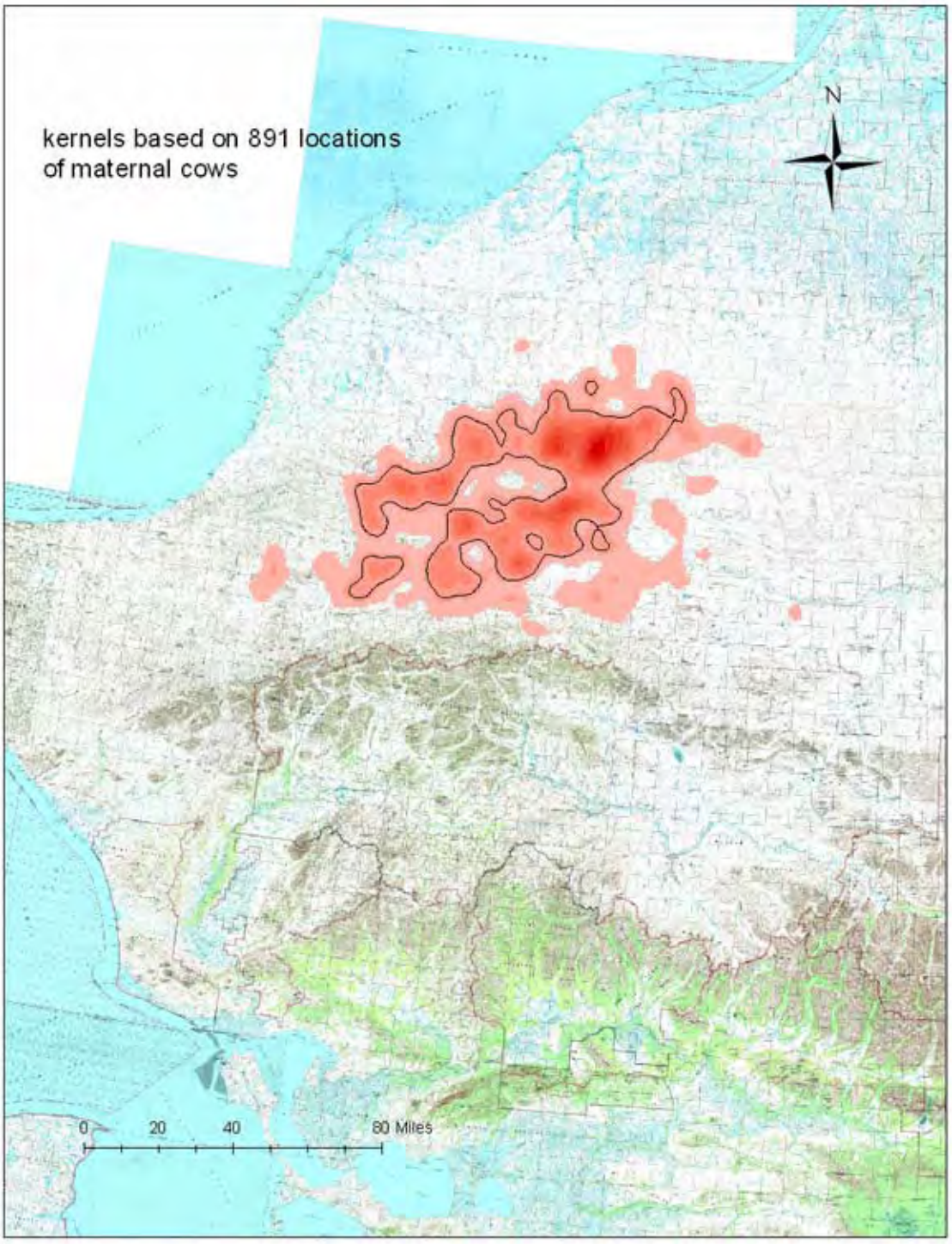


FIGURE 13 Kernel depiction of the WAH calving grounds based on locations of maternal cows, 1987–1989 and 2000–2008 (all years combined); darkest red indicates greatest use, black line represents 50% kernel and outer perimeter represents 95% kernel.

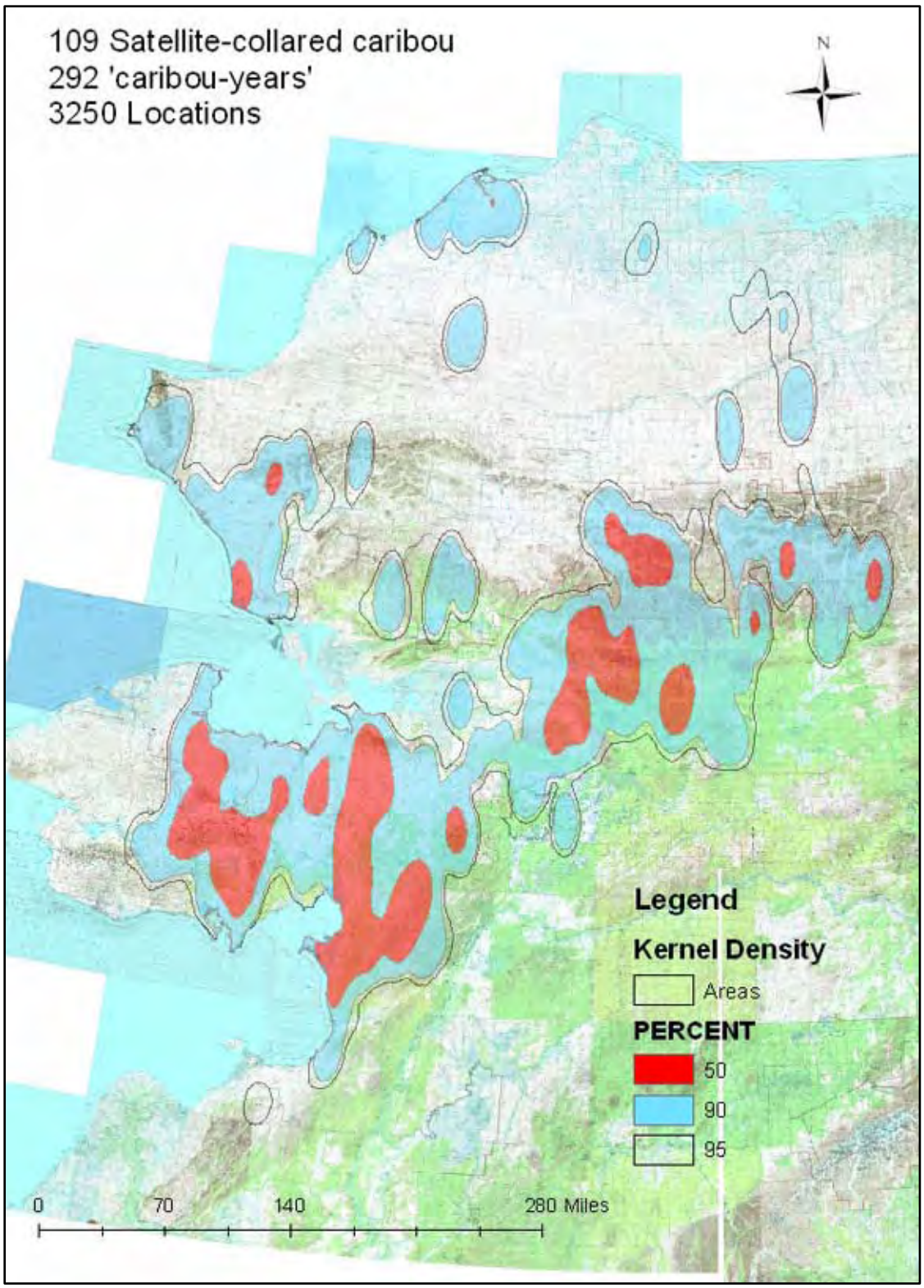


FIGURE 14 Kernel densities (50%, 90%, and 95%) showing winter (November 15–March 31) distribution of Western Arctic herd caribou, November1988–January 2008 (data excludes first year caribou was collared; all collars standardized to 1 location every 6 days

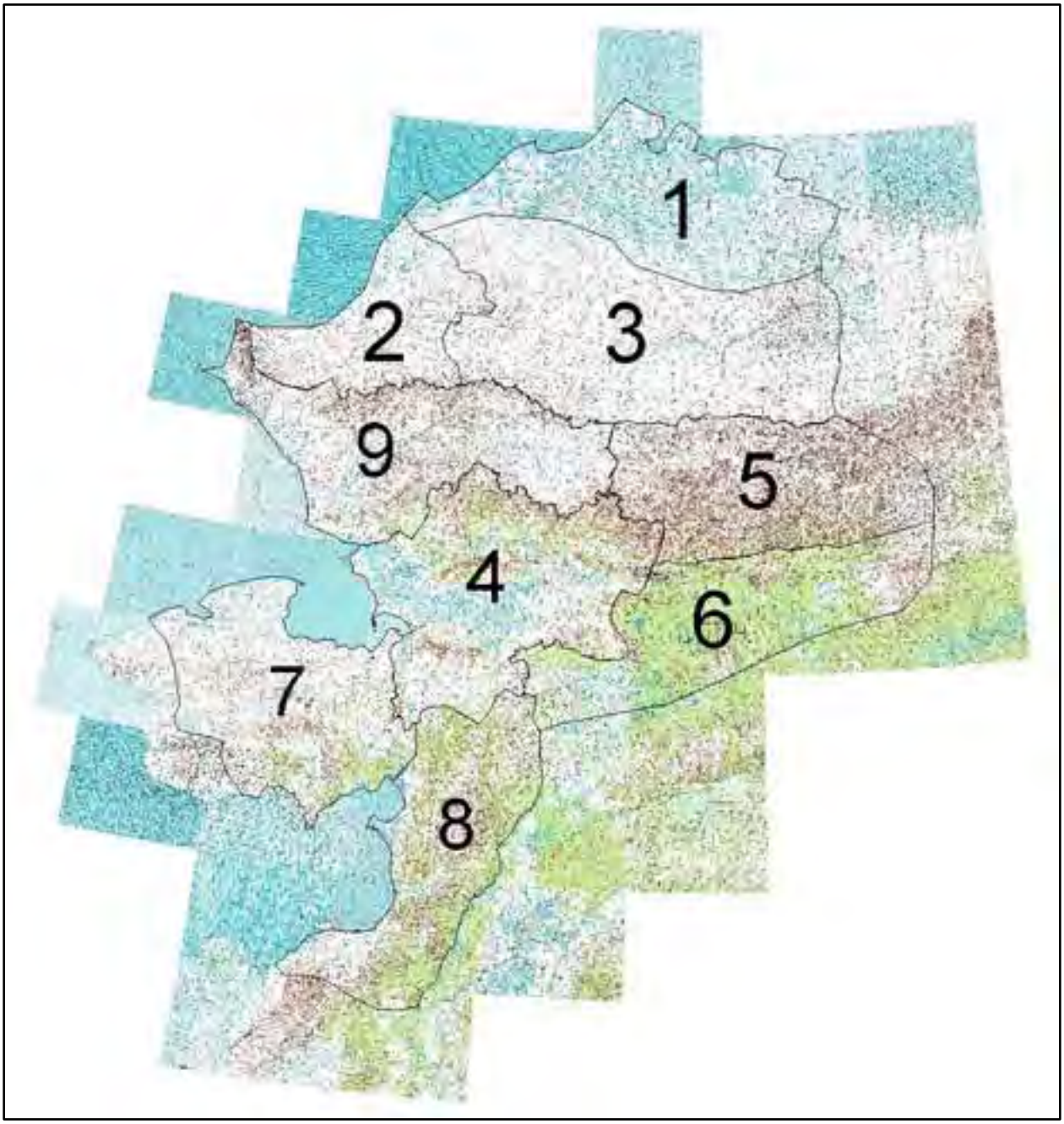


FIGURE 15 Subareas of Western Arctic herd range used to assess winter distribution (see Table 7 for geographic descriptions)

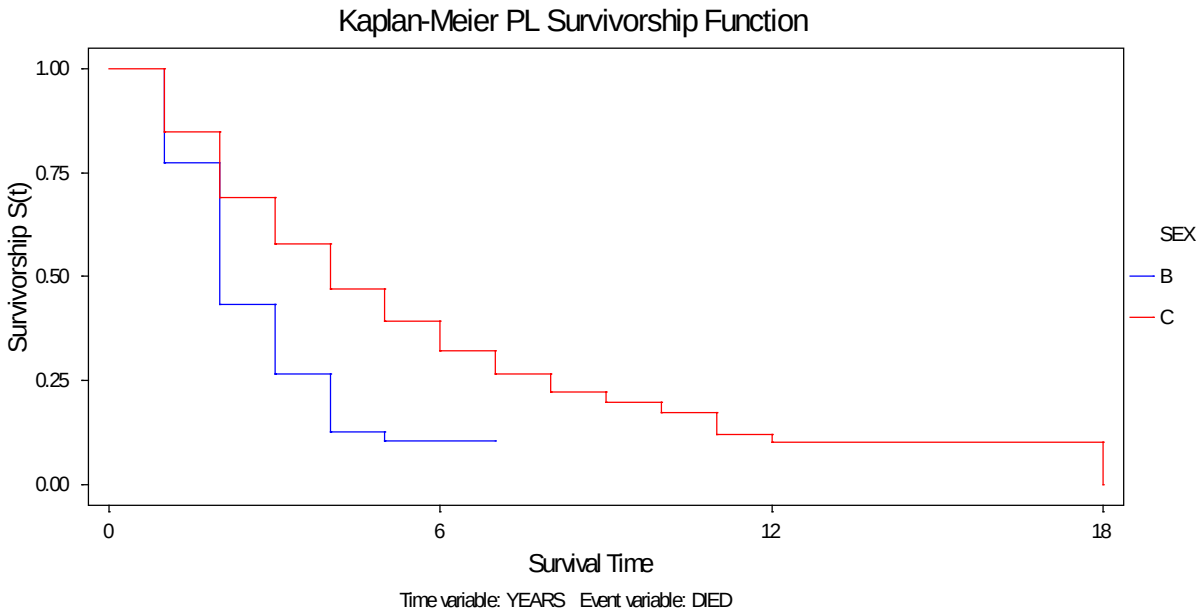


FIGURE 16 Kaplan-Meier Product-Limit survival estimates for collared bulls vs. cows, 1985–2008 (survival time is calculated from time of collaring, not time of birth)

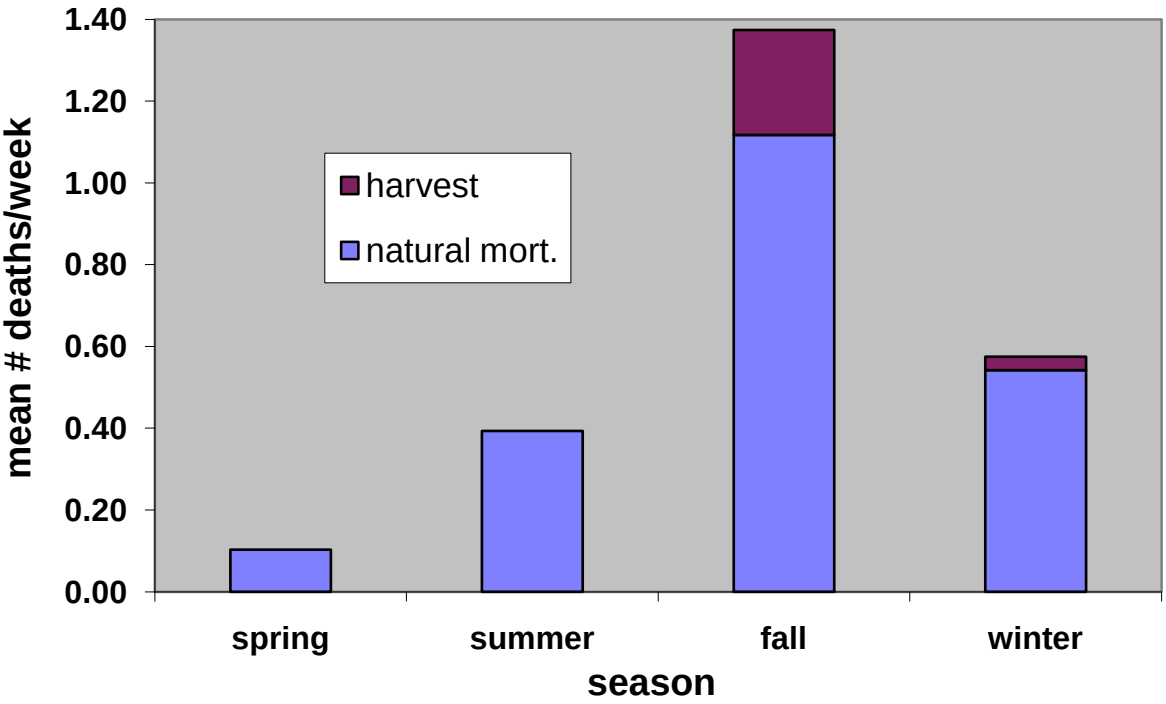


FIGURE 17 Seasonal mortality of radiocollared bulls, 1992–93 through 2009–10 (all years combined)

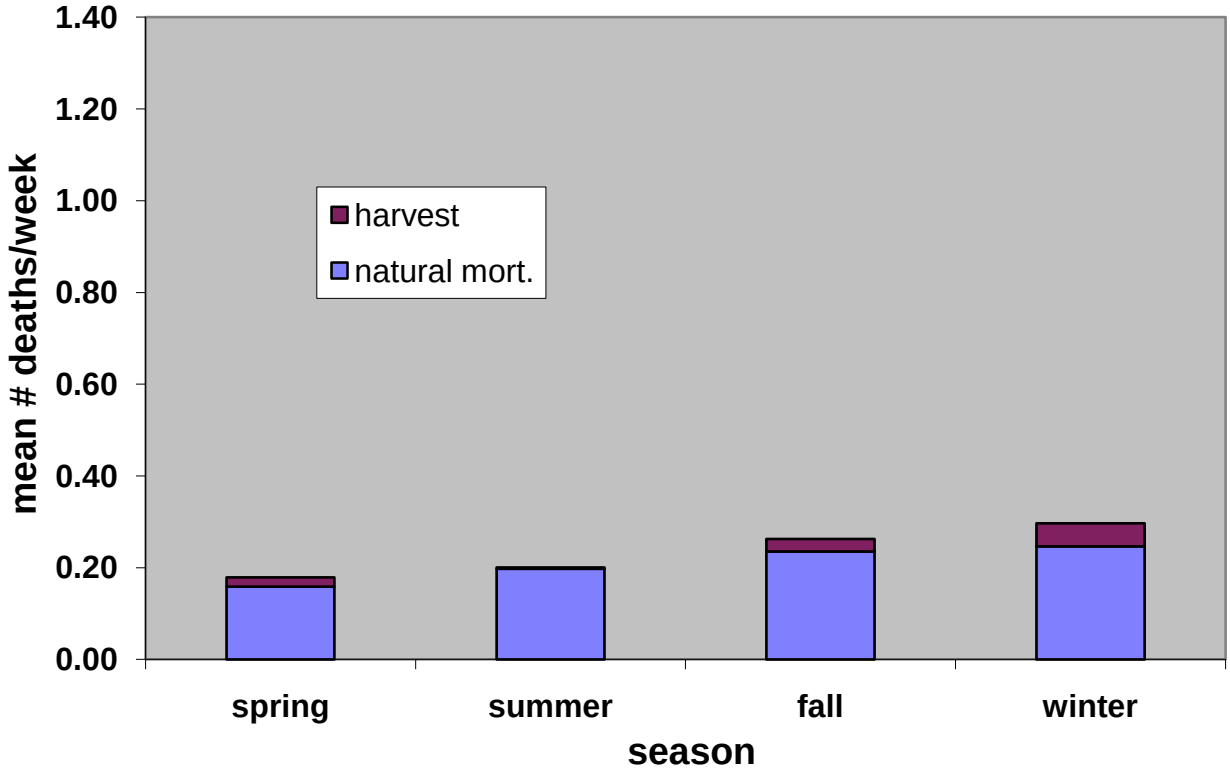


FIGURE 18 Seasonal mortality of radiocollared cows, 1983–84 and 1985–86 through 2009–10 (all years combined)

TABLE 1 Summary of community-based harvest assessments (conducted by ADF&G unless otherwise noted) for communities within the range of the Western Arctic caribou herd, 1985–2002; human population numbers in parentheses estimated during household interviews rather than by Department of Commerce and Economic Development.

Unit	Community	Survey Year	Human Population[a]	Number of WAH Caribou Harvested	Reference
21					
	Galena	1996	548	40	ADF&G[b]
	Galena	1997	536	39	ADF&G[b]
	Galena	1998	481	7	ADF&G[b]
	Galena	1999	592	8	ADF&G[b]
	Galena	2001	675	0	ADF&G[b]
	Kaltag	1996	227	16	ADF&G[b]
	Kaltag	1997	247	8	ADF&G[b]
	Kaltag	1998	227	6	ADF&G[b]
	Kaltag	1999	251	0	ADF&G[b]
	Kaltag	2001	227	0	ADF&G[b]
	Nulato	1996	328	13	ADF&G[b]
	Nulato	1997	311	3	ADF&G[b]
	Nulato	1998	282	5	ADF&G[b]
	Nulato	1999	347	0	ADF&G[b]
	Nulato	2001	341	0	ADF&G[b]
	Ruby	1999	179	1	ADF&G[b]
	Ruby	2001	192	0	ADF&G[b]
22					
	Brevig Mission	2000	286	76	ADF&G[b]
	Elim	1999	313	227	ADF&G[b]
	Golovin	1989	169	40	ADF&G[b]
	Golovin	2001	148	94	ADF&G[b]
	Koyuk	1998	280	263	ADF&G[b]
	Koyuk	2005	376	426	Pedersen et al. 2006
	Shaktoolik	1998	235	167	ADF&G[b]
	Shaktoolik	1999	216	125	ADF&G[b]
	Shaktoolik	2004	223	198	Pedersen et al. 2006
	Shismaref	1989	472	197	ADF&G[b]
	Shishmaref	1995	560	342	ADF&G[b]
	Shishmaref	2000	589	286	ADF&G[b]
	Stebbins	2003	586	0	Pedersen et al. 2006
	St. Michael	2004	413	48	Pedersen et al. 2006

Unit	Community	Survey Year	Human Population[a]	Number of WAH Caribou Harvested	Reference
	Teller	2001	241	21	Pedersen et al. 2006
	Unalakleet	2003	725	167	Pedersen et al. 2006
	Unalakleet	2005	705	723	Pedersen et al. 2006
	Wales	1993	152	4	ADF&G[b]
	Wales	2000	159	0	ADF&G[b]
	White Mountain	1999	203	93	ADF&G[b]
23					
	Ambler	2003	291	325	Pedersen et al. 2006
	Deering	1994	147	142	ADF&G[b]
	Kiana	1999	398	488	ADF&G[b]
	Kivalina	1992	344	351	ADF&G[b]
	Kobuk	2005	123	134	Pedersen et al. 2006
	Kotzebue	1986	(2681)	1917	ADF&G[b]
	Kotzebue	1991	2751	3782	ADF&G[b]
	Noatak	1994	379	615	ADF&G[b]
	Noatak	1999	423	683	ADF&G[b]
	Noatak	2002	455	410	Pedersen et al. 2006
	Noorvik	2002	677	988	ADF&G[b]
	Point Hope	1992	699	225	Fuller and George 1997
	Selawik	1999	767	1289	ADF&G[b]
	Shungnak	1998	255	561	ADF&G[b]
24					
	Alatna	1997	25	21	ADF&G[b]
	Alatna	1998	25	11	ADF&G[b]
	Alatna	1999	34	0	ADF&G[b]
	Alatna	2001	36	0	ADF&G[b]
	Allakaket	1997	176	11	ADF&G[b]
	Allakaket	1998	191	43	ADF&G[b]
	Allakaket	1999	197	13	ADF&G[b]
	Allakaket	2001	97	9	ADF&G[b]
	Allakaket	2002	136	106	ADF&G[b]
	Anaktuvuk Pass	1990	314	592	Pedersen and Opie 1990
	Anaktuvuk Pass	1991	272	545	Pedersen and Opie 1991
	Anaktuvuk Pass	1992	270	566	Fuller and George 1997
	Anaktuvuk Pass	1993	318	574	Pedersen and Opie 1993
	Anaktuvuk Pass	1994–95	318	322	Brower and Opie 1996
	Bettles	1997	23	0	ADF&G[b]

Unit	Community	Survey Year	Human Population[a]	Number of WAH Caribou Harvested	Reference
	Bettles	1998	31	25	ADF&G[b]
	Bettles	1999	36	21	ADF&G[b]
	Bettles	2002	31	0	ADF&G[b]
	Evansville	1997	44	3	ADF&G[b]
	Evansville	1998	28	4	ADF&G[b]
	Evansville	1999	24	2	ADF&G[b]
	Evansville	2002	24	0	ADF&G[b]
	Huslia	1997	218	56	ADF&G[b]
	Huslia	1998	245	264	ADF&G[b]
	Huslia	1999	283	78	ADF&G[b]
	Huslia	2001	285	0	ADF&G[b]
	Huslia	2002	217	82	ADF&G[b]
26					
	Atqasuk	1994–95	237	262	Hepa et al. 1997
	Atqasuk	2002–03	228	52	Pedersen 2005
	Atqasuk	2003–04	228	42	Pedersen 2005
	Barrow	1987	3016	1595	Braund et al. 1991
	Barrow	1988	3379	1533	Braund et al. 1991
	Barrow	1989	3379	1656	Braund et al. 1991
	Barrow	1992	3908	1993	Fuller and George 1997
	Barrow	2002–03	4581	494	Pedersen 2005
	Barrow	2003–04	7769	777	Pedersen 2005
	Nuiqsut	1985	337	513	Pedersen 1995
	Nuiqsut	1992	418	278	Fuller and George 1997
	Nuiqsut	1993	361	672	Pedersen 1995
	Nuiqsut	1994–95	418	258	Brower and Opie 1997
	Nuiqsut	1999	468	413	Pedersen 2001
	Nuiqsut	2000–01	468	600	Pedersen 2001
	Nuiqsut	2002–03	433	36	Pedersen 2005
	Nuiqsut	2002–04	433	54	Pedersen 2005
	Point Lay	1987	(121)	157	Pedersen 1989
	Wainwright	1988	506	505	Braund et al 1993
	Wainwright	1989	468	711	Braund et al 1993
	Wainwright	1992	584	748	Fuller and George 1997

[a] Human population figures from Alaska Department of Commerce and Economic Development, Alaska Community Database (www.dced.state.ak.us/mra/CF_CUSTM.htm)
[b] Alaska Department of Fish and Game Community Profile Database

TABLE 2 Photo census population estimates of the Western Arctic caribou herd, 1970–2009

	Minimum population size	Mean annual growth rate[a]	Estimated population size
1970	242,000		
1971		-18	200,000
1972		-18	164,000
1973		-18	135,000
1974		-18	111,000
1975		-18	91,000
1976	75,000		
1977		19	89,000
1978	107,000		
1979		14	121,000
1980	138,000		
1981		12	154,000
1982	172,000		
1983		7	185,000
1984		7	198,000
1985		7	213,000
1986	229,000		
1987		22	280,000
1988	343,000		
1989		10	378,000
1990	416,000		
1991		3	427,000
1992		3	438,000
1993	450,000		
1994		1	454,000
1995		1	459,000
1996	463,000		
1997		1	466,800
1998		1	470,600
1999[b]	430,000	1	474,400
2000		1	478,200
2001		1	482,100
2002		1	486,000
2003	490,000		
2004		-6	459,000
2005		-6	430,000
2006		-6	403,000
2007	377,000		
2008		3	388,815
2009	401,000		

[a] Mean annual rate of change = e^r ;e = 2.7183; $r = [\ln(N_{t2}) - \ln(N_{t1})]/t$; t = number of years between censuses; N_{t1} = pop. estimate at $time_1$; N_{t2} = pop. estimate at $time_2$

[b] 1999 census probably underestimated population size; therefore, annual rate of change computed from 1996 to 2003.

TABLE 3 Annual mortality rate and binomial confidence intervals for Western Arctic caribou herd cows collared with conventional or lightweight satellite radio collars[a], 1984–1985 through 2008–2009 collar years (1 Oct–30 Sep)

				Binomial Confidence Level		
Collar year	Sample size[a]	Nr died	Mortality rate[b] (%)	80%	90%	95%
1984–1985	29	4	14	6–26	5–29	4–32
1985–1986	49	6	12	7–20	5–23	5–25
1986–1987	66	8	12	7–19	6–21	5–22
1987–1988	88	8	9	5–14	5–16	4–17
1988–1989	87	13	15	10–21	9–23	8–24
1989–1990	102	15	15	10–20	9–22	8–23
1990–1991	100	15	14	10–21	9–22	9–24
1991–1992	104	16	15	11–21	10–22	9–24
1992–1993	107	21	20	15–25	14–27	13–28
1993–1994	102	16	16	11–21	10–23	9–24
1994–1995	108	14	13	9–18	8–20	7–21
1995–1996	112	20	18	13–23	12–25	11–26
1996–1997	107	16	15	11–20	10–22	9–23
1997–1998	102	8	8	5–12	4–14	3–15
1998–1999	94	16	17	12–23	11–25	10–26
1999–2000	86	19	22	16–29	15–31	14–32
2000–2001	77	14	18	13–25	11–27	10–29
2001–2002	87	13	15	10–21	9–23	8–24
2002–2003	99	19	19	14–25	13–27	12–28
2003–2004	99	14	14	11-21	10-22	9-24
2004–2005	104	23	22	17-28	16-30	15-31
2005-2006	111	32	29	23-35	22-37	21-38
2006-2007	102	16	16	11-21	10-23	9-24
2007-2008	118	35	30	24-36	23-37	22-39
2008-2009	101	19	19	14-25	13-27	12-28

[a] Sample size = number of potentially active conventional or lightweight satellite radio collars active on adult cows at the beginning of the collar year

[b] Mortality rate = (Number caribou died/Sample size)100

TABLE 4 Aerial calving surveys from observations of radiocollared cows in the Western Arctic caribou herd, 1987–2008

Year	Median June survey date	With Calf	No Calf ≥1 hard antler	No Calf soft antlers	No Calf no antlers	Total	Maternal	Non-Maternal	Calves: 100 Cows
1987	16	29	0	1	9	39	29	10	74
1988	5	27	17	1	9	54	44	10	81
1989	12	34	5	2	9	50	39	11	78
1990	11	51	0	5	15	71	51	20	72
1991	Fogged out								
1992	12	55	6	0	10	71	61	10	86
1993	14	39	3	17	21	80	42	39	52
1994	11	42	15	2	21	80	57	23	71
1995	11	47	2	13	21	83	49	34	59
1996	6	38	16	13	21	88	54	34	61
1997	5	39	13	16	22	90	52	38	58
1998	13	36	5	16	21	78	41	37	53
1999	12	47	0	11	23	81	47	34	58
2000	13	39	11	5	17	72	50	22	69
2001	16	8	34	9	13	64	42	22	66
2002	2	13	38	8	6	65	51	14	78
2003	6	16	38	7	19	80	54	26	68
2004	6	38	13	17	18	86	51	35	59
2005	10	45	13	8	18	84	58	26	69
2006	10	37	11	8	18	74	48	26	65
2007	6	36	25	7	16	84	61	23	73
2008	12	48	5	7	16	76	53	23	70

TABLE 5 Fall population composition of the Western Arctic caribou herd, 1961–2008

Year	Bulls	Cows	Calves	Total	Calves: 100 Cows	Calves: 100 Adults	Bulls: 100 Cows
1961	276	501	187	964	37	24	55
1970	1748	2732	1198	5678	44	27	64
1975	720	2330	1116	4166	48	37	31
1976	273	431	222	926	52	32	63
1980	715	1354	711	2780	53	34	53
1982	1896	3285	1923	7104	59	37	58
1992	1600	2498	1299	5397	52	32	64
1993	859	2321	859	4039	37	25	37
1994	1354	3284	1118	5756	34	24	41
1995	1176	2029	1057	4262	52	33	58
1996	2621	5119	2525	10265	49	33	51
1997	2588	5229	2255	10072	43	29	49
1998	2298	4231	1909	8438	45	29	54
1999	2059	4191	1960	8210	47	31	49
2001	1117	2943	1095	5155	37	27	38
2004	2916	6087	2154	11157	35	24	48
2006	1900	4501	1811	8212	40	28	42
2008	2981	6618	3156	12755	48	33	45

TABLE 6 Short yearling[a] survey results of the Western Arctic caribou herd, 1980–2009

Year	Number of caribou			Number		SY[a]:100 adults	3-yr moving average
	Adults	SY[a]	Total	Groups	Radio-collared cows		
1980	7823	2559	10382			33	
1981							31
1982	3988	1164	5152			29	31
1983	5079	1648	6727			32	31
1984	1646	503	2149			31	28
1985	2776	600	3376			22	25
1986	5372	1227	6599			23	23
1987	4272	1003	5275			23	23
1988	6047	1312	7359	31	45	22	26
1989	5321	1718	7039	29	37	32	26
1990	5231	1278	6509	25	36	24	25
1991	7111	1371	8482	47	48	19	22
1992	7660	1678	9338	49	52	22	20
1993	4396	814	5210	19	33	19	20
1994	8369	1587	9956	44	53	19	18
1995	13283	2196	15479	53	86	17	19
1996	4876	1073	5949	32	36	22	22
1997	9298	2438	11736	40	56	26	23
1998	7409	1585	8994	34	46	21	21
1999	6354	975	7329	34	36	15	18
2000	8398	1513	9911	41	47	18	17
2001	6814	1294	8108	32	33	19	17
2002	8268	1258	9526	38	42	15	18
2003	8515	1602	10120	42	49	19	19
2004	7078	1599	8677	33	42	23	18
2005	8376	1026	9402	35	40	12	18
2006	7528	1479	9007	36	41	20	19
2007	10570	2603	13173	44	57	25	19
2008	9550	1084	10634	43	54	11	17
2009	13873	1963	15836	59	71	14	

[a] Short yearlings are defined as 10- to 11-month-old caribou.

TABLE 7 Geographic distribution of radiocollared Western Arctic herd caribou during winter (Nov–Mar), 1983-84 through 2007-08; numbers represent percentage of radiocollared caribou located in each subarea[a]; bottom row is number of collared caribou found during that winter (Note: subareas are shown in Figure 15)

Area[a]	83 84	84 85	85 86	86 87	87 88	88 89	89 90	90 91	91 92	92 93	93 94	94 95	95 96	96 97	97 98	98 99	99 00	00 01	01 02	02 03	03 04	04 05	05 06	06 07	07 08	08 09
1	14	13	6	12	0	0	0	5	5	9	0	1	10	4	6	9	0	5	5	4	2	0	1	0	0	0
2	0	16	6	0	0	0	0	0	1	0	0	1	0	0	0	0	9	0	0	0	0	0	0	0	0	0
3	7	13	0	0	0	0	11	0	1	2	4	0	5	0	5	1	1	5	0	4	0	0	2	1	6	0
4	24	32	12	38	49	28	20	2	52	6	1	26	33	12	5	11	42	12	22	23	12	16	48	33	32	31
5	14	11	18	0	8	1	9	0	9	6	8	3	26	4	25	31	5	6	9	16	31	5	10	8	21	6
6	0	0	0	0	0	1	1	0	6	19	4	1	2	2	0	2	12	0	3	8	20	0	13	0	9	2
7	2	0	0	0	1	5	2	3	4	4	7	6	9	59	29	24	17	42	31	38	14	19	5	16	28	43
8	17	5	53	38	39	65	56	89	20	54	75	54	16	20	29	20	5	29	5	0	20	53	18	42	4	15
9	21	11	6	12	3	1	2	0	2	0	0	9	1	0	1	1	9	2	25	7	1	6	2	0	1	3
n_i[b]	14	19	17	34	38	77	57	75	61	70	90	78	63	81	88	67	72	63	58	69	86	78	70	69	121	78

[a] Areas: 1 North Slope coastal plain west of Colville drainage; 16,378 mi^2

2 Foothills of Brooks Range west of Utukok River; 8,817 mi^2

3 Foothills of Brooks Range east of Utukok River and west of Dalton Highway; 24,082 mi^2

4 Kobuk drainage below Selby River; Squirrel drainage below North Fork; Selawik drainage; Buckland drainage; 18,928 mi^2

5 Kobuk drainage above Selby R; central Brooks Range north of Koyukuk R & west of Dalton Hwy; Noatak drainage above Douglas Crk; 12,436 mi^2

6 Koyukuk drainage south of Brook Range mountains, including Kanuti Flats, Galena Flats; 13,089 mi^2

7 Seward Peninsula west of Buckland and Koyukuk villages; 15,436 mi^2

8 Nulato Hills; 14,418 mi^2

9 Noatak drainage below Douglas Creek; Squirrel drainage above North Fork; Wulik and Kivalina drainages; Lisburne Hills; 16,541 mi^2

[b] Number of radiocollared caribou; excludes the year in which a caribou was initially collared; when a collared caribou wintered in >1winter range, we assumed time was spent equally among ranges and included appropriate fractions of use

TABLE 8 Caribou density (number/mi^2) in 9 subareas (Figure 15) of Western Arctic Caribou Range during winter (1 Nov–31 Mar), 1983–84 through 2008–09

Area[a]	83 84	84 85	85 86	86 87	87 88	88 89	89 90	90 91	91 92	92 93	93 94	94 95	95 96	96 97	97 98	98 99	99 00	00 01	01 02	02 03	03 04	04 05	05 06	06 07	07 08	08 09
1	1.73	1.71	0.82	2.01	0.00	0.00	0.00	1.39	1.32	2.52	0.00	0.18	2.69	1.04	1.63	2.59	0.00	1.40	1.53	1.30	0.65	0.00	0.35	0.00	0.00	0.00
2	0.00	3.81	1.53	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.33	0.00	0.00	0.00	0.00	4.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00
3	0.59	1.16	0.00	0.00	0.00	0.00	2.08	0.00	0.15	0.39	0.73	0.00	0.92	0.00	0.89	0.29	0.28	0.95	0.00	0.74	0.00	0.00	0.40	0.11	0.91	0.00
4	2.49	3.55	1.42	5.66	8.82	5.58	4.36	0.55	12.14	1.51	0.27	6.22	7.96	2.86	1.37	2.80	10.52	3.03	5.53	5.88	2.82	3.50	10.29	6.64	5.88	5.45
5	2.27	1.80	3.25	0.00	2.18	0.39	2.88	0.00	3.18	2.55	3.04	0.95	9.75	1.37	9.47	11.66	1.87	2.15	3.37	6.18	11.59	1.77	3.32	2.42	5.90	1.54
6	0.00	0.00	0.00	0.00	0.00	0.19	0.27	0.00	1.92	6.29	1.54	0.45	0.56	0.87	0.00	0.81	4.31	0.00	1.28	2.90	6.86	0.00	3.96	0.00	2.38	0.49
7	0.30	0.00	0.00	0.00	0.29	1.11	0.46	0.86	1.16	1.23	2.12	1.91	2.62	17.53	8.78	7.33	5.38	13.13	9.77	12.11	4.21	5.36	1.24	3.89	6.33	9.30
8	2.30	0.78	8.41	7.43	9.39	17.02	15.92	26.39	6.23	16.48	23.62	17.14	5.10	6.72	9.59	6.62	1.61	9.55	1.74	0.16	6.29	16.06	4.93	10.99	1.01	3.48
9	2.57	1.36	0.81	1.99	0.55	0.15	0.43	0.00	0.43	0.00	0.00	2.49	0.22	0.00	0.32	0.43	2.61	0.69	7.35	2.15	0.32	1.67	0.58	0.00	0.18	0.51
N[b]	*198*	*213*	**229**	*280*	**343**	*378*	**416**	*426*	*438*	**450**	*454*	*459*	**463**	*467*	*471*	*474*	*478*	*482*	*486*	**490**	*459*	*430*	*403*	**377**	*353*	*331*

[a] Areas: 1 North Slope coastal plain west of Colville drainage; 16, 378 mi^2

2 Foothills of Brooks Range west of Utukok River; 8,817 m

3 Foothills of Brooks Range east of Utukok River and west of Dalton Highway; 24,082 mi^2

4 Kobuk drainage below Selby River; Squirrel drainage below North Fork; Selawik drainage; Buckland drainage; 18,928 mi^2

5 Kobuk drainage above Selby River; central Brooks Range north of Koyukuk R & west of Dalton Hwy; Noatak drainage above Douglas Crk; 12,436 mi^2

6 Koyukuk drainage south of Brook Range mountains, including Kanuti Flats, Galena Flats; 13,089 mi^2

7 Seward Peninsula west of Buckland and Koyukuk villages; 15,436 mi^2

8 Nulato Hills; 14,418 mi^2

9 Noatak drainage below Douglas Creek; Squirrel drainage above North Fork; Wulik and Kivalina drainages; Lisburne Hills; 16,541 mi^2

[b] Western Arctic Herd population size in thousands. Numbers in italics are interpolations using average annual growth rates between consecutive censuses. Numbers in bold are census estimates. Census from 1999 excluded because estimate was probably low. To calculate density for 2007-08 and 2008-09, population assumed to be declining 6% annually (mean annual rate of change = $e^r = 0.937$) as measured between the 2003 and 2007 censuses.

TABLE 9 Annual harvests of Western Arctic herd caribou by game management unit and hunter residence ("%" is percent of total annual harvest); estimates of caribou harvested by residents living within the range of this herd made using 'levels' model (Sutherland 2005) while number of caribou taken by 'All other hunters' based on harvest ticket reports

		Residents within WAH range		All other hunters		Total harvest	
Reg. year	GMU	# Caribou	%	# Caribou	%	# Caribou	%
1999–00	21	16	0	3	0	19	0
	22	2128	14	36	0	2164	14
	23	10,478	69	439	3	10,917	72
	24	582	4	58	0	640	4
	26A	1340	9	53	0	1393	9
	Total	14,544	96	589	4	15,133	
2000–01	21	7	0	2	0	9	0
	22	2612	17	32	0	2644	17
	23	10,424	68	412	3	10,836	71
	24	447	3	13	0	460	3
	26A	1386	9	53	0	1439	9
	Total	14,876	97	512	3	15,388	
2001–02	21	0	0	0	0	0	0
	22	2326	16	43	0	2369	16
	23	10,279	69	402	3	10,681	72
	24	418	3	8	0	426	3
	26A	1381	9	55	0	1436	9
	Total	14,404	97	508	3	14,912	
2002–03	21			0	0		
	22	2247	15	69	0	2316	16
	23	9979	68	525	4	10,504	71
	24			19	0	19	0
	26A	1783	12	76	1	1859	13
	Total	14,009	95	689	5	14,698	
2003–04	21			0	0		
	22	1860	16	32	0	1892	16
	23	7268	63	406	4	7674	67
	24			17	0	17	0
	26A	1899	16	94	1	1993	17
	Total	11,027	95	549	5	11,576	

TABLE 9 (continued)

		Residents within WAH range		All other hunters		Total harvest	
Reg. year	GMU	# Caribou	%	# Caribou	%	# Caribou	%
2004–05	21			0	0	0	0
	22	2021	13	46	0	2067	13
	23	11,787	75	603	4	12,390	79
	24			34	0	34	0
	26A	1201	8	116	1	1317	9
	Total	15,009	95	799	5	15,808	
2005–06	21			0	0	0	0
	22	1433	10	18	0	1451	10
	23	10883	74	626	4	11509	78
	24			4	0	4	0
	26A	1666	11	84	1	1750	12
	Total	13,992	95	732	5	14,714	
2006-07	21			0			
	22	628	7	40	0	668	7
	23	6916	73	544	6	7460	79
	24			9	0	9	0
	26A	1276	13	87	1	1363	14
	Total	8820	93	680		9500	
2007-08	21			0			
	22	331	3	24	0	354	3
	23	7548	74	320	3	7868	77
	24			5	0	5	0
	26A	1923	19	69	1	1992	19
	Total	9802	96	418	4	10,219	

TABLE 10 Number of hunters residing outside the range of the Western Arctic caribou herd and number of caribou they harvested by sex, regulatory year, and game management unit

		Hunters			Caribou			
Year	GMU	Succ.	Unsucc.	Total	Bulls	Cows	Unk.	Total
2002–03	21	0	4	4	0	0	0	0
	22	42	30	72	62	7	0	69
	23	338	163	501	493	32	0	525
	24	8	37	45	14	5	0	19
	26A	50	15	65	73	3	0	76
	Total	443	250	693	642	47	0	689
2003–04	21	0	1	1	0	0	0	0
	22	20	36	56	26	6	0	32
	23	236	147	383	381	25	0	406
	24	10	42	52	12	5	0	17
	26A	65	16	81	91	3	0	94
	Total	331	242	573	510	39	0	549
2004-05	21	0	0	0	0	0	0	0
	22	24	21	45	36	10	0	46
	23	351	120	471	564	39	0	603
	24	24	41	65	28	6	0	34
	26A	61	15	76	100	14	2	116
	Total	460	199	659	728	69	2	799
2005-06	21	2	0	2	0	0	0	0
	22	14	10	24	16	2	0	18
	23	396	159	555	612	8	6	626
	24	4	30	34	4	0	0	4
	26A	56	25	81	76	8	0	84
	Total	473	227	700	708	18	6	732
2006-07	21	0	0	0	0	0	0	0
	22	19	14	33	36	0	4	40
	23	382	183	565	520	14	10	544
	24	9	25	34	9	0	0	9
	26A	53	15	68	73	14	0	87
	Total	463	237	700	638	28	14	680
2007-08	21	0	0	0	0	0	0	0
	22	18	12	30	24	0	0	24
	23	262	104	366	316	4	0	320
	24	6	13	19	2	3	0	5
	26A	48	10	58	65	4	0	69
	Total	334	139	473	407	11	0	418

TABLE 11 Numbers of nonlocal hunters by transport methods and year for the Western Arctic Herd (all Game Management Units combined; annual percentages in parentheses)

	Plane	Horse-Dog Team	Boat	4-wheeler	Snow machine	Off road vehicle	Highway vehicle	Airboat	Total
1998-1999	416 (72)	4 (1)	96 (17)	10 (2)	23 (4)	2 (0)	29 (5)	0 (0)	580
1999-2000	414 (72)	3 (1)	83 (14)	20 (3)	14 (2)	4 (1)	32 (6)	3 (1)	573
2000-2001	426 (65)	0 (0)	139 (21)	23 (3)	19 (3)	1 (0)	51 (8)	0 (0)	659
2001-2002	410 (69)	3 (1)	88 (15)	19 (3)	12 (2)	3 (1)	59 (10)	2 (0)	596
2002-2003	460 (68)	1 (0)	122 (18)	31 (5)	14 (2)	2 (0)	50 (7)	1 (0)	681
2003-2004	378 (67)	0 (0)	99 (17)	28 (5)	9 (2)	5 (1)	48 (8)	0 (0)	567
2004-2005	471 (73)	3 (0)	90 (14)	17 (3)	18 (3)	2 (0)	47 (7)	0 (0)	648
2005-2006	510 (74)	1 (0)	112 (16)	11 (2)	12 (2)	6 (1)	34 (5)	1 (0)	687
2006-2007	526 (76)	4 (1)	102 (15)	21 (3)	4 (1)	7 (1)	26 (4)	0 (0)	690
2007-2008	370 (78)	2 (0)	58 (12)	18 (4)	4 (1)	3 (1)	16 (3)	1 (0)	472
2008-2009	396 (78)	2 (0)	61 (12)	25 (5)	5 (1)	4 (1)	13 (3)	0 (0)	506

TABLE 12 Percent positive results for brucellosis, haptoglobin levels and sample sizes (in parentheses) from serology analyses of the Western Arctic caribou herd, 1962–2005 (Note: a positive result for brucellosis only indicates exposure to the bacteria rather than an actual infection)

	Brucellosis[a]		Elevated Haptoglobin Level[b]	
Year	%	(*n*)	%	(*n*)
1962	30	(56)		
1963	19	(74)		
1964	14	(37)		
1965	12	(149)		
1975	14	(14)		
1981	39	(23)		
1986	19	(37)		
1992	4	(52)	0	(14)
1993	12	(51)	4	(25)
1994	11	(47)	19	(27)
1995	12	(34)	5	(19)
1996	3	(76)	1	(73)
1997	0	(76)	11	(62)
1998	7	(113)	16	(112)
1999	5	(77)	10	(77)
2000	6	(115)	10	(116)
2001	2	(85)	0	(83)
2002	1	(92)	3	(92)
2003	6	(107)	5	(108)
2004	6	(80)	5	(80)
2005	2	(66)	17	(58)
2006	0	(45)	9	(45)
2007	0	(44)	25	(44)
2008	1	(72)	15	(73)

[a]Brucellosis = *Brucella suis* type 4
[b]Haptoglobins are proteins that indicate inflammation regardless of cause; an elevated haptoglobin level indicates the caribou had some type of infection.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNITS: 25A, 25B, 25D, and 26C (59,400 mi^2)

HERD: Porcupine

GEOGRAPHIC DESCRIPTION: Eastern portions of the Arctic Slope, Brooks Range, and northeastern Interior Alaska

BACKGROUND

The Porcupine caribou herd (PCH) migrates between Alaska, and Yukon and Northwest Territories in Canada. Most of the herd's 130,000-mi^2 range is remote, roadless wilderness. The PCH is a vital subsistence resource for native people of Alaska and Canada. In addition, the PCH provides valued hunting and wildlife viewing opportunities for nonlocals. Because the PCH often calves in promising onshore petroleum prospects in Alaska (Clough et al. 1987), various state and federal agencies and their Canadian counterparts cooperated to carry out baseline ecological studies of the PCH in the 1980s and 1990s. These studies are expected to provide the basis for mitigation of any adverse effects of petroleum development on caribou. Since then, research of the PCH has been substantially reduced and efforts are 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 government and user groups. The board includes a representative from the Alaska Department of Fish and Game (ADF&G), representatives of the governments of the United States, Canada, Yukon and Northwest Territories, and members of communities and Native organizations from Alaska and Canada. Additionally, 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, Yukon Department of Environment (YDE; formerly Yukon Department of Renewable Resources), Northwest Territories Department of Environment and Natural Resources (NWT),

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

Canadian Wildlife Service (CWS), Parks Canada, and U.S. Geological Survey Biological Resources Division. The PCTC meets annually to coordinate research and management activities and set priorities for future work.

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

The PCH remained more stable than other Alaskan herds during the 1960s and 1970s at about 100,000 caribou (Table 1). In 1979 the population began a steady increase and reached 178,000 caribou by 1989. Annual rates of growth averaged about 5% from 1979 to 1989. The PCH then decreased to 160,000 caribou in 1992, probably in response to lower yearling recruitment after harsh winters (Arthur et al. 2003). The herd continued to decline to an estimated 129,000 animals in 1998 and 123,000 in 2001, probably due to increased adult mortality (Arthur et al. 2003).

MANAGEMENT DIRECTION

The following goals, proposed by the IPCB in 1998 (International Porcupine Caribou Board 1998), were used to guide management activities since the decline in research efforts of the early 1990s.

MANAGEMENT GOALS

- Conserve the 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.

- Ensure opportunities for customary and traditional uses of the PCH.

- Enable users of the PCH to participate in international efforts to conserve the PCH and its habitat.

- Encourage cooperation and communication among governments, users of the PCH, and others to achieve these objectives.

MANAGEMENT OBJECTIVE AND MANAGEMENT ACTIVITIES

- Maintain a minimum population of 135,000 caribou.

    - Conduct censuses every 2–3 years.

    - Estimate parturition rates and late June calf:cow ratios from radiocollared females.

    - Monitor herd movements by periodically locating radiocollared and GPS (satellite) collared caribou.

    - Monitor the harvest through field observations, hunter reports, and contact with residents.

METHODS

POPULATION STATUS AND TREND

Population Size

Personnel from ADF&G, ANWR, and YDE cooperated to estimate population size with aerial photocensuses conducted at intervals of 2–3 years, using the modified aerial photo-direct count technique (Davis et al. 1979; Valkenburg et al. 1985). Postcalving aggregations of caribou were located by radiotracking radiocollared animals. These aggregations usually occurred when temperatures were >55°F and wind was <8 mph. Groups of caribou were photographed with a Ziess RMK-A aerial camera mounted in a DeHavilland Beaver aircraft. Caribou were counted directly from photographs. No population estimates were conducted since 2001 due to adverse weather and lack of aggregations.

Parturition, Calf:Cow Ratios, and Early Calf Survival

Parturition rate was estimated by observing radiocollared females ≥2 years old from a fixed-wing aircraft during the first half of June. Caribou observed with calves, hard antlers, or distended udders were classified as parturient (Whitten 1995*a*). Parturient caribou may have been misclassified because the cow did not have hard antlers, the udder was not distended, calves were born early and died, or calves were born late and not observed.

The proportion of calves:100 cows was estimated by observing radiocollared females ≥2 years old from a fixed-wing aircraft in late June after most calves were born. June calf survival was estimated with 2 methods: 1) the proportion of radiocollared cows observed with a calf in late June compared to those observed with a calf in early June (excludes most perinatal mortality), and 2) late June calf:cow ratio/parturition rate (survival from birth to late Jun).

Population Composition

Using techniques recommended in Urquhart (1983), personnel from YDE conducted March composition counts from a helicopter on the PCH winter range in most years since 1991. Because the composition of the PCH is never homogeneous, Urquhart (1983) recommended a sample size of 10% of herd size composed from several well dispersed sample areas. Caribou were classified as adult cow, calf, and immature and mature bulls.

ADF&G conducted summer composition surveys of postcalving groups during 1971–1992. Caribou were classified as adult bull, adult cow, yearling, and calf from a helicopter or the ground in July (Stephenson 2005).

A fall composition survey was conducted during rut in October 1980 in Alaska and Canada. Caribou were classified as adult bull, adult cow, yearling, and calf from a helicopter or the ground. No fall composition surveys were conducted since 1980 because homogeneity of sex and age classes during the rut observed in previous surveys (1972–1978) was variable between years and areas (Whitten 1981). Distribution of caribou in 1980 was ideal for conducting reliable composition counts. During mid October 2008, ADF&G and YDE attempted a composition survey in Alaska and Yukon. The survey was canceled after the first day due to significant mixing of the PCH with Central Arctic caribou in Alaska and Hart River caribou in Yukon.

Distribution and Movements

Personnel from ADF&G, ANWR, and YDE cooperated to monitor distribution of the PCH during calving, postcalving, summer, rut, and winter by relocating radiocollared females and using satellite (GPS) radiocollars.

HARVEST

Harvest and hunting pressure by Alaska residents who lived south of the Yukon River (nonlocal) and by nonresidents were monitored using harvest reports submitted by hunters. This represents less than 2% of the total PCH harvest.

Alaska residents who lived north of the Yukon River were not required to obtain caribou harvest tickets and report cards. However, they were required to register with ADF&G or an authorized vendor. Reporting has typically been poor; therefore, harvest by local residents prior to RY06 was estimated based on knowledge of local hunting patterns and the availability of caribou near communities. Local harvest depends largely on the relative availability of caribou and can be quite variable between years.

Prior to RY06, ADF&G likely underestimated local harvest in Alaska in years when the PCH wintered near Arctic Village and Kaktovik. Therefore, we adjusted annual local harvest from 200–500 to 400–700 annually for RY06–RY07. To arrive at this estimate, we used, in part, a model developed by Sutherland (2005) to estimate harvest of Western Arctic Caribou for villages within that herd's range. The model uses household surveys, community size, proximity to the herd, and the ability of villagers to access caribou to estimate harvest for a given year. Although we did not have the data necessary to run the model for Arctic Village, Sutherland (2005) provided estimates of harvest for various villages on a per capita basis. We felt it important to reduce the probability of underestimating harvest of the PCH by local villages. In the model, Anaktuvuk Pass consistently had the highest per capita harvest of 2 caribou/person. Therefore, we used estimated per capita harvest for Anaktuvuk to estimate harvest of PCH caribou by Arctic Village (200–350 caribou per year). We estimated harvest by Kaktovik residents (200–250 caribou per year) from household surveys conducted in 1987–1988, and adjusted for current Kaktovik population size (Pedersen, 1990). In some years, caribou are harvested by residents of Venetie, Beaver, Fort Yukon, and Chalkyitsik (0–100 caribou per year combined).

Canadian harvest was obtained from YDE during 1984–1998. Since 1999, YDE has not collected harvest data, but harvest was assumed to average 4000 annually. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY06 = 1 Jul 2006 through 30 Jun 2007).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Population size was not estimated in 2006–2008 due to inadequate aggregations. The most recent estimate of 123,052 caribou in 2001 indicated a steady decline since 1989, when 178,000 caribou

were estimated (Table 1). Subsequently, the herd declined by 3–4% per year from 1989 to 1998 and 1.5% per year from 1998 to 2001 (Table 1). Based on recent June and March composition surveys (Table 2), a 3-year study on survivorship of radiocollared adult females, and population modeling, it was likely the PCH continued to decline and may have numbered between 110,000–115,000 caribou by 2006 (S. Arthur, ADF&G files, Fairbanks). Average or above average parturition, June calf survival, and calf:cow ratios since 2006 and a likely reduction in harvest in Canada due to winter caribou distribution in 2007 and 2008 may have slowed or halted herd decline. However, adult survival remained unchanged since 2003 and if the herd continued to decline at the previously modeled rate, expected herd size would be about 100,000 caribou in 2008.

Parturition and Early Calf Survival

Parturition rates of radiocollared females ≥4 years old in 2007 and 2008 were 88% (n = 67) and 79% (n = 63) compared to the 1987–2006 mean of 81% (Table 2).

Parturition rates for 3-year-olds were 100% (n = 3) in 2007 and 83% (n = 6) in 2008. All 2-year-olds were barren (n = 8) in 2007 and one 2-year-old was judged parturient (n = 7) in 2008.

Postcalving survival of calves estimated from cows observed with calves in early June that were subsequently observed in late June (excludes most perinatal mortality) was 90% in 2007 and 92% in 2008. Postcalving survival estimates in both years were the highest measured since 1999 but did not differ significantly (95% binomial confidence interval) from any previous years' estimates or the long-term mean (1991–2008, $\bar{x}$ = 88%).

Late June calf:cow ratios of radiocollared females ≥4 years old were 73:100 (n = 56) in 2007 and 59:100 (n = 53) in 2008. The calf:cow ratio in 2007 was among the highest measured in the PCH since 1987 and significantly higher than calf:cow ratios estimated in 2005 and 2006 (95% binomial confidence interval). The calf:cow ratio subsequently declined in 2008 (not significantly) and may reflect poorer body condition by adult females following high parturition and calf survival from the prior (Cameron 1994).

Population Composition

March composition surveys in 2005 indicated a calf:cow ratio of 24:100 compared with a range of 28–56:100 during the previous 5 years (Table 2; D. Cooley, YDE, personal communication). No surveys were conducted in March 2006 because the PCH was mixed with the Hart River herd in central Yukon and with the Central Arctic herd near Arctic Village, Alaska. In March 2007, YDE staff observed 39 calves:100 cows compared to the mean of 35 calves:100 cows during 1995–2004.

Results of postcalving composition surveys during 1971–1992 are found in Whitten (1993*a*) and Stephenson (2005). Sample sizes were 2,500–33,000 caribou. Bull:cow ratios were variable because sexes were segregated (range: 5–95:100). Calf:cow ratios were less variable, ranging 38–73:100 during those years. Percentage of yearlings was low and ranged 5–15%. These surveys were discontinued because data on calf production and early calf survival were also being

collected using radiocollared caribou and at the time there was little concern about the bull:cow ratios because the herd had been lightly harvested and bull:cow ratios indicated no trend.

Results of the 1980 fall composition surveys indicated a bull:cow ratio of 60:100 and a calf:cow ratio of 54:100 (n = 10,339 in Alaska and 3532 in Canada; Whitten 1981, 1992). Distribution of caribou in 1980 was thought to be ideal for conducting reliable composition counts. However, no fall composition surveys were conducted after 1980 because degree of segregation by sex and age classes during the rut observed in previous surveys (1972–1978) was variable between years and areas (Whitten 1981). In fall 2008 a composition survey was attempted. Significant mixing of the PCH with Central Arctic caribou in Alaska and Hart River caribou in Canada prevented the survey.

Distribution and Movements

Calving Distribution. In mid April and May 2007, the PCH migrated from Alaska and central Yukon to the coastal plain in northern Yukon. Cool weather and extensive fog apparently delayed melting and as a result the coastal plain west of the Alaska–Canada border was nearly completely snow covered. Seventy-nine radiocollared cows were observed during calving survey flights on 2–4 June. Of those, 5 were located in ANWR, Alaska and 74 were located in Ivvavik National Park, Yukon. No caribou were located in the 1002 area of ANWR (The Alaska National Interest Lands Conservation Act of 1980 established ANWR. Section 1002 of that act identifies 1.5 million acres on the coastal plain in the western portion of ANWR in which management direction has been deferred due to the area's potential for oil and gas resources. This area is referred to as the "1002 area" in this report). Calving extended from just east of the Kongakut River, Alaska to the Babbage River, Yukon and was concentrated near the Malcolm and Firth rivers, Yukon.

In April and May 2008, the PCH migrated from Alaska and Central Yukon to the coastal plain between the Malcolm and Babbage rivers, Yukon. By early June the coastal plain was nearly snow free as far west as the Hulahula River, Alaska. However, caribou were mostly distributed from the Babbage River, Yukon to the Kongakut River, Alaska, at time of calving. Seventy-six radiocollared cows were observed during flights to monitor calving on 1–3 June. Of those, 25 were located in ANWR, Alaska, and 51 were located in Ivvavik National Park, Yukon. No radiocollared cows were located in the 1002 area of ANWR. Calving extended from the Aichilik River, Alaska to the Babbage River, Yukon and was concentrated around the Clarence River, Yukon.

In the 1980s and 1990s, most of the PCH calved in ANWR, Alaska, often in the 1002 area. Since 2000 the PCH primarily calved in Ivvavik National Park, Yukon. Deep snow in the spring of 2000 and 2001 evidently delayed most caribou from migrating to the coastal plain and calving occurred as far south as the Old Crow Flats, Yukon. In 4 of 7 years during 2002–2008, calving occurred on the coastal plain, primarily in Yukon between the Alaska–Canada border and the Babbage River, Yukon. Calving distribution since 2002 indicates that important calving areas include the coastal plain from the Jago River, Alaska to the Babbage River, Yukon. This may be especially true in years when deep snow delays migration or snow cover on calving grounds in Alaska prohibits successful calving.

Summer Distribution. Following calving in 2006, most of the PCH migrated from the coastal plain in Alaska south into the Brooks Range in July. The PCH then moved into Canada north of the Old Crow Flats and left this summer range after the rut in October.

Following calving in 2007, the PCH moved west from Yukon to the coastal plain in Alaska. During 22–23 June, radiotracking flights determined that most of the PCH was distributed between the Alaska–Canada border and the Okpilak River, Alaska and caribou were concentrated between the Jago and Aichilik rivers. By late June, most of the herd moved south into the Brooks Range. Warm, sunny weather resulted in aggregated groups that were scattered in the mountains from the Jago River south and east to the headwaters of the Colleen River. A photocensus was attempted on 1 July. Conditions during the photocensus were not ideal. Many caribou groups were photographed with the sun low in the horizon and in steep mountainous terrain. Within individual photos, light conditions varied from brightly illuminated to dark shadow. As a result, many photographs were partially or completely underexposed. Therefore, a count of caribou could not be completed. In addition, some small groups of caribou that were moving rapidly through the mountains could not be photographed.

Following calving in summer 2008, the PCH moved west and were distributed between the Kongakut and Hulahula rivers, Alaska at elevations from 2500 to 5000 feet. Radiocollared cows were among loosely aggregated groups. However, a considerable concentration observed in the Okpilak River drainage contained 58% of located radiocollars (n = 64). Two of 15 GPS-collared cows and 15% of radiocollared cows were located in the Firth River drainage near Mountain Creek, Yukon. Fifteen of 20 radiocollared bulls were located and most were in the Jago River drainage and segregated from cows. Cool weather in the mountains and an apparent lack of harassment by insects prevented adequate aggregations for a photo census. By late June and early July, most of the herd moved south across the Continental Divide and into the upper Sheenjek River drainage. By late July, most of the PCH migrated east to the Richardson Mountains between the Blow and Bell rivers, Yukon. Fewer caribou remained in Alaska in the upper Okpilak River drainage.

Fall Distribution. In fall 2006 the PCH migrated later than usual (the last 2 weeks of Oct). Most of the PCH moved east from the Old Crow Flats in Yukon before settling near the Dempster Highway between Sheep Creek and the Yukon–Northwest Territories border. Fewer caribou migrated west into Alaska.

In August 2007 most of the PCH migrated to the Richardson Mountains, Yukon. By early October, the herd split and approximately 75% of the herd migrated west into the upper Sheenjek and Chandalar River drainages, Alaska. The remainder migrated south to the Ogilvie Mountains, Yukon.

In August 2008 most of the PCH was in the northern Richardson Mountains near the Blow River, Yukon. Some caribou also were scattered as far south as the Bell and Porcupine River drainages Yukon, while some remained on the coastal plain near the Egaksrak River, Alaska. During September, most of the PCH, including 13 of 15 satellite radiocollared caribou, migrated west from the Richardson Mountains and were in Alaska between the Coleen and Middle Fork

Chandalar rivers by late September. Two of 15 satellite radiocollared caribou migrated south to the Ogilvie Basin, Yukon.

Winter Distribution. During winter 2006–2007, data from GPS collars indicated that most of the PCH wintered in Northwest Territories, Canada in or near the Richardson Mountains, extending from the Peel River north along the Eagle and Bell rivers to the foothills west of Aklavik. Smaller numbers of caribou wintered in the Ogilvie Basin in Central Yukon and along the Sheenjek and East Fork Chandalar rivers, Alaska (Lenart 2007; S. Arthur, ADF&G, PCH calving survey memorandum, Jun 2007, Fairbanks).

During winter 2007–2008, GPS satellite collars indicated that most of the PCH wintered in the southern foothills of the Brooks Range between the Coleen and Junjik rivers, Alaska. Caribou were more concentrated around Arctic Village between the Sheenjek and East Fork Chandalar rivers. Fewer caribou wintered in the Ogilvie Basin, the upper Miner and the upper Whitestone River drainages in Central Yukon.

Historical information on movements and distribution of the PCH are summarized by Garner and Reynolds (1986), Whitten (1987, 1993*b*, 1995*b*), Whitten and Regelin (1988), Fancy et al. (1989), Golden (1989, 1990), Whitten and Fancy (1991), and Griffith et al. (2002).

MORTALITY

Harvest

Season and Bag Limit. The State of Alaska hunting season for all hunters during RY02–RY08 was 1 July to 30 April; in addition, hunters could take only bull caribou during 23–30 June in Unit 26C. The bag limit for all Alaska residents was 10 caribou. The bag limit for nonresidents was 5 caribou.

Alaska Board of Game Actions and Emergency Orders. The Alaska Board of Game took no regulatory action and there were no emergency orders issued regarding the PCH during RY06–RY07.

Harvest by Hunters. Nonlocal and nonresident hunters in Alaska harvested 59 PCH in RY06 and 126 in RY07 (Table 3). Harvest during those years reflected availability of caribou to hunters in August and September when most hunting by nonlocals and nonresidents occurs. During August and September 2006, most of the PCH was in eastern Yukon compared to considerable numbers of caribou present in the upper Sheenjek and Chandalar River drainages in August 2007. Overall, harvest and hunting pressure by nonresidents has remained low. The combined reported harvest by nonlocal Alaska residents and nonresidents represents a small proportion (<20%) of the estimated harvest in Alaska and is less than 2% of the total combined harvest in Alaska and Canada. Due to difficult logistics, high expense, and uncertainty in herd location from year to year, the PCH has never been subjected to substantial harvest by nonlocal and nonresident hunters in Alaska.

Total annual harvest of the PCH in RY06 and RY07 is unknown because harvest data from northern Yukon has not been collected since RY99 and reporting by local Alaska residents is

poor. Most local Alaska harvest is by residents of Kaktovik and Arctic Village. Harvest occurs seasonally and is affected by caribou distribution. Harvest by Kaktovik residents occurs primarily during summer, following the calving period and likely does not exceed 200 animals. Residents of Arctic Village harvest caribou during winter months in years when the PCH winters in or near the upper Chandalar River. Anecdotal information suggests that harvest ranges from 200 to 350 caribou in years when caribou are accessible. Up to several hundred caribou were probably harvested in RY06 by Arctic Village because most of the PCH wintered in Yukon. In RY07, harvest in Arctic Village was likely near the upper range for that community because caribou were concentrated near the community for several months during winter. A small number of additional caribou were harvested by residents of Venetie.

Harvest in Canada probably continued to be high in RY06 because caribou often move through the Old Crow area several times each year and frequently winter along the Dempster Highway. Additionally, hunters from Gwich'in communities in Canada took small numbers of caribou along the Porcupine River near the Alaska–Yukon border in the fall. Annual harvest in Canada is thought to average 4000 caribou but may be significantly more or less depending on herd distribution and movement throughout the year. In RY07 and RY08, harvest in Canada likely declined compared to prior years because most of the PCH wintered in Alaska.

Hunter Success. In RY06 and RY07, combined success rates by nonlocal Alaska residents and nonresident were 38% and 57% (Table 4). Most PCH caribou were harvested in Unit 25A and Unit 26C. Hunting pressure and success rates were low in Unit 25D and Unit 25B. This is expected, as these units are on the periphery of the PCH's range.

Local hunter success depended on spatial and temporal distribution of the PCH relative to village locations. Success rates by Kaktovik residents were thought to be low in RY06 and RY07 because the PCH migrated south of the coastal plain into the Brooks Range during mid to late June. However, success rates for residents of Arctic Village were likely high in RY06 and RY07 due to an abundance of PCH caribou that wintered in the upper Chandalar River drainages.

Harvest Chronology. Nearly all nonlocal Alaska resident and nonresident harvest of the PCH in Alaska occurs during August and early September. Local harvest near Kaktovik primarily occurs in July, August, and April if traveling conditions are good and caribou are present (Pedersen, 1990). Harvest by local residents south of the Brooks Range primarily occurs during winter. However, harvest chronology depends on availability of caribou near villages, and harvest occurs whenever caribou are present.

Transport Methods. Traditionally, nonlocal Alaska resident and nonresident hunters fly into the PCH range, and a few travel by boat up the Porcupine River. Local residents in Alaska use boats or ATVs in summer and snowmachines in winter when the predominant harvest of the PCH in Alaska occurs.

Natural Mortality

A study on the causes of natural mortality on the PCH has not been conducted since the late 1980s. However, wolves, grizzly bears, and golden eagles were determined to be the 3 most

common predators, with golden eagles being a significant source of mortality on PCH calves on the calving grounds (Whitten et al. 1992).

Although recent data on the cause of mortalities have not been collected, Wertz et al. (2007) reported annual survival rates for adult females that ranged from 75 to 88% and averaged 82% during 2003–2006. This appears to be lower than during 1997–2001, when average annual survival was 90% (Arthur et al. 2003), and during 1982–1991, when average annual survival was 84% (Fancy et al. 1994). Estimates of adult (combined bull and cow) survival during 2003–2006 ranged 73–86% and averaged 79% (Wertz et al. 2007). Population models (Walsh et al. 1995; Griffith et al. 2002; Arthur et al. 2003) indicate that an annual adult survival rate of less than 84% would result in a population decline such as that observed in the PCH since 1989.

HABITAT

Studies on the calving grounds indicate calving caribou select areas with rapid plant growth, rather than specific sites or habitats (Griffith et al. 2002). Areas with the most rapid plant growth vary each year, but rapid growth tends to occur most frequently in the region identified by Fancy and Whitten et al (1991) as the primary calving area of the PCH. These studies indicate that, over time, the entire extent of the calving grounds is important for caribou. Thus, preserving or protecting only portions of the calving area may not adequately protect the herd from declines caused by human disturbance associated with development.

CONCLUSIONS AND RECOMMENDATIONS

The Porcupine caribou herd likely peaked near 178,000 caribou in 1989 and declined to 123,000 by 2001. Modeling indicated that the PCH may have numbered 110,000–115,000 by 2006 (Lenart 2007). Current size of the PCH is unknown. If the PCH continued to decline at the modeled rate, the PCH may number about 100,000 caribou. However, average or above average parturition rates, June calf survival, and June calf:cow ratios during 2006–2008; and a likely reduction in harvest in 2007 and 2008 (due to winter caribou distribution), may have slowed population decline. Conversely, parturition rates and late June calf numbers do not appear to be sensitive indicators of population trend (Walsh et al. 1995; Arthur et al. 2003); whereas adult survival, a more sensitive indicator, has not improved.

Although no habitat studies were conducted during RY06–RY07 on PCH range in Alaska, long-term data on calving distributions indicate all of the coastal plain in ANWR and Yukon may be important to the herd over the long term (Fancy and Whitten 1991; Griffith et al. 2002; this report).

The PCH was lightly hunted in Alaska; thus, harvest in Alaska probably played a relatively small role in the decline of the PCH. There is little information about harvest levels or composition in Canada; however, harvest is thought to average 4000 caribou annually and may be as high as 6000 in some years. As the PCH declines in size, current harvest levels in Canada will likely become more additive and either precipitate additional herd decline or suppress recovery. Therefore, in 2008, a working group made up of governments of Canada and local Native communities drafted a Harvest Management Plan (HMP) for the PCH for review by the

Porcupine Caribou Management Board and IPCB. The HMP outlines a harvest strategy that would restrict or liberalize harvest based on herd size. The plan recognizes that a census of the PCH has been unreliable in recent years (e.g., adverse weather, lack of aggregations, etc.) and therefore uses population indicators to trigger various harvest strategies when a current census is not available. In general, the plan would allow for unrestricted harvest when the PCH is greater or equal to 125,000, institute a voluntary bull only harvest if herd size is 75,000–125,000, institute a mandatory bull only harvest with annual limits if herd size is 50,000–75,000, and prohibit harvest (except for ceremonial purposes) if herd size is below 50,000. The HMP is currently under review.

We met our goal to conserve the PCH and its habitat through international cooperation and coordination with ANWR and with Canadian government agencies (YDE, NWT, CWS and Parks Canada) to assess population parameters (parturition rates, early calf survival, adult survival, overwinter survival, population size, seasonal distribution) of the PCH and the importance of the ANWR coastal plain to the PCH. We met annually with these agencies as part of the PCTC.

We met our goal to ensure opportunities for customary and traditional uses of the PCH by providing liberal seasons and bag limits. The goal to enable users of the PCH to participate in international efforts to conserve the PCH was not met because the IPCB, which includes members from local communities, did not meet during RY06–RY07. However, development of the HMP will require considerable involvement from users of the PCH and governments in the coming years.

Based on the most recent census and estimates from population modeling, we likely did not meet our management objective of 135,000 animals. However, we did collect data to estimate parturition rates and June calf:cow ratios. We should continue to work with other agencies to identify factors affecting population dynamics of the PCH and evaluate potential effects of harvest and development on the coastal plain.

LITERATURE CITED

ARTHUR, S. M., K. R. WHITTEN, F. J. MAUER, AND D. COOLEY. 2003. Modeling the decline of the Porcupine caribou herd, 1989–1998: the importance of survival versus recruitment. Rangifer Special Issue 14:123–130.

CAMERON, R. D. 1994. Reproductive pauses by female caribou. Journal of Mammalogy 75:10–13.

CLOUGH, N. K., P. C. PATTON, AND A. C. CHRISTENSEN, EDITORS. 1987. Arctic National Wildlife Refuge, Alaska, coastal plain resource assessment. Report and recommendation to the Congress of the United States and final legislative environmental impact statement. U.S. Fish and Wildlife Service, Washington, D.C., USA.

DAVIS, J. L., P. VALKENBURG, AND S. HARBO. 1979. Refinement of the aerial photo-direct count-extrapolation caribou census technique. Alaska Department of Fish and Game. Federal

Aid in Wildlife Restoration. Research Progress Report. Grant W-17-11. Study 3.25. Juneau, Alaska, USA.

FANCY, S. G., L. F. PANK, K. R. WHITTEN, AND W. L. REGELIN. 1989. Seasonal movements of caribou in Arctic Alaska as determined by satellite. Canadian Journal of Zoology 67:644–650.

———, AND K. R. WHITTEN. 1991. Selection of calving sites by Porcupine herd caribou. Canadian Journal of Zoology 69:1736–1743.

———, ———, AND D. E. RUSSELL. 1994. Demography of the Porcupine caribou herd, 1983–1992. Canadian Journal of Zoology 72:840–846.

GARNER, G. W., AND P. E. REYNOLDS, EDITORS. 1986. Caribou. Pages 210–250 *in* Final report baseline study of the fish, wildlife, and their habitats. Volume I. Arctic National Wildlife Refuge Coastal Plain Resource Assessment. U.S. Fish and Wildlife Service, Region 7, Anchorage, Alaska, USA.

GOLDEN, H. N. 1989. Porcupine caribou herd management report. Pages 156–165 *in* S.O. Morgan, editor. Caribou management report of survey–inventory activities. Part XI. Volume XIX. Alaska Department of Fish and Game. Study 3.0. Juneau.

———. 1990. Porcupine caribou herd management report. Pages 159–163 *in* S.O. Morgan, editor. Caribou management report of survey–inventory activities. Part XI. Volume XX. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

GRIFFITH, B., D. C. DOUGLAS, N. E. WALSH, D. D. YOUNG, T. R. MCCABE, D. E. RUSSELL, R. G. WHITE, R. D. CAMERON, AND K. R. WHITTEN. 2002. The Porcupine caribou herd. Pages 8–37 *in* D. C. Douglas, P. E. Reynolds, and E. B. Rhode, editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001. Reston, Virginia, USA.

INTERNATIONAL PORCUPINE CARIBOU BOARD (IPCB). 1998. Appendix 1 in Fifth Annual Report. U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge. Fairbanks, Alaska, USA.

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

PEDERSEN, S. 1990. Caribou hunting: land use dimensions, harvest level, and selected aspects of the hunt during regulatory year 1987–88 in Kaktovik, Alaska. Alaska Department of Fish and Game. Technical Paper Number 172 Fairbanks, Alaska, USA.

STEPHENSON, R. O. 2005. Units 25A, B, D, and 26C caribou. Pages 219–234 *in* C Brown, editor. Caribou management report of survey and inventory activities 1 July 2002–30 June 2004. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

SUTHERLAND, B. 2005. Harvest estimates of the Western Arctic caribou herd, Alaska. Rangifer, Special Issue No. 16:177–184.

URQUHART, D. R. 1983. The status and life history of the porcupine caribou herd, first draft. Department of Renewable Resources. Government of Yukon, Canada.

VALKENBURG, P., D. A. ANDERSON, J. L. DAVIS, AND D. J. REED. 1985. Evaluation of an aerial census technique for caribou based on radiotelemetry. Pages 287–299 *in* T. C. Meredith and A. M. Martell, editors. Proceedings second North American caribou workshop. McGill Subarctic Research Paper 40.

WALSH, N. E., B. GRIFFITH, AND T. R. MCCABE. 1995. Evaluating growth of the Porcupine caribou herd using a stochastic model. Journal of Wildlife Management 59:262-272.

WERTZ, T. L., S. M. ARTHUR, B. GRIFFITH, D. COOLEY, M. KIENZLER. 2007. The Puzzle of the Porcupine Caribou Herd: Do we have all the pieces? Yukon North Slope Conference. Whitehorse, Yukon.

WHITTEN, K. R. 1981. Porcupine caribou herd. Pages 53–58 *in* R. A. Hinman, editor. Caribou management report of survey and inventory activities. Caribou, moose, and mountain goats. Part II. Volume XII. Alaska Department of Fish and Game. Juneau, Alaska, USA.

———. 1987. Porcupine caribou herd. Pages 54–55 *in* B. Townsend, editor. Caribou management report of survey and inventory activities. Part XI. Volume XVII. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———. 1992. Porcupine caribou herd. Pages 151–164 *in* S. M. Abbott, editor. Caribou management report of survey and inventory activities 1 July 1989–30 June 1991. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———. 1993*a*. Porcupine caribou herd. Pages 190–197 *in* S. M. Abbott, editor. Caribou management report of survey and inventory activities 1 July 1990–30 June 1992. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———. 1993*b*. Movement patterns of the Porcupine caribou herd in relation to oil development. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grants W-22-5, W-22-6, W-23-1 through W-23-5, and W-24-1. Study 3.34. Juneau, Alaska, USA.

———. 1995*a*. Antler loss and udder distention in relation to parturition in caribou. Journal of Wildlife Management 59:273–277.

———. 1995*b*. Porcupine caribou herd. Pages 176–186 *in* M. V. Hicks, editor. Caribou management report of survey–inventory activities. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———, AND S. G. FANCY. 1991. Movement patterns of the Porcupine caribou herd in relation to oil development. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Final Report. Grant W-23-3. Study 3.34. Juneau, Alaska, USA.

———, G. W. GARNER, F. J. MAUER, AND R. B. HARRIS. 1992. Productivity and early calf survival in the Porcupine caribou herd. Journal of Wildlife Management 56:201–212.

———, AND W. L. REGELIN. 1988. Movement patterns of the Porcupine caribou herd in relation to oil development. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-23-1. Study 3.34. Juneau, Alaska, USA.

PREPARED BY:

Jason R. Caikoski
Wildlife Biologist II

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

CAIKOSKI, J. R. 2009. Units 25A, 25B, 25D, and 26C caribou. Pages 240–258 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Porcupine caribou herd population estimates, 1961–2008

Year	Population estimate[a]	Technique[b]
1961	110,000	Calving ground census
1972	99,959	APDCE
1977	105,000	APDCE
1979	105,683	Modified APDCE
1982	125,174	APDCE
1983	135,284	APDCE
1987	165,000	APDCE
1989	178,000	APDCE
1992	160,000	APDCE
1994	152,000	APDCE
1998	129,000	APDCE
2001	123,000	APDCE
2002–2008[c]		

[a] All estimates include calves except for the 1961 estimate.
[b] Calving ground census data presented by R. O. Skoog at the 1962 Alaska Science Conference; APDCE is aerial photo-direct count extrapolation (Davis et al. 1979; Valkenburg et al. 1985).
[c] No estimates because of weather or poor aggregation.

TABLE 2 Porcupine caribou demographic data, 1987–2008[a]

Year	Cows observed[b]	Parturition rate	June calf survival[c]	Postcalving survival[d]	Late June calf:cow[e]	March calf:cow[f]	Population estimate
1987	51	0.78	0.71		0.55		165,000
1988	91	0.84	0.65		0.55		
1989	74	0.78	0.74		0.58	0.43	178,000
1990	74	0.82	0.90		0.74		
1991	77	0.74	0.82		0.61	0.22	
1992	78	0.86	0.57		0.49	0.33	160,000
1993	63	0.81	0.56	0.83	0.45	0.32	
1994	98	0.91	0.77	0.93	0.70	0.40	152,000
1995	95	0.69	0.85	0.92	0.59	0.41	
1996	74	0.89	0.81	0.91	0.72	0.46	
1997	48	0.75	0.77	0.90	0.58	0.38	
1998	58	0.83	0.82	0.94	0.68	0.27	129,000
1999	39	0.84	0.83	0.86	0.70	0.56	
2000	44	0.73	0.61	0.82	0.44	0.28	
2001	70	0.84	0.61	0.79	0.51	0.31	123,000
2002	68	0.87	0.65	0.85	0.56	0.38	
2003	70	0.87	0.79	0.85	0.69	0.33	
2004	74	0.82	–[g]	–[g]	–[g]	0.24	
2005	55	0.64	0.77	0.88	0.49	–[h]	
2006	66	0.79	0.73	0.86	0.58	0.39	
2007	67	0.88	0.83	0.90	0.73	–[h]	
2008	63	0.79	0.73	0.92	0.59	–[h]	
$\bar{x}$		0.81	0.74	0.88	0.60	0.36	

[a] Data are from Fancy et al. (1994), Alaska Department of Fish and Game, and Yukon Department of Environment.
[b] Number of radiocollared cows for which parturition status was determined in early June, excluding those known to be <4 years old. Includes caribou of unknown age, but most likely ≥4 years old. Prior to 2003, all caribou were of unknown age.
[c] Estimated as (Jul calf:cow ratio)/(parturition rate).
[d] Includes only calves observed during early June whose dams were observed in late June (i.e., does not include most perinatal mortality).
[e] Excludes radiocollared cows known to be <4 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.
[h] No data due to mixing of caribou herds on winter range.

TABLE 3 Porcupine caribou herd harvest, regulatory years 1984–1985 through 2007–2008

Regulatory	Reported				Estimated unreported			
year	M	F	Unk	Total	Alaska	Canada	Total	Total
1984–1985	49	4	0	53	500–700	4000	4500–4700	4553–4753
1985–1986	52	12	1	65	500–700	4000	4500–4700	4565–4765
1986–1987	70	14	0	84	1000–2000	500–1000	1500–3000	1584–3084
1987–1988	106	22	1	129	<500	2000–4000	2500–4500	2629–4629
1988–1989	82	7	0	89	<500	2000–4000	2500–4500	2589–4589
1989–1990	104	8	0	112	500–700	2000	2500–2700	2612–2812
1990–1991	19	1	0	20	100–150	1680	1780–1830	1800–1850
1991–1992	101	3	0	104	100–150	2774	2874–2904	2978–3028
1992–1993	78	1	0	79	658	1657	2315	2394
1993–1994	77	5	0	82	250	2934	3184	3266
1994–1995	72	3	0	75	200	2040	2240	2315
1995–1996	61	7	0	68	200	2069	2269	2337
1996–1997	76	2	0	78	200	2159	2359	2437
1997–1998	58	4	1	63	300	1308	1608	1671
1998–1999	83	11	1	95	300	–[a]		
1999–2000	84	4	0	88	400	–[a]		
2000–2001	62	10	0	72	300	–[a]		
2001–2002	105	9	0	114	400	–[a]		
2002–2003	72	3	1	76	300	–[a]		
2003–2004	120	8	0	128	500	–[a]		
2004–2005	60	7	0	67	200	–[a]		
2005–2006	32	10	0	42	500	–[a]		
2006–2007	57	1	1	59	400–700	–[a]		
2007–2008	113	13	0	126	400–700	–[a]		

[a] Canadian data unavailable.

TABLE 4 Porcupine caribou herd local, nonlocal[a] and nonresident hunter success, regulatory years 1991–1992 through 2007–2008

Regulatory year/ Hunters	Unit				Total for Units 25 and 26C
	25A	25B	25D	26C	
1995–1996					
Total hunters	57	9	1	21	88
Successful	32	2	0	10	44
% Successful	56	22	0	48	50
1996–1997					
Total hunters	47	20	0	9	76
Successful	29	16	0	2	47
% Successful	62	80	0	22	62
1997–1998					
Total hunters	56	10	3	17	86
Successful	34	5	0	6	45
% Successful	61	50	0	35	52
1998–1999					
Total hunters	85	12	3	17	117
Successful	63	3	2	9	77
% Successful	74	25	67	53	66
1999–2000					
Total hunters	80	23	16	6	125
Successful	55	14	5	3	77
% Successful	69	61	31	50	62
2000–2001					
Total hunters	91	13	12	6	122
Successful	56	0	2	2	60
% Successful	61	0	17	33	49
2001–2002					
Total hunters	121	27	14	14	176
Successful	85	5	2	9	101
% Successful	70	19	14	64	57
2002–2003					
Total hunters	98	21	23	12	154
Successful	65	5	2	4	76
% Successful	66	24	9	33	49
2003–2004					
Total hunters	127	29	12	13	181
Successful	95	19	0	9	123
% Successful	75	66	0	69	68

Regulatory year/ Hunters	Unit				Total for Units 25 and 26C
	25A	25B	25D	26C	
2004–2005					
Total hunters	85	11	16	20	132
Successful	54	0	3	8	65
% Successful	64	0	19	40	49
2005–2006					
Total hunters	80	11	12	30	133
Successful	24	0	0	18	42
% Successful	30	0	0	60	32
2006–2007					
Total hunters	88	12	33	23	156
Successful	45	1	1	12	59
% Successful	51	8	3	52	38
2007–2008					
Total hunters	142	10	16	55	223
Successful	82	1	3	40	126
% Successful	58	10	19	73	57

[a] Nonlocal includes Alaskans residing outside Units 25, 26B, and 26C.

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNIT: Western half of Unit 25C and small portions of northern Unit 20B and eastern Unit 20F (3090 mi^2)

HERD: White Mountains

GEOGRAPHIC DESCRIPTION: White Mountains area north of Fairbanks

BACKGROUND

As recently as 1960, 30,000 caribou from the Fortymile caribou herd (FCH) regularly crossed the Steese Highway to calve and summer in the White Mountains (Jones 1961). As the FCH declined throughout the 1960s, these caribou abandoned the traditional White Mountains calving area and remained southeast of the Steese Highway. However, in the late 1970s, public reports and incidental observations by biologists confirmed the year-round presence of caribou in the White Mountains, implying a small resident herd had existed for many years (Valkenburg 1988).

When the White Mountains caribou herd was first documented as a distinct herd in the late 1970s, it numbered 100–200 caribou (P. Valkenburg, ADF&G, personal communication). The federal Bureau of Land Management (BLM) estimated the herd's size at around 1000 caribou in the mid 1980s (Valkenburg 1988), although the basis for this estimate is unknown. In a photo census on 6 July 1992, J. Herriges (BLM) counted 832 caribou but extrapolated the estimate to 1200, based on missing radiocollared animals and a rough estimate of herd composition. In retrospect, it seems most likely that the herd grew from about 150 in 1978 to around 1000 in 1992, was stable until about 1999, when it declined to about 600–800 by 2000 and 600–700 by 2007 (Table 1).

The White Mountains National Recreation Area is managed by BLM and encompasses most of the White Mountains caribou herd's range. The recreation area was created by the Alaska National Interest Lands Conservation Act in 1980. In 1982 BLM and ADF&G initiated a cooperative project to determine the identity and distribution of caribou in the White Mountains.

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

Caribou radiocollared during that project provided information on herd movements and distribution. The White Mountains caribou herd also provided a low-density comparison population for the long-term Delta caribou herd research project.

Public use of the White Mountains is increasing, especially during late winter. BLM continues to improve access and increase recreational opportunities through development of roads, trails, and cabins. Despite this increased access, annual reported harvests have been low. In 1990, 2 drawing permit hunts (DC877 and DC878) were established to provide opportunity to hunt caribou in winter. DC877 allowed motorized access hunting, while DC878 was nonmotorized access only. Although 100 permits were issued for the first 3 seasons (50 per hunt), success was low (6 caribou). The number of permits available was increased to 250 (125 per hunt) during regulatory years (RY) 1993 and 1994 (RY = 1 Jul through 30 Jun; e.g., RY93 = 1 Jul 1993 through 30 Jun 1994). However, the increase in available permits did not produce an increase in harvest, and participation dropped until there were more permits available than applicants. During the March 1998 Board of Game meeting, drawing permit hunts DC877 and DC878 were changed to registration hunts RC877 and RC878 with an unlimited number of permits available. Regulations were further liberalized at the March 2000 Board of Game meeting. The fall general season bag limit was changed from 1 bull to 1 caribou, and RC877 and RC878 were combined to create RC879, with season dates of 1 November through 31 March and no motorized restrictions. However, the area open to hunting the White Mountains caribou herd was reduced because the FCH hunt boundary was moved northwest from the Steese Highway to Preacher and American Creeks, removing a portion of the eastern area for hunting White Mountains caribou. In March 2002 the Board of Game changed the fall caribou bag limit back to bull only because cow harvests in 2000 and 2001 approached sustainable limits.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Ensure that increased recreational use and mining development do not adversely affect the White Mountains herd.
- Provide the greatest sustained opportunity for hunting caribou.
- Provide an opportunity to view and photograph caribou.

MANAGEMENT OBJECTIVE

- Maintain a stable or increasing population with a fall bull:cow ratio of at least 30 bulls:100 cows.

METHODS

POPULATION STATUS AND TREND

Population Size

A photo census was not completed on the White Mountains herd in 2006 due to cool, wet weather in June that precluded the tight grouping of caribou necessary for a census. In 2007, June weather conditions were so favorable that ADF&G twice estimated the White Mountains herd population size using the radio-search technique (Valkenburg et al. 1985). We conducted surveys on 19 and 29 June. We located all of the 10 functioning radiocollars during both surveys, and photographed groups of caribou with handheld digital cameras from a radiotelemetry-equipped Bellanca Scout fixed-wing aircraft. We counted a minimum of 590 and 580 caribou, respectively, during the 19 June and 29 June surveys and estimated the population size to be up to 650 (Table 1).

In our attempt to maintain at least 20 radiocollared caribou in the White Mountains herd to aid in estimation of herd dynamics, we deployed radiocollars on 6 female calves on 10 October 2007. This brought the total number of functioning radio collars to approximately 17 by November 2007. The calves radiocollared in 2007 weighed an average of 149 pounds (154, 159, 157, 150, 130, and 137) which is among the heaviest for fall caribou calves in Alaska and indicates a high nutritional condition of the herd (Valkenburg et al. 2002).

Population Composition

We conducted composition surveys on 16 October 2006 and 10 October 2007 using an R-44 helicopter and a Bellanca Scout aircraft. The biologist in the fixed-wing aircraft located the radiocollared caribou. A biologist in the R-44 helicopter classified caribou that were in groups with radiocollared animals and also classified any caribou found in a search of the surrounding area. We broadly searched areas containing numerous radiocollared caribou for additional groups. We also classified any caribou encountered while in transit between search areas. Classification categories consisted of cows; calves; and large, medium, and small bulls. Observers identified bulls by the absence of vulva and classified bulls by antler characteristics (Eagan 1993). We tallied the composition of each group on a 5-position counter and recorded the tallies on a data sheet. We classified 362 and 358 caribou in 2006 and 2007, respectively (Table 1).

MORTALITY

Harvest

We estimated harvest by using data from returned harvest ticket and registration permit report cards. For RY06 and RY07, caribou harvested west of Preacher and American Creeks and north of the Steese Highway were considered White Mountains herd animals; caribou harvested east of these drainages and/or south of the Steese Highway were considered FCH animals. To separate the White Mountains herd from the Ray Mountains herd harvest in Unit 20F, caribou killed south of the Yukon River were considered White Mountains herd animals. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size and Composition

The June 2007 population estimate of 590–650 caribou was slightly higher than the 2005 estimate of 514–600. The minimum count of 590 was 15% higher than the minimum count of 514. It is possible that the herd was increasing during this period, especially since the highest calf per cow ratio since 1999 was observed in 2007 (Table 1). Fall calf:cow and bull:cow ratios in the White Mountains herd have been variable. Productivity and early calf survival appeared insufficient (<25 calves:100 cows) to suggest herd growth during RY03–RY06, but 37 fall calves per 100 cows in 2007 suggests that the population estimate may increase in 2008. Bull:cow ratios remained relatively high and continued to meet objectives during RY06–RY07. Variation in bull:cow ratios since 1983 (23–62:100) probably reflect biased sampling because bulls are often segregated after the rut (e.g., surveys conducted in 1991 and 1995). Surveys conducted early in the fall (i.e., 29 Sep–6 Oct) yielded higher bull:cow ratios than surveys conducted later. Differences in composition among years may also be attributed to behavior of the White Mountains caribou herd. Because these caribou are usually in small, scattered groups and in timbered areas, it is easy to miss groups and this could affect the overall composition estimates.

Distribution and Movements

During RY04–RY07, radiocollared White Mountains herd caribou were normally located during May, June, and October, then roughly every other month between those periods. Calving in the White Mountains herd is often widespread and dispersed, which appears to have changed little since Durtsche and Hobgood (1990) observed it. Calving occurs primarily in the higher elevations east of Beaver Creek, including the Nome, Fossil, Cache, and Preacher Creek drainages. Some scattered calving also occurs west of Beaver Creek. Postcalving aggregations occur from mid June to late July east of Beaver Creek to Mount Prindle. Prior to RY02, White Mountains caribou often moved north of Beaver Creek and wintered in upper Hess and Victoria Creeks and the upper Tolovana River drainages, although some wintered in the Preacher Creek drainage west of Circle. Most of the herd wintered in the Preacher Creek drainage during RY04–RY07. The western wintering area burned in 1988 and was followed by a perceived shift of caribou away from the western wintering area. Twenty to 50 caribou can still be found in the western wintering area during most months of the fall and winter.

MORTALITY

Harvest

Season and Bag Limit.

Season/Hunt conditions	RY90–RY97	RY98–RY99	RY00–RY01	RY02–RY07
Fall general season[a]	10 Aug–20 Sep			
Hunt area	Units 20B, 20F, and 25C, north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway.		Units 20B and 20F north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway, and	

Season/Hunt conditions	RY90–RY97	RY98–RY99	RY00–RY01	RY02–RY07
			Unit 25C west of Preacher and American Creeks.	
Bag limit	1 bull		1 caribou	1 bull
Motor vehicle restrictions	None			
Winter season[a]	Drawing; 1 Feb–31 Mar	Registration; 1 Nov–31 Mar		Registration; 1 Dec–31 Mar
Hunt area	Units 20B, 20F, and 25C, north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway.		Units 20B and 20F north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway, and Unit 25C west of Preacher and American Creeks.	
Bag limit	1 caribou			
Motor vehicle restrictions	Yes		No	

[a] Residents and nonresidents.

Alaska Board of Game Actions and Emergency Orders. No emergency orders were issued by the department during RY06–RY07.

There were no board actions for the White Mountains caribou herd during RY06–RY07. Previous board actions are addressed in the background section of this report.

Harvest by Hunters. Harvest during fall hunts was low from RY87 to RY99 (range 6–26). Fall harvest peaked in RY00 at 51 (Table 2) when Fortymile caribou herd animals came north of the Steese Highway and may have been the source of many of the 51 caribou taken. Additionally, RY00 was the first year that cow caribou were legal in the fall hunt, and harvest of cows contributed 20 of the 51 caribou in the reported harvest. The bag limit was changed back to bull only in RY02, and the FCH has not returned to the area in large numbers during the general seasons since RY00. Due to these factors, the fall harvest declined to previous levels and remained there in RY06 and RY07.

Permit Hunts. Participation was high and harvests were low for registration hunt RC879 (Table 3). In RY06, 271 permits were issued and zero caribou were reported harvested, and in RY07 410 permits were issued, and 1 caribou was reported harvested.

To estimate a harvest quota for the winter hunt, we used a computer population model designed by P. Valkenburg and D. Reed (ADF&G). The model indicated the White Mountains caribou herd could sustain a maximum total fall and winter harvest of 40 bulls and 25 cows. The higher-than-average harvest in RY00 approached sustainable limits with 34 bulls and 26 cows taken, but harvest remained well below sustainable limits during RY06–RY07 (Table 2).

Tracking the ratio of large bulls:100 cows can provide an indication of bull harvest with respect to sustainable limits. The proportion of large bulls per hundred cows averaged 12 during RY92–RY05 (Table 1), and 8 during RY06–RY07. Based on reported harvest and population modeling, the lower large bull:100 cow ratio in RY06 and RY07 is likely a result of caribou distribution during composition surveys rather than overharvest. It appears that the large bull segment of the White Mountains caribou herd is not in danger of overharvest.

Hunter Residency and Success. The majority of White Mountains caribou were harvested by local resident hunters (Table 4). Success rates were usually quite low in both fall and winter hunts. The low success rates were probably due to the inaccessibility of caribou during both seasons, but may have been further reduced in recent years due to the popularity of the FCH hunts nearby. Many FCH hunters who traveled the Steese Highway also obtained a general season harvest ticket or a RC879 permit for the chance to take a caribou as they passed through the range of the White Mountains caribou herd. This tended to artificially reduce success rates for the White Mountains caribou herd hunts.

Harvest Chronology. From RY90 (when the winter seasons were opened) to RY03, 58–100% of the harvest occurred during the fall season (10 Aug–20 Sep). In RY06 and RY07, 94% of the harvest occurred during the fall season.

Transport Methods. The most common method of transportation used by successful hunters during the fall seasons in RY06 and RY07 was 3- or 4-wheelers, which accounted for 71% of transportation use in both years (Table 5). Because of limited participation and low harvests, transportation methods for the winter hunts have little meaning, but in hunts where motorized access was allowed, the vast majority of the harvest was by snowmachine.

Winter travel in the White Mountains can be difficult for hunters, but extension of developed trails and cabins provided by BLM is making winter access easier. However, access trails have not been well developed in caribou wintering areas, and caribou frequent dense spruce forest in winter, making hunting difficult.

HABITAT ASSESSMENT AND ENHANCEMENT

Much of the western portion of the White Mountains herd range burned in 1988, and much of the central portion of their range burned in 2004 and 2005. These fires have appeared to change seasonal movement patterns somewhat, but the long-term implications of these habitat changes are not yet understood. BLM continues to improve access to the White Mountains Recreation area, which includes most of the herd's range. This improved access may bring more human activity to portions of the herd's range, and may degrade those habitats for the caribou through disturbance.

CONCLUSIONS AND RECOMMENDATIONS

We met the management objective for RY06–RY07, which was to maintain a stable or increasing population with a fall bull:cow ratio of at least 30 bulls:100 cows. The 2007 photo census results suggest that the population is stable or increasing, and the fall composition counts indicated a bull:cow ratio of 36:100 and 39:100.

When the FCH harvest was liberalized in 2000, hunting pressure on the White Mountains caribou herd seemed to decrease. However, with BLM's improved access in this area, increased hunter effort and harvest during fall may occur in the future if opportunities to hunt other Interior caribou herds decline.

Population data for the White Mountains caribou herd are generally limited to annual composition counts with an occasional census. To obtain a better understanding of population dynamics of the White Mountains caribou herd we need to allocate more resources to more intensive census efforts. Relatively low herd size and low hunter success have made funding allocations for this herd a low priority compared to other Interior Alaska caribou herds.

By working closely with BLM, we monitored increases in recreational uses and development. We should continue to participate in agency and public meetings about development of BLM lands in the White Mountains caribou herd's range. This cooperation will help effect better management strategies for the White Mountains caribou.

Protection of key seasonal ranges from mining and recreational development should be considered during any land use planning. Key ranges include known and historic calving areas, summer ranges, wintering areas, and movement corridors.

LITERATURE CITED

DURTSCHE, B. M., AND W. HOBGOOD. 1990. Distribution, movements, and seasonal use areas of caribou in the White Mountains National Recreation Area, Alaska, 1982–1988. U.S. Department of the Interior, BLM-Alaska Open File Report 29.

EAGAN, R. M. 1993. Delta herd caribou. Pages 122–147 *in* S. M. Abbott, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

JONES, F. 1961. Movements, distribution, and numbers – Steese–Fortymile herd. Pages 91–101 *in* Caribou investigations. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Annual Report. Grant W-6/R-2. Juneau, Alaska, USA.

VALKENBURG, P. 1988. White Mountains caribou. Pages 51–53 *in* S. O. Morgan, editor. Caribou management report of survey and inventory activities. Alaska Department of Fish and Game. Volume XVIII. Part XI. Study 3.0. Juneau, Alaska, USA.

———, D. A. ANDERSON, J. L. DAVIS, AND D. J. REED. 1985. Evaluation of an aerial photocensus technique for caribou based on radio-telemetry. Pages 287–299 *in* T. C. Meredith and A. M. Martell, editors. Proceedings second North American caribou workshop, October 1984. McGill Subarctic Research Station, Schefferville, Quebec, Canada.

———, M. A. KEECH, R. A. SELLERS, R. W. TOBEY, AND B. W. DALE. 2002. Investigation of regulating and limiting factors in the Delta caribou herd. Alaska Department of Fish and Game. Final Research Technical Report, July 1996–June 2002. Project 3.42. Juneau, Alaska, USA.

PREPARED BY:

C. Tom Seaton
Wildlife Biologist II

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

SEATON, C. T. 2009. Units 25C, 20B, and 20F caribou. Pages 259–270 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 White Mountains caribou herd fall composition counts and estimated population size, 1983–2007

Date	Bulls:100 Cows	Large bulls: 100 Cows	Calves:100 Cows	% Calves	% Cows	% Small bulls	% Medium bulls	% Large bulls	% Total bulls	Composition sample size	Estimate of herd size
9/29/83	44	19	31	18	57	26	29	44	25	135	
10/85	36		31	18	60				22	65	
9/29/88	43	14	33	19	57	51	16	33	24	211	
10/06/89	50	11	36	19	54	46	33	22	27	744	750–1000
10/11/91	23	5	24	16	68	44	35	21	15	312	
10/29/91[a]				15						324	761[b]–1000
10/13/92	39	12	23	14	62	52	18	30	24	247	832[b]–1200
9/27/93	48	21	22	13	59	34	23	43	28	497	
10/04/94	39	16	25	15	61	34	24	42	24	418	
10/16–17/95	36	10	31	19	60	44	27	29	22	418	
10/2/96	44	9	54	27	50	60	20	20	22	513	
10/2/97	34	11	38	22	58	50	19	31	20	341	
10/2/98	50	11	18	11	60	42	37	21	30	759	961[b]–1100
9/30/99	62	16	39	20	47	33	40	26	31	644	
9/29/00	54	11	13	8	60	40	40	20	32	399	687[b]–800
9/25/01	57	11	26	14	55	46	36	19	31	441	700–800
9/24/02	34	7	29	18	61	44	35	21	21	405	
10/5/03	30	11	17	11	68	40	22	38	20	308	
10/5/04	35	6	23	15	63	32	49	18	22	321	642[b]–733
10/6/05	44	18	21	13	61	33	27	40	27	391	514[b]–600
10/16/06	36	9	20	13	64	43	31	26	23	362	
10/10/07	39	7	37	21	57	54	27	19	22	358	590[b]–650

[a] Conducted with fixed-wing aircraft instead of helicopter.
[b] Minimum count from summer census.

TABLE 2 White Mountains caribou harvest during fall general season[a], regulatory years 1987–1988 through 2007–2008

Regulatory year	General season harvest			
	Bull	Cow	Unk	Total
1987–1988	6	0	0	6
1988–1989	12	0	0	12
1989–1990	14	0	0	14
1990–1991	17	0	1	18
1991–1992	19	0	0	19
1992–1993	15	0	0	15
1993–1994	21	0	0	21
1994–1995	18	0	0	18
1995–1996	10	0	0	10
1996–1997	17	0	0	17
1997–1998	25	0	0	25
1998–1999	13	0	0	13
1999–2000	26	0	0	26
2000–2001	30	20	1	51
2001–2002	15	8	0	23
2002–2003	11	0	1	12
2003–2004	6	0	0	6
2004–2005	12	0	0	12
2005–2006	6	0	0	6
2006–2007	6	0	0	6
2007–2008	11	0	0	11

[a] Excludes winter permit hunt harvest.

TABLE 3 White Mountains caribou herd harvest by permit hunt, regulatory years 1990–1991 through 2007–2008

Hunt	Regulatory year	Permits issued	Did not hunt (%)[a]	Unsuccessful hunters (%)	Successful hunters (%)	Bulls	Cows	Unk	Harvest
DC877 & DC878	1990–1991	89	68 (76)	18 (86)	3 (14)	2	1	0	3
	1991–1992	100	88 (88)	12 (100)	0 (0)	0	0	0	0
	1992–1993	100	78 (78)	19 (86)	3 (14)	1	2	0	3
	1993–1994	150	124 (83)	26 (100)	0 (0)	0	0	0	0
	1994–1995	149	120 (81)	26 (90)	3 (10)	1	2	0	3
	1995–1996	137	100 (73)	37 (100)	0 (0)	0	0	0	0
	1996–1997	106	89 (84)	17 (100)	0 (0)	0	0	0	0
	1997–1998	67	46 (69)	20 (95)	1 (5)	1	0	0	1
RC877 & RC878	1998–1999[b]	82	29 (35)	52 (98)	1 (2)	0	1	0	1
	1999–2000	164	40 (24)	111 (90)	13 (10)	3	10	0	13
RC879	2000–2001	333	137 (41)	186 (95)	10 (5)	4	6	0	10
	2001–2002	405	252 (62)	135 (89)	17 (11)	15	1	1	17
	2002–2003	313	200 (64)	111 (98)	2 (2)	2	0	0	2
	2003–2004	259	198 (76)	60 (98)	1 (2)	1	0	0	1
	2004–2005	137	104 (76)	32 (97)	1 (3)	1	0	0	1
	2005–2006	186	142 (76)	43 (98)	1 (2)	1	0	0	1
	2006–2007	271	222 (82)	49 (100)	0 (0)	0	0	0	0
	2007–2008	410	300 (73)	109 (99)	1 (1)	0	1	0	1

[a] Includes those that did not report.
[b] First year of registration hunts with an unlimited number of permits available.

TABLE 4 White Mountains caribou herd hunter residency and success during fall general seasons, regulatory years 2003–2004 through 2007–2008

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	
2003–2004	4	1	1	6 (4)	98	39	3	140 (96)	146
2004–2005	12	0	0	12 (8)	83	51	1	135 (92)	147
2005–2006	5	1	0	6 (4)	73	61	4	138 (96)	144
2006–2007	5	1	0	6 (8)	44	21	5	70 (92)	76
2007–2008	7	2	2	11 (14)	41	23	4	68 (86)	79

[a] Residents of Units 20 and 25C.

TABLE 5 White Mountains caribou herd percent harvest by transport method during fall general seasons, regulatory years 2003–2004 through 2007–2008

Regulatory year	Percent harvest by transport method								
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Other/Unk	*n*
2003–2004	0	0	17	83	0	0	0	0	6
2004–2005	0	8	0	42	0	17	33	0	12
2005–2006	17	0	0	50	0	0	17	17	6
2006–2007	0	0	0	67	0	0	33	0	6
2007–2008	9	0	9	73	0	0	9	0	11

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 115526
JUNEAU, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNIT: 26A (56,000 mi^2)

HERD: Teshekpuk

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

Archeological and traditional knowledge suggest that caribou have been abundant near Teshekpuk Lake for at least the last 400 years (Silva et al. 1985). Currently, the Teshekpuk caribou herd (TCH) is an important subsistence resource to hunters from several North Slope villages. In recent years, the average per-capita harvest of caribou by North Slope villages within the TCH range has been estimated at 0.9 caribou per person, the majority of which are from the TCH (Carroll 2007).

Based on a calving distribution that was geographically distinct from the adjacent Western Arctic and Central Arctic herds (WAH and CAH), the TCH was first identified as a distinct herd in 1978 (Davis and Valkenburg). The TCH primarily inhabits the central coastal plain north of the Brooks Range during spring and summer, but has a large historical range, encompassing wintering areas across northwestern Alaska (Figure 1).

Visual counts between 1978 and 1982 indicated approximately 4,000 caribou used the area near Teshekpuk Lake during the insect relief period (Davis et al. 1979, Reynolds 1981, Silva et al. 1985). In 1984, a minimum population of 11,822 was estimated using postcalving aggregation photography (Davis et al. 1979, Carroll 1992). Growth continued through 2002, when the TCH was estimated at a minimum of 45,166 individuals (Carroll 2003). The exponential growth rate between 1984 and 2002 was 7.4% (Table 1).

Starting in 1990, cooperative efforts between the North Slope Borough (NSB), U.S. Bureau of Land Management (BLM), and Alaska Department of Fish and Game (ADF&G) led to extensive deployments of satellite collars in the TCH. Major findings include the demonstration of high fidelity to calving areas surrounding Teshekpuk Lake, extensive use of coastal habitats between Cape Halkett and Barrow for insect relief, broad use of the coastal plain west of the Colville drainage in late summer, and highly variable use of winter ranges. Overlap of the TCH with the

[1] This report contains data collected outside the report period at the discretion of the reporting biologist.

WAH and CAH can be extensive during fall and winter. These data are summarized in multiple publications (Philo et al. 1993, Prichard et al. 2001, Person et al. 2007).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Protect and maintain the TCH and its habitat.
- Provide continued hunting opportunity on a sustained yield basis.

MANAGEMENT OBJECTIVES

- Determine the population size of the herd every 2–3 years.
- Monitor recruitment and calf production through late winter recruitment and summer calving-ground surveys each year.
- Define critical habitat areas, such as calving, insect relief, and wintering areas.
- Identify and map the movements and distribution of the herd throughout the year using aerial survey, radiotelemetry, and satellite telemetry data.
- Encourage local participation in research and management decisions.
- Work with the North Slope Borough and the ADF&G Subsistence Division to collect harvest information.
- Determine the sources and timing of mortality in adult and calf caribou.
- Monitor mortality events through radiotelemetry, field observations, and sample collection.
- Work with management agencies, oil companies, and caribou users to minimize conflicts between the herd and major exploration and development projects.
- Maintain a sample size of at least 70 collared females. Capture caribou without the use of drugs.
- Monitor disease, parasite, contaminant, and body condition levels.
- Maintain a population composition of at least 30 bulls per 100 cows.
- Involve students in caribou research operations, work with students to track satellite-collared caribou movements, and lecture to school classes about caribou biology.

METHODS

POPULATION STATUS AND TREND

Population Size

Since 1984, we have used the aerial photo direct count extrapolation technique (Davis et al. 1979), known more commonly as a "photo census," to estimate the minimum population size of the TCH. A photo census was completed on 8 July 2008, a week after the end of this reporting period. A Cessna 182 aircraft with telemetry equipment was used to search for radiocollared caribou while TCH caribou were in insect relief aggregations. A DeHavilland Beaver (DHC-3) aircraft was directed toward groups for photography. Photographs were taken with a floor-mounted Zeiss RMK-A camera. The software program Photoman, developed at ADF&G (Rob DeLong, ADF&G, Fairbanks, AK), was used to ensure adequate overlap during photography and accurate photo layout prior to counting. Immediately following photography, the Cessna 182 radiotracked over the area to listen for WAH collars. We did not listen for CAH collars because they had been extensively radiotracked on 3 July, and were not missing any active collars. The 286, 9x9-inch photographs were developed by HAS Images (Dayton, Ohio). Photo layout occurred in early October 2008 and photographs were counted in December 2008.

In order to evaluate the chances that immigration may have influenced population growth rates, we estimated the probability that a collared caribou would be part of an immigrating group of WAH caribou, conditioned on a source population assumed to be 400,000, with 100 randomly distributed radiocollared caribou, and emigrating populations of 500 to 16,000. The cumulative probabilities, with the previous assumptions remaining stable, were also calculated.

Productivity, Recruitment, and Mortality Estimates

In early June, we attempted to fly calving surveys every 1 to 3 days over most of the TCH range using telemetry equipment to relocate collared cows. In 2007 and 2008, calving surveys were flown using a Cessna 180 on 5–14 June and a Cessna 182 on 6–10 June, respectively. The collared cows were observed at close range to determine the timing and location of calving. For each observation we recorded the location using a Garmin Global Positioning System (GPS) receiver, the presence or absence of a calf, antler condition (hard, soft, or none), and presence or absence of a visible udder. Cows with soft antlers (covered with velvet) were determined to be nonparturient (Whitten 1995). We continued to observe collared cows through the end of the survey period, or until they were seen with a calf. We estimated parturition rate as the number of adult cows ($\geq$3 years old) seen with a calf or observed with hard antlers or a distended udder (Whitten 1995), divided by the total number of adult cows. A second measure of productivity, termed the calving success rate, is estimated as the number of adult cows which still had a calf at the end of the survey period divided by the total number of adult cows.

Fall composition surveys were flown using a Cessna 180 on 31 October, 2 November, and 4 November 2006 and with a Piper PA-18 on 2 and 3 November 2007. Spring short-yearling surveys were flown using a Supercub on 8–10 April 2007 and on 9, 10, 12, and 21 April 2008. We used telemetry equipment to locate radiocollared cows and classified approximately 100 caribou in the area surrounding the collared animals. Calf:adult ratios and recruitment rates were calculated using Cochran's cluster sampling method (1977). The long-term trend in short-

yearling recruitment rate was analyzed using a weighted regression, weighting annual estimates by 1 over the estimated variance (Zar 1999).

The female mortality rate was estimated as the number of detected mortalities divided by the number of active collars at the beginning of the collar year, defined as 1 July–30 June, with the start date corresponding to the approximate date when new collars were deployed each year. Very High Frequency (VHF) transmitters were tracked 10–15 times each year, primarily during calving, the insect relief season, rut, and late winter, prior to the spring migration. We did not use mortality data from caribou instrumented with Platform Terminal Transmitters (PTT) from 1990 to 1998 because they appeared to have a much higher mortality rate than those carrying VHF-only collars. Beginning in 2000, major reductions in the transmitter weight of PTTs appeared to eliminate the difference in mortality rates; since then, we have used data from VHF, GPS and PTT collars for mortality estimates. VHF-and PTT-collared bulls are not included in mortality estimates due to the small sample size, and the bias toward collaring large adults which are likely nearing the end of their natural lifespan.

Capture, Health Assessments and Body Condition

We captured caribou using a hand-held net gun fired from a Robinson R44 helicopter and restrained them using hobbles, ropes, and blindfolds. We collected blood, fecal, and hair samples and took morphometric measurements, including weight, and made a subjective assessment of body condition (Gerhart et al. 1996).

We used a weighted regression to test for significant changes in capture weight since 1998. Because caribou were captured on different dates each year, we used the residuals from the date-weight relationship to test for a long-term trend. Yearlings and adults were analyzed separately. We also tested for significant differences in weight between the first and subsequent capture events for caribou that had been recaptured, using a paired t-test (Zar 1999).

Distribution and Movements

We received satellite-location data from the Service Argos Data Collection and Location System (ARGOS) in Landover, Maryland. Current locations from PTT and GPS collars were plotted periodically throughout the year by ADF&G staff in Nome using ArcView (ESRI, Redlands, CA). Further analyses of satellite-telemetry data were undertaken as part of the cooperative research program by ABR Inc.—Environmental Research & Services, under contract by the BLM. In addition to receiving caribou locations from PTT and GPS collars, we completed periodic VHF radiotracking flights to collect information on caribou movements and distribution.

ArcMap (ESRI, Redlands, CA) was used to map calving period locations. For cows seen with a calf, the location the cow was first seen with a calf was assumed to be the approximate calving location (Carroll et al. 2005). For cows that were not observed with a calf, the location nearest in time to the median calving date was used. To document historical use of calving grounds, we used calving locations documented from 1994 to 2008 to produce fixed kernel utilization distributions for each year using Kernel HR (Seaman et al. 1998, Griffith et al. 2002, Parrett 2007). Annual utilization distributions were produced using a 5-km grid, with least-squares cross-validation of bandwidth selection (Seaman et al. 1998). We then summed the observation

densities at grid intersections across years and rescaled the densities to sum to one in order to produce a cumulative calving distribution that is unbiased with respect to annual sample size.

HARVEST

We determined hunter harvests of TCH caribou by examining data from community harvest surveys completed within the range of the TCH. Harvest surveys were done in Atqasuk, Barrow, and Nuiqsut by the ADF&G Subsistence Division during the first year of the reporting period, so we were able to use their estimates for the total number of caribou harvested. For the second year of the reporting period, and for villages other than Atqasuk, Barrow, and Nuiqsut, we used the estimated harvest from past survey reports and the human population for the year of the survey to calculate the per-capita harvest, and then applied recent human population estimates from the Department of Commerce, Community, and Economic Development to the per-capita harvest for each village to estimate the total caribou harvest for 2006–2007 and 2007–2008. Because villages harvest caribou from more than one herd, a rough estimate of the proportional harvest from different herds has been made for many of the villages within the range of the TCH, based on distributional patterns observed through satellite- and VHF-collared caribou (Carroll 2007). For Atqasuk, Barrow, and Nuiqsut, the proportion of recent harvest estimates from the TCH was assumed to be 60%, 70%, and 60% respectively. Harvest by nonlocal hunters was determined through harvest-ticket reporting.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

From census photographs taken on 8 July 2008, we counted 63,999 caribou, distributed between Barrow and Harrison Bay (Figure 2). An additional 107 caribou were counted but not photographed, for a total minimum estimate of 64,106 caribou. Of 62 collared caribou that were known to be active, we located 57 during the 2008 photocensus. An additional 3 were known to be with the CAH when it was photocensused on 3 July, while an additional 2 were known or suspected to be with the WAH, based on their current distribution or distribution during calving 3 weeks earlier. During radiotracking in the hours following photography, we did not hear any WAH frequencies among TCH photocensus groups.

The exponential growth rate (Johnson 1994) was 7% from 1984 to 2008, and 5.9% between 2002 and 2008 (Table 1). Counts between 1984 and 1999 indicated an exponential growth rate of only 5.9%, while the counts from 1999 to 2002 indicated an exponential growth rate of 15.2%. It is unlikely that the herd could have achieved the growth rate of 15.2% per year required to increase from 29,000 in 1999 to 45,000 caribou in 2002, particularly with years of poor short-yearling recruitment in 2001–2002 (9%) and mediocre recruitment in 2000–2001 (15%; Table 2). In contrast, the photo censuses between 1995 and 1999 indicated a growth rate of only 3.3% (Table 1), despite high recruitment rates of 24%, 25%, and 21%. (Table 2).

The probability that 2,000 caribou could emigrate annually from a WAH population with 400,000 caribou without including a single collared caribou is approximately 60%, but if this remains constant over the course of 5 years, this probability drops to less than 10% (Figure 3).

The probability of detecting this immigrant is unknown, but if the collar were active during a photo census, it is likely to be high.

Productivity, Recruitment, and Mortality Estimates

In 2007, we monitored 48 adult cows in early June. The parturition rate was 69% (33/48), and calving success was 60% (29/48). In 2008, we monitored 42 adult cows during the calving period. The parturition rate was 74% (31/42), and calving success was 67% (28/42). While parturition rates were fairly low compared to recent years, the calving success rates were similar to the long-term average of 65% (1994–2008; Table 2).

Fall composition counts. During 2006, fall-composition surveys were flown in late October and early November. We located 25 collared caribou, and classified 3,371 caribou in the vicinity of the collared animals and counted 825 calves (25% calves, or 32 calves:100 adults; Table 3).

In 2007 fall composition surveys were flown on 2 and 3 November. We located 18 collared caribou, and classified 2,213 caribou in the vicinity of the collared animals and counted 420 calves (19% calves, or 23 calves:100 adults; Table 3).

Short-yearling counts. In 2007, we located 22 collared cows during recruitment surveys. We classified 2,355 caribou in the areas surrounding the collared animals and saw 18.8% short yearlings (+/- 2.3%) or 23 short yearlings:100 adults (Table 2).

In 2008, we located 31 collared cows during spring-recruitment surveys. We classified 2,177 caribou in the areas surrounding the collared animals and saw 16% short yearlings or 19 short yearlings:100 adults (Table 2). The percentage of short yearlings in the spring composition counts has declined an average of 0.46% per year since 1990 ($p=0.048$).

Mortality. The 2006–2007 collar year started with 60 collared females. The female mortality rate in 2006–2007 was 8% (+/- 7%). The 2007–2008 collar year started with 55 collared females. The female mortality rate in 2007–2008 was 19% (+/-10%). In both years, most of the mortality occurred in late winter and early spring. These mortality rates compare to a long-term average of 14.5% (1990–2008; Table 4).

The trends in adult female mortality and short-yearling recruitment appear to be converging. However, the numbers are not directly comparable because the short-yearling recruitment rate indexes both female and male short yearlings within the adult population. In addition, there is an unknown but probable bias toward sampling female-dominated groups during recruitment surveys due to late-winter sexual segregation. As a result, estimating the actual number of female recruits per 100 adult females would require an estimate of both the bull:cow ratio and the degree of sexual segregation in late winter, both of which are unknown for this herd.

Capture, Health Assessments, and Body Condition

During 8–10 July 2006, we captured 28 caribou (4 males and 24 females). One was a recapture, and the remaining 27 were new captures. We deployed 16 PTT collars and 12 GPS collars.

During 24–26 June 2007 we captured 25 female caribou. Five were new captures and 20 were recaptures. We deployed 12 GPS collars and 10 VHF collars. We did not capture any male caribou.

During 29 June–2 July 2008 we captured 37 female caribou. Twenty were new captures, and 17 were recaptures. A total of 8 VHF and 27 GPS collars were deployed. We did not capture any male caribou.

There was 1 capture mortality in 2006, 1 in 2007, and there were 3 in 2008. We have averaged just under 1 capture mortality per year since 2000. The combination of a new helicopter pilot and new netgunner may have contributed to the high capture mortality rate in 2008.

There was a significant relationship between date of capture and weight during 1997 through 2008 ($p<0.0001$). Although a group of captures that occurred in early September of 2002 are influential in this relationship, adult caribou (>1 year old) were an average of 0.18 kg heavier for each day later the capture occurred in summer. Yearlings were an average of 0.20 kg heavier per day. After correcting for the Julian date of capture, there was no significant trend in capture weight during 1997 through 2008 for adults ($p=0.60$), or yearlings ($p=0.37$). There were 25 adult females that were captured at least twice, with an average interval between captures of 1.9 years (range 1-6). There was nonsignificant increase of 2.7 kg between the first and second capture weights ($p=0.08$).

Distribution and Movements

General patterns of seasonal movement and the great diversity in wintering areas have been previously documented (Philo et al. 1993, Prichard et al. 2001, Carroll et al. 2005, Carroll 2007, Person et al. 2007). In 2006, after calving generally to the south and southeast of Teshekpuk Lake, caribou spent late June and early July within 60 km of the lake. By late July, caribou began to spread widely to the east and west, between the Colville River and Atqasuk. Caribou were widely dispersed in this area, with a slight southerly movement in late August and early September. By late October, caribou began to move southeast, with some remaining in the upper Fish and Judy Creek drainages for the remainder of the winter. Another major winter concentration in 2006–2007 was in the foothills of the Brooks Range between the Killik and Sagavanirktok Rivers. This usage of wintering areas was similar to the winters of 2004–2005 and 2005–2006 (Carroll 2007)

In 2007, caribou calved generally to the south of Teshekpuk Lake (Figure 4). Following calving, caribou were again distributed all around Teshekpuk Lake in late June, but spent more time than normal to the north of the lake in early July. By late July, caribou were spread widely from the Colville River to Barrow, with some caribou as far east as the Kuparuk River by early August. By late August, caribou were primarily south of Teshekpuk Lake. In late September caribou were spread in a band between Atqasuk and Ocean Point. By late October, caribou had shifted well to the southeast. Similar to 2006–2007, major wintering concentrations in 2007–2008 occurred southeast of Teshekpuk Lake, and in the foothills of the Brooks Range between the Sagavanirktok and Etivluk rivers. By June of 2008, most TCH caribou had moved north toward Teshekpuk Lake (Figure 5), but 5 collared-caribou that had been mixed with the WAH in winter stayed with them through calving. Similarly, 4 collared-caribou that had been mixed with the CAH in winter stayed with them through calving, with 3 parturient cows remaining longer than

the non-parturient cow. All 3 of the cows that remained with the CAH during calving stayed with them for the remainder of the summer, and at least 1of 2 caribou that stayed with the WAH through calving remained with them for the remainder of the summer.

Since 2004, some proportion of collared TCH caribou (4–24%) have remained with other caribou herds during the calving period. These are not necessarily the same individuals from year to year, and most of them have been documented calving near Teshekpuk Lake at least once. Typically, it appears that individuals that are wintering near large concentrations of caribou from adjacent herds occasionally follow those caribou from winter range onto the calving grounds of the other herd. The summer of 2008 was the first year that many of them remained with adjacent herds throughout the summer. Parturient caribou appear to be much more likely to remain for at least some period of time than nonparturient cows. Despite these observations, TCH distribution near Teshekpuk Lake remained highly predictable between June and July and continues to be the time period of greatest predictability with respect to TCH distribution. Between 1994 and 2008, the areas immediately to the northeast, southeast, and south of Teshekpuk Lake received the most consistent and concentrated use for calving (Figure 6).

HARVEST

Season and Bag Limit. The hunting seasons and bag limits were the same for both regulatory years of the reporting period.

2006–2007 and 2007–2008 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 26A Resident Hunters: 5 caribou per day; cow caribou may not be taken 16 May–30 Jun	1 Jul–30 Jun	
Nonresident Hunters: 5 caribou total; cow caribou may not be taken 16 May–30 Jun.		1 Jul–30 Jun

Board of Game Actions and Emergency Orders. At the November 2007 board of game meeting, the board passed an amended version of proposal 55, which modified the boundaries of the Anaktuvuk Pass Controlled Use Area (CUA). The issue was the perceived alteration of caribou migratory paths by hunters to the north of Anaktuvuk Pass. The original CUA, which prohibited the use of aircraft for hunting caribou within the Anaktuvuk River drainage, was originally established with a sunset clause eliminating the CUA at the end of the 2006–2007 regulatory year. The new controlled use area was reduced in size, and focused specifically on areas north and northwest of Anaktuvuk Pass.

Human-Induced Harvest. It has been difficult to determine TCH harvest because not all hunters report their harvest and because each North Slope village harvests caribou from more than 1 herd. The primary issues with the accuracy of these harvest estimates are that the estimates of proportional harvest rates between overlapping herds could be improved, as could the relationship between annual distribution of caribou and harvest level. However, using the information provided by several harvest-monitoring projects, we have been able to make a reasonable estimate of harvest from the TCH. Based on these harvest-monitoring studies, we estimate that 4,829 TCH caribou were harvested in 2006–2007 and 4,102 were harvested in 2007–2008 (Tables 5 and 6). This represents a harvest rate of between 6.6% and 7.5% of the herd at its current population level.

Permit Hunts. There were no permit hunts for caribou in Unit 26A during the reporting period.

Hunter Residency and Success. Most TCH harvest is from local hunters because the area is remote and largely inaccessible to nonlocal hunters. Nonlocal resident and nonresident hunters took a small proportion of TCH caribou, primarily from the Colville River drainage. Within 26A, from which both WAH and TCH caribou are harvested, nonlocal hunters took 91 caribou in 2006–2007, and 109 caribou in 2007–2008. Success rates for nonlocal hunters in Unit 26A were 74% in 2006–2007, and 72% in 2007–2008. Successful hunters harvested an average of 1.7 caribou per person in both years. Nonlocal hunters are typically split evenly between residents and nonresidents. Of the total estimated TCH harvest, nonlocal hunters in Unit 26A take less than 3%, assuming their entire take is from the TCH.

Harvest Chronology. Caribou are harvested throughout the year, but most harvest is during July through October (Tables 7 and 8).

Transport Methods. Caribou hunters in Unit 26A used a wide variety of transport methods. Most residents of the unit used boats and all-terrain vehicles (ATVs) during July, August, and September; and they used snowmobiles during the remainder of the year. Some use of aircraft occurs throughout the year, primarily by nonlocal residents and nonresidents, of whom 85% use aircraft to hunt caribou. Hunters occasionally used highway vehicles when caribou moved near the limited road systems, particularly the gas-well road near Barrow, and occasionally by dog team or highway vehicle from the Dalton Highway.

Other Mortality

We have recorded sizable caribou die-offs in past years within the range of the TCH. During the winter of 1989–1990, many dead and lethargic caribou were found in an area between Teshekpuk Lake, the Ikpikpuk River, and the Colville River. We estimate approximately 2,000–3,000 caribou died in this area, but it is impossible to determine how many were from the TCH since caribou from the WAH and the CAH were also present in the area (Carroll 1992). During the winter of 1992–1993 at least several hundred, and probably over 1,000 caribou died in the area to the east of Teshekpuk Lake and south of the Kogru River during a period of extremely cold, windy weather. Radio collars indicated that most of these animals were from the TCH (Carroll 1995). We did not detect any sizeable die-offs during this reporting period.

HABITAT

Assessment

Results of satellite telemetry studies (Philo et al. 1993; Prichard et al. 2001, Person et al. 2007), VHF radio-tracking flights (Kelleyhouse 2001, Carroll et al. 2005, Parrett 2007), and composition surveys have indicated that the area around Teshekpuk Lake, particularly south, east, and north of the lake, is the highest density calving area used by the TCH; the area to the north of the lake is used intensively for insect relief and grazing (Parrett 2007); and the narrow corridors of land to the east and northwest of the lake are important as migratory paths to and from the insect relief area (Yokel et al. 2009).

In 1997 BLM began a process of opening the National Petroleum Reserve-Alaska (NPR-A), which encompasses much of the TCH range, to oil exploration and development. The first area to be considered was a 4.8-million-acre planning area in the northeast corner of NPR-A, which includes important TCH calving, insect relief, grazing, and migration areas located near Teshekpuk Lake. After a compilation and review of the available data and many public meetings, it was decided that 87% of the planning area would be available for oil and gas leasing. In recognition of the importance of the land around Teshekpuk Lake as crucial habitat for caribou and geese, much of it was protected. No leasing was allowed in the area north and east of the lake, and no surface structures were allowed in a strip of land to the west and south of the Teshekpuk Lake and around the Kogru River (BLM 1998). BLM revised this plan in 2005 and again in 2008 (BLM 2005, BLM 2008a). In 2008, a record of decision on the most recent revised plan makes 90% of the 4.4 million acre planning area available to leasing, with a 10-year deferral on the remaining 430,000 acres, which includes a large proportion of the concentrated calving area, caribou insect relief areas, and important waterfowl and shorebird habitat (BLM 2008b).

Enhancement

There were no habitat enhancement activities during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

The issue of whether to open important caribou habitat to development in northeast NPR-A is a very important management issue and will be determined as part of an ongoing process. This process will involve public input, agency recommendations, and executive decisions. ADF&G will play an important role in providing information and recommendations in this process.

CONCLUSIONS AND RECOMMENDATIONS

The 2008 estimate of 64,106 caribou is the highest population level ever recorded for the TCH. Multiple factors influence the quality of a photo census estimate, including the size and cohesiveness of caribou aggregations, the relative number of radio collars used to find aggregation groups, the degree of sexual segregation, and image quality (Davis et al. 1979). As noted previously (Carroll 2007), the growth rate of the TCH between 1999 and 2002 seemed higher than recruitment indices and mortality rates would indicate. While there are multiple explanations possible for these inconsistencies, we feel that the most plausible explanation is that the photo census of 1999 was of relatively poor quality, from the perspective of both aggregation and image quality, while the photo censuses of 2002 and 2008 were of relatively high quality.

While we acknowledge that the photo census method is not sampling based, and a frequentist approach to estimating confidence limits is not feasible, an attempt to quantify photo census quality is a worthwhile research direction.

Movement between herds has been observed (Person et al. 2007), and continues to be observed. The potential for immigration to influence and inflate populations remains a possibility; however, all movements observed to date have been emigration of the TCH into the adjacent WAH and CAH. The ability to detect an immigration event into the TCH is dependent on two factors, the probability that a marked animal is included in any movement from one herd into the TCH, and the probability of detecting that movement. The product of these probabilities, although variable through time, is not particularly low, even with respect to movement from the much larger WAH to the TCH. We recommend that some effort be made to increase the power to detect immigration events, particularly from the WAH to TCH, in particular by marking and following both young and male caribou, two segments of the population that currently receive little attention.

Parturition rates during the reporting period were similar to previous years; this metric has been stable over the long-term, while exhibiting substantial inter-annual variation. In contrast, the short-yearling ratio appears to be declining slowly; whether this is an indication of density dependent recruitment, we do not know at this time. The lack of a trend in both adult and yearling capture weights would not currently support that conclusion. A major issue with ratio-based data is the potential for the denominator to be an unstable base of comparison (McCullough 1994). Due to the lack of recently collected bull:cow ratios in the TCH, and poor understanding of the extent and nature of sexual segregation in late winter, we cannot assume the adult portion of the ratio is stable. Although statistically significant, the rate of decline in the short-yearling ratio is very slow, and could be the result of increasing bull:cow ratios, although this would be inconsistent with observations in the WAH, which appears to have a very similar rate of decline in the short-yearling ratio (Dau 2007).

The shift in wintering grounds from areas near Atqasuk to the southeast of Teshekpuk Lake and the northern foothills of the Brooks Range noted for 2004–2005 and 2005–2006 (Carroll 2007), was consistent through 2006–2007 and 2007–2008. This is a change from 1990 through 2003 when most TCH caribou wintered on the coastal plain, with the majority wintering near the Atqasuk area, although notable variation from that pattern has occurred (Prichard et al. 2001, Person et al. 2007). If this eastward shift in wintering area continues, it could have a variety of consequences on the herd and on North Slope hunters. Caribou have been relatively scarce for Barrow and Atqasuk hunters during winter and have been more plentiful for Nuiqsut and Anaktuvuk Pass hunters. This shift in wintering area may reduce hunting pressure on the herd from the largest subsistence community (Barrow) during winter, but it may increase hunting pressure from people that travel up the Dalton Highway. The overall effect on harvest is hard to predict, since most harvest on the TCH takes place between July and October (Pedersen et al. in prep). The shift in winter range to the east and south may also result in more wolf predation, particularly when caribou winter in the southern drainages of the Colville River, and overlap with moose distribution. Shifts in winter distribution may be evidence of winter range degradation in areas commonly used between 1990 and 2003, however the lack of data on lichen biomass and the remarkable variation in winter range use by the TCH since 1990 makes that a tenuous speculation. Regardless of the causes and potential consequences of shifts in winter

habitat use, the winter distribution of the TCH remains one of the more interesting and unpredictable aspects of the TCH ecology.

The results of several harvest monitoring projects, human population numbers, and caribou distribution data were used to estimate that approximately 4,802 TCH caribou were harvested in 2005–2006 and 4,102 in 2006-2007. This is a considerable increase over the harvest estimates of the late 1980s and early 1990s (Braund et al. 1991, Fuller and George 1997). Whether the increased estimates are real, and due to changes in hunter effort, caribou distribution, or caribou abundance, or due to differences in harvest monitoring methodology is unknown. A harvest of 4,000–5,000 caribou would be a harvest rate of 6–8% of the current population estimate. This rate, although lower than the approximately 10% harvest rate estimated for 2002–2005, is still at least twice the estimated harvest rates for the adjacent WAH and CAH. This relatively high harvest emphasizes the importance of this herd as a subsistence resource and the importance of making sure that development activities do not reduce its productivity.

Carroll (2007) reviewed important habitat use issues to be considered when developing land management plans for the NPR-A. At the heart of these issues is the potential for population declines due to development on calving and insect relief areas. Further research is needed to quantify this potential, particularly through research regarding fitness in relation to habitat use.

At this time, no regulatory changes are deemed necessary. The TCH has continued to grow, and the relatively high harvest pressure on this herd is currently sustainable.

Research and Management Recommendations

- Develop methods to quantify photo census quality, particularly an estimate of downward bias.

- Reestablish regular composition counts. The lack of a bull:cow ratio impedes attempts to model population growth and make inference regarding changes in the short-yearling ratio difficult. In addition, the high bull harvest estimated for this herd through community harvest surveys merits increased attention on the bull:cow ratio.

- Improve the probability of detecting immigration between herds. This may require increased sample sizes of marked animals, increased communication and shared radiotracking between herd managers, or some combination of both.

- Estimate the degree of sexual segregation during time periods where population-level data are being collected, particularly during insect relief aggregations and late-winter recruitment surveys. Improved information on bull distribution will also help in estimating the proportional harvest between overlapping herds.

- Improve our understanding of how habitat influences calf survival and weight gain in areas historically used for calving and insect relief.

LITERATURE CITED

BLM. 1998. Northeast National Petroleum Reserve-Alaska: final integrated activity plan/environmental impact statement. Department of Interior, BLM, Anchorage, AK.

———. 2005. Northeast National Petroleum Reserve-Alaska: amended integrated activity plan/environmental impact statement. Department of Interior, BLM, Anchorage, AK.

———. 2008a. Northeast National Petroleum Reserve-Alaska: final supplemental integrated activity plan/environmental impact statement. Department of Interior, BLM, Anchorage, AK.

———. 2008b. Northeast National Petroleum Reserve-Alaska: supplemental integrated activity plan record of decision. Department of Interior, BLM, Anchorage, AK.

BRAUND, S. R. & ASSOCIATES, AND INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH. 1991. North Slope Subsistence Study - Barrow, 1987, 1988, and 1989. Technical Report No. 149. Prepared for the U.S. Department of Interior, Minerals Management Service.

———. 1993. North Slope Subsistence Study - Wainwright, 1988 and 1989. Technical Report No. 147. Prepared for the U.S. Department of Interior, Minerals Management Service.

BROWER, H. K. AND R. T. OPIE. 1996. North Slope Borough Subsistence Documentation Project: Data for Anaktuvuk Pass, Alaska for the Period July 1, 1994 to June 30, 1995. North Slope Borough Department of Wildlife Management Report. 36 pp. Available from North Slope Borough Department of Wildlife Management, Box 69, Barrow, Alaska 99723 USA.

———, AND ———. 1997. North Slope Borough Subsistence Documentation Project: Data for Nuiqsut, Alaska for the Period July 1, 1994–June 30, 1995. North Slope Borough Department of Wildlife Management Report. 44 pp. Available from North Slope Borough Department of Wildlife Management, Box 69, Barrow, Alaska 99723 USA.

CARROLL, G. M. 1992. Teshekpuk Lake Caribou Herd survey-inventory progress report, 1989–90. Pages 177–186 *in* S.M. Abbott, editor. Annual Report of survey-inventory activities. Caribou. Alaska Dept. of Fish and Game. Federal Aid in Wildlife Restoration. Progress Report. Grant W–23–3, W–23–4. Juneau. 198pp.

———. 1995. Teshekpuk Lake Caribou Herd survey-inventory progress report. Pages 200–210 *in* M.V. Hicks, editor. Management report of survey-inventory activities. Caribou. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration Progress Report Grant W–24–1, W–24–2. Juneau. 224pp.

———. 2003. Unit 26A caribou management report. Pages 280–303 in C. Healy, editor. Caribou management report of survey and inventory activities 1 July 2000–30 June 2002. Alaska Department of Fish and Game. Juneau, Alaska.

———. 2007. Unit 26A, Teshekpuk caribou herd. Pages 262–283 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0 Juneau, Alaska, USA.

———, L. S. PARRETT, J. C. GEORGE, AND D. A. YOKEL. 2005. Calving distribution of the Teshekpuk caribou herd, 1994-2003. Rangifer Special Issue 16: 27-35.

COCHRAN, W. G. 1977. Sampling techniques. John Wiley and Sons. New York, New York.

DAU, J. 2007. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24 and 26A caribou management report. Pages 174-231 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2004-30June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau.

DAVIS, J. L., AND P. VALKENBURG. 1978. Western Arctic Caribou Herd studies. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration. Final Report. Grant W–17–8 and W–17–9. Juneau. 95pp.

———, AND ———, AND S. J. HARBO. 1979. Refinement of the aerial photo-direct count extrapolation caribou census technique. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration. Final Report. Grant W–17–11. Juneau. 23pp.

FULLER, A. S. AND J. C. GEORGE. 1997. Evaluation of subsistence harvest data from the North Slope Borough 1993 census for right North Slope villages: for the calendar year 1992. North Slope Borough Department of Wildlife Management Report. 76 pp. Available from North Slope Borough Department of Wildlife Management, Box 69, Barrow, Alaska 99723 USA.

GERHART, K. L., R. G. WHITE, R. D. CAMERON, D. E. RUSSELL.1996. Estimating fat content of caribou from body condition scores. Journal of Wildlife Management. 60: 713-718.

GRIFFITH, B., D. C. DOUGLAS, N. E. WALSH, D. D. YOUNG, T. R. MCCABE, D. E. RUSSELL, R. G. WHITE, R. D. CAMERON, AND K. R. WHITTEN. 2002. The Porcupine caribou herd. Pages 8-37 *in* D. C. Douglas, P. E. Reynolds, and E. B. Rhode, editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U. S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD BSR-2002-0001.

HEPA, R. T., H. K. BROWER, AND D. BATES. 1997. North Slope Borough subsistence harvest documentation project: data for Atqasuk, Alaska for the period July 1, 1994 to June 30, 1995. Department of Wildlife Management, North Slope Borough, Barrow, Alaska. 40 pages.

JOHNSON, D. H. 1994. Population analysis. Pages 419-444 *in* T.A. Bookhout, ed. Research and management techniques for wildlife and habitats. Fifth ed. The Wildlife Society. Bethesda, MD.

KELLEYHOUSE, R. A. 2001. Calving ground selection and fidelity: Teshekpuk Lake and Western Arctic Caribou Herds. M.S. Thesis. University of Alaska Fairbanks. 124 pp.

MCCULLOUGH, D. R. 1994. What do herd composition counts tell us? Wildlife Society Bulletin. 22:295-300.

PARRETT, L. S. 2007. Summer ecology of the Teshekpuk caribou herd. M.S. Thesis. University of Alaska Fairbanks. 147pp.

PEDERSEN, S. 1989. Pt. Lay subsistence land and resource use. In Impact Assessment, Inc: Pt. Lay Case Study. Technical Report No.139. U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region, Anchorage, Alaska.

———. 1995. Nuiqsut. Chapter XXII, Vol.5. In J, FALL AND C, UTERMOHLE, editors. An investigation of the sociocultural consequences of Outer Continental Shelf development

in Alaska. Technical Report No.160. U.S. Department of the Interior, Minerals Management Service, Alaska OCS Region, Anchorage, Alaska.

———. 2001. Subsistence harvest levels and spatial dimensions of caribou, moose, brown bear and muskox hunting in Nuiqsut during regulatory year 2000. Draft Report: Division of Subsistence, Arctic Region, Alaska Department of Fish and Game, Fairbanks, Alaska.

———. 2007. Report to Board of Game on timing of caribou harvest in Anaktuvuk Pass in relation to the Anaktuvuk Pass controlled use area. ADF&G File Report, Fairbanks, Alaska.

PEDERSEN, S. AND R. T. OPIE. 1990, 1991, and 1993. File reports: Subsistence caribou harvest levels and land use in Anaktuvuk Pass 1989–90, 1990–91 and 1992–93. Division of Subsistence, Arctic Region, Alaska Department of Fish and Game and North Slope Borough, Department of Wildlife Management. Fairbanks, Alaska.

PEDERSEN, S., S. MCINTOSH, ET. AL. In prep. Atqasuk, Barrow and Nuiqsut caribou harvest surveys, 2002-2006. Alaska Department of Fish and Game, Subsistence Research Report, Fairbanks.

PERSON, B. T., A. K. PRICHARD, G. M. CARROLL, D. A. YOKEL, R. S. SUYDAM, J. C. GEORGE. 2007. Distribution and Movements of the Teshekpuk Caribou Herd 1990-2005: Prior to oil and gas Development. Arctic

PHILO, L. M., G. M. CARROLL, AND D. A. YOKEL. 1993. Movements of caribou in the Teshekpuk Lake Herd as determined by satellite tracking, 1990–1993. North Slope Borough Department of Wildlife Management Report. 60pp. Available from North Slope Borough Department of Wildlife Management, Box 69, Barrow, Alaska 99723.

PRICHARD, A. K., S. M. MURPHY, AND M. D. SMITH. 2001. Analysis and mapping of satellite telemetry for the Teshekpuk caribou herd 1990–1999 with a note on 5 Western Arctic Caribou. Draft report prepared by ABR Inc. for the North Slope Borough Department of Wildlife Management, Alaska Department of Fish and Game, and Bureau of Land Management. 102 pp.

REYNOLDS, P. 1981. Preliminary report of the status of the Teshekpuk caribou herd. Unpublished manuscript. U.S. Bureau of Land Management, Arctic District Office, Fairbanks, Alaska. 20pp.

SEAMAN, D. E., B. GRIFFITH, AND R. A. POWELL. 1998. KERNELHR: a program for estimating animal home ranges. Wildlife Society Bulletin. 26:95-100.

SILVA, J. B., L. G. ADAMS, R. GAL. 1985. Habitat evaluation for the Teshekpuk Lake special area study. U.S. Bureau of Land Management. Arctic Resource Area, Fairbanks, Alaska. 183pp plus appendices.

WHITTEN, K. R. 1995. Antler loss and udder distension in relation to parturition in caribou. Journal of Wildlife Management. 59:273-277.

YOKEL, D., A. PRICHARD, G. CARROLL, L. PARRETT, B. PERSON, AND C. REA. 2009. Teshekpuk caribou herd movement though narrow land corridors around Teshekpuk Lake, Alaska. Alaska Park Science. Volume 8, Issue 2: 79-83.

ZAR, J. H. 1999. Biostatistical Analysis. Prentice Hall. Upper Saddle River, New Jersey, USA.

PREPARED BY:

Lincoln Parrett
Wildlife Biologist II

SUBMITTED BY:

Peter J. Bente
Survey-Inventory Coordinator

Please cite any information taken from this section, and reference as:

PARRETT, L.S. 2009. Unit 26A, Teshekpuk caribou herd. Pages 271–298 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0 Juneau, Alaska, USA.

TABLE 1 Population estimates and exponential growth rates of the Teshekpuk caribou herd, 1978–2008

Year	Population estimate	r [c]
1978–1982	3000–4000[a]	N/A
1984	11,822[b]	N/A
1985	13,406[a]	N/A
1989	16,649[b]	6.8%
1993	27,686[b]	12.7%
1995	25,076[b]	-5.0%
1999	28,627 [b]	3.3%
2002	45,166 [b]	15.2[d]
2008	64,106 [b]	5.8%

[a]Derived from visual estimate.
[b]Derived using aerial photocensus.
[c]$r= (\ln(N_{t2})-\ln(N_{t1})/t$, where t= number of years between censuses, N = population estimated at time t.
[d]It is unlikely that the herd increased at this rate. The 1999 count was probably an underestimation, and the herd has increased since 1995.

TABLE 2 Teshekpuk caribou herd calving and short-yearling survey results, 1990–2008

	Calving surveys (June)			Short-yearling surveys (April)			
Year	Cows observed	Parturition[a] (%)	Live calves[b] (%)	N	Short yearlings: 100 adults	Short yearlings (%)	95% confidence limits[c]
1990	–	–	–	352	27	21	–
1991	–	–	–	700	31	24	–
1992	–	–	–	858	35	26	–
1993	–	–	–	1462	22	18	9–28%
1994	14	–	63	1486	16	14	–
1995	15	–	73	1637	18	16	0–34%
1996	28	–	86	2362	32	24	19–30%
1997	19	–	50	2640	33	25	–
1998	27	–	56	–	–	–	–
1999	36	–	67	2040	27	21	13–25%
2000	29	–	85	1985	25	20	14–26%
2001	36	–	44	1369	17	15	7–22%
2002	32	94	71	2270	10	9	7–11%
2003	34	94	65	2141	26	20	15–26%
2004	36	58	48	2692	22	18	11–23%
2005	30	73	56	1564	9	8	0–16%
2006	40	88	82	2177	20	16	11–22%
2007	48	69	60	2357	23	19	15–23%
2008	42	74	67	3718	19	16	13–19%
AVERAGE	31	79	65	1878	23	18	

[a]Number of collared cows with calf + collared cows with no calf with but hard antler or udder / number of mature collared cows observed.

[b]Number of collared cows with live calves at the end of calving surveys / number of mature collared cows observed.

[c]Calculated based Cochran's cluster sampling method (1977). Cluster data unavailable for 1990–1992, 1994, 1997-1998.

TABLE 3 Teshekpuk caribou herd post-calving and fall composition counts, 1991–2007

	Post-calving helicopter surveys (July)						Fall fixed-wing surveys (November)		
Date	Bulls:100 Cows	Bulls (%)	Calves:100 Cows	Calves (%)	Cows (%)	N	Calves:100 adults	Calves (%)	N
1991	25	13	66	35	52	3673	–	–	–
1992	93	34	80	29	37	3047	–	–	–
1993[a]	98	37	39	15	38	2959	–	–	–
1994	–	–	–	–	–	–	37	27	1681
1995	68	29	73	30	41	1987	36	27	1931
1996	–	–	–	–	–	–	–	–	–
1997	32	18	46	26	56	3771	–	–	–
1998	75	31	67	28	41	3302	25	20	458
2000	49	23	63	30	47	3921	–	–	–
2001	–	–	–	–	–	–	13	11	1458
2002	–	–	–	–	–	–	26	21	3510
2004	–	–	–	–	–	–	6	5	658
2005	–	–	–	–	–	–	22	18	1700
2006	–	–	–	–	–	–	32	25	3371
2007	–	–	–	–	–	–	23	19	2213

[a]In 1993, yearling caribou were categorized separately, so the percentage totals add up to 90%, rather than 100%

TABLE 4 Annual mortality of adult female radiocollared Teshekpuk Caribou, 1990–2008

Collar year[a]	Sample size[b]	Mortalities[c]	Mortality rate[d] (%)	95% Binomial confidence
1990–1991	13	2	15	4–42%
1991–1992	21	3	14	5–35%
1992–1993	21	3	14	5–35%
1993–1994	30	4	13	5–30%
1994–1995	29	5	17	8–35%
1995–1996	31	4	13	5–29%
1996–1997	25	6	24	12–43%
1997–1998	28	4	14	6–32%
1998–1999	39	3	8	3–20%
1999–2000	37	5	14	6–28%
2000–2001[e]	45	5	11	5–24%
2001–2002	40	7	17	9–32%
2002–2003	36	4	11	4–25%
2003–2004	52	13	25	15–38%
2004–2005	46	8	17	9–31%
2005–2006	43	4	9	4–22%
2006–2007	60	5	8	4–18%
2007–2008	55	10	18	10–30%
Average			14.5	

[a] Collar year defined as 1 July–30 June.
[b] Sample size – the total number of active radio collars at the beginning of the collar year.
[c] Number of radiocollared caribou that died during the collar year.
[d] Mortality rate – Mortalities/Sample Size.
[e] Beginning in 2000–2001, caribou that were collared with PTT, GPS or VHF radio collars were used in the analysis. Previous to 2000–2001 only VHF-collared caribou were used.

TABLE 5 Summary of community-based harvest assessments for communities within the range of the Teshekpuk caribou herd, 1985–2006

Community	Survey year	Human population	Average Nr caribou harvested/yr	Harvest information reference
Anaktuvuk Pass	1990	314	592	Pedersen and Opie 1990
Anaktuvuk Pass	1991	272	545	Pedersen and Opie 1991
Anaktuvuk Pass	1992	270	566	Fuller and George 1997
Anaktuvuk Pass	1993	318	574	Pedersen and Opie 1993
Anaktuvuk Pass	1994–1995	318	322	Brower and Opie 1996
Anaktuvuk Pass	2006-2007	277	697	Pedersen (pers. comm.)
Atqasuk	1994–1995	237	262	Hepa et al. 1997
Atqasuk	2002–2006	228	198	Pedersen et al. In Prep
Barrow	1987-1989	3016	1595	Braund et al. 1991
Barrow	1992	3908	1993	Fuller and George 1997
Barrow	2002–2006	4581	4478	Pedersen et al. In Prep
Nuiqsut	1985	337	513	Pedersen 1995
Nuiqsut	1992	418	278	Fuller and George 1997
Nuiqsut	1993	361	672	Pedersen 1995
Nuiqsut	1994–1995	418	258	Brower and Opie 1997
Nuiqsut	1999–2000	468	413	Pedersen 2001
Nuiqsut	2000–2001	468	600	Pedersen (pers. comm.)
Nuiqsut	2002–2006	433	398	Pedersen et al. In Prep
Point Lay	1987	121	157	Pedersen 1989
Point Hope	1992	699	225	Fuller and George 1997
Wainwright	1988	506	505	Braund et al. 1993
Wainwright	1989	468	711	Braund et al. 1993
Wainwright	1992	584	748	Fuller and George 1997

TABLE 6 Estimated harvest of Teshekpuk herd caribou during the 2006–2007 and 2007–2008 regulatory years by residents living within the range of this herd

Community	Human population	Per capita caribou harvest	Estimated total community harvest[a]	Approximate % TCH in harvest	Estimated Nr of TCH caribou harvested	Assessments used to estimate per capita caribou harvest[b]
Anaktuvuk Pass			697 (06-07)	30	209	
	277	1.76	488 (07-08)		146	Anak. Pass 1990–1995
Atqasuk			113 (06-07)	60	68	
	223	.89	198 (07-08)		119	Atqasuk 2002-2007
Barrow			5380 (06-07)	70	3766	
	4054	1.1	4459 (07-08)		3121	Barrow 2002-2007
Nuiqsut			470 (06-07)	60	282	
	403	.99	398 (07-08)		239	Nuiqsut 2002-2007
Point Lay	250	1.3	325	20	65	Pt. Lay 1987
Point Hope	704	0.32	225	0	0	Pt. Hope 1992
Wainwright	540	1.27	686	60	412	Wainwright 1988, 1989, 1992
Total Harvest					4802 (06-07)	
					4102 (07-08)	

[a]Harvest estimates for Anaktuvuk Pass, Atqasuk, Barrow and Nuiqsut are from household surveys in 2006-2007. For 2007-2008, those same communities were estimated based on current population, and the mean per-capita harvest between regulatory years 2002-2003 through 2006-2007 (Pedersen et al. In Prep).
[b]Citations associated with each harvest assessment are in Table 5.

TABLE 7 Sex and percent chronology of annual caribou harvest among Atqasuk, Barrow and Nuiqsut residents, 2006–2007

Village	Sex	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Unk.	Annual harvest
Anaktuvuk[a]	Bull	7%	15%	29%	27%	2%	0%	0%	0%	1%	4%	5%	9%	0%	475
Pass	Cow	0%	0%	0%	7%	8%	15%	8%	6%	34%	7%	13%	0%	0%	222
	Unk.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0
	Total	5%	10%	20%	21%	4%	5%	3%	2%	12%	5%	7%	6%	0%	697
Atqasuk[b]	Bull	40%	14%	19%	10%	0%	0%	0%	0%	0%	0%	0%	0%	17%	109
	Cow	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3
	Unk.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0
	Total	41%	14%	19%	9%	0%	0%	0%	0%	0%	0%	0%	0%	17%	112
Barrow[b]	Bull	21%	19%	19%	21%	5%	1%	5%	2%	1%	0%	1%	3%	4%	4116
	Cow	22%	22%	3%	25%	0%	0%	0%	0%	12%	2%	10%	0%	2%	894
	Unk.	12%	12%	47%	29%	0%	0%	0%	0%	0%	0%	0%	0%	0%	372
	Total	21%	19%	18%	22%	4%	1%	4%	1%	2%	0%	2%	2%	3%	5381
Nuiqsut[b]	Bull	3%	17%	29%	25%	11%	10%	0%	0%	0%	1%	2%	1%	1%	392
	Cow	0%	26%	33%	7%	0%	33%	0%	0%	0%	0%	0%	0%	0%	42
	Unk.	0%	0%	39%	12%	7%	0%	7%	7%	0%	0%	0%	20%	7%	41
	Total	2%	16%	31%	23%	10%	11%	1%	1%	0%	1%	2%	3%	1%	475

[a]Data from Pedersen 2007

[b]Data from Pedersen et al. in prep

TABLE 8 Percent chronology of annual caribou harvest among Wainwright residents (1988–1990)

Village	Jul–Aug	Sep–Oct	Nov–Dec	Jan–Feb	Mar–Apr	May–Jun	Annual harvest
Wainwright (88-89)[a]	31%	53%	9%	3%	2%	2%	505
Wainwright (89-90)[a]	38%	31%	4%	15%	11%	<1%	711

[a]Data from Braund et al. 1991,1993

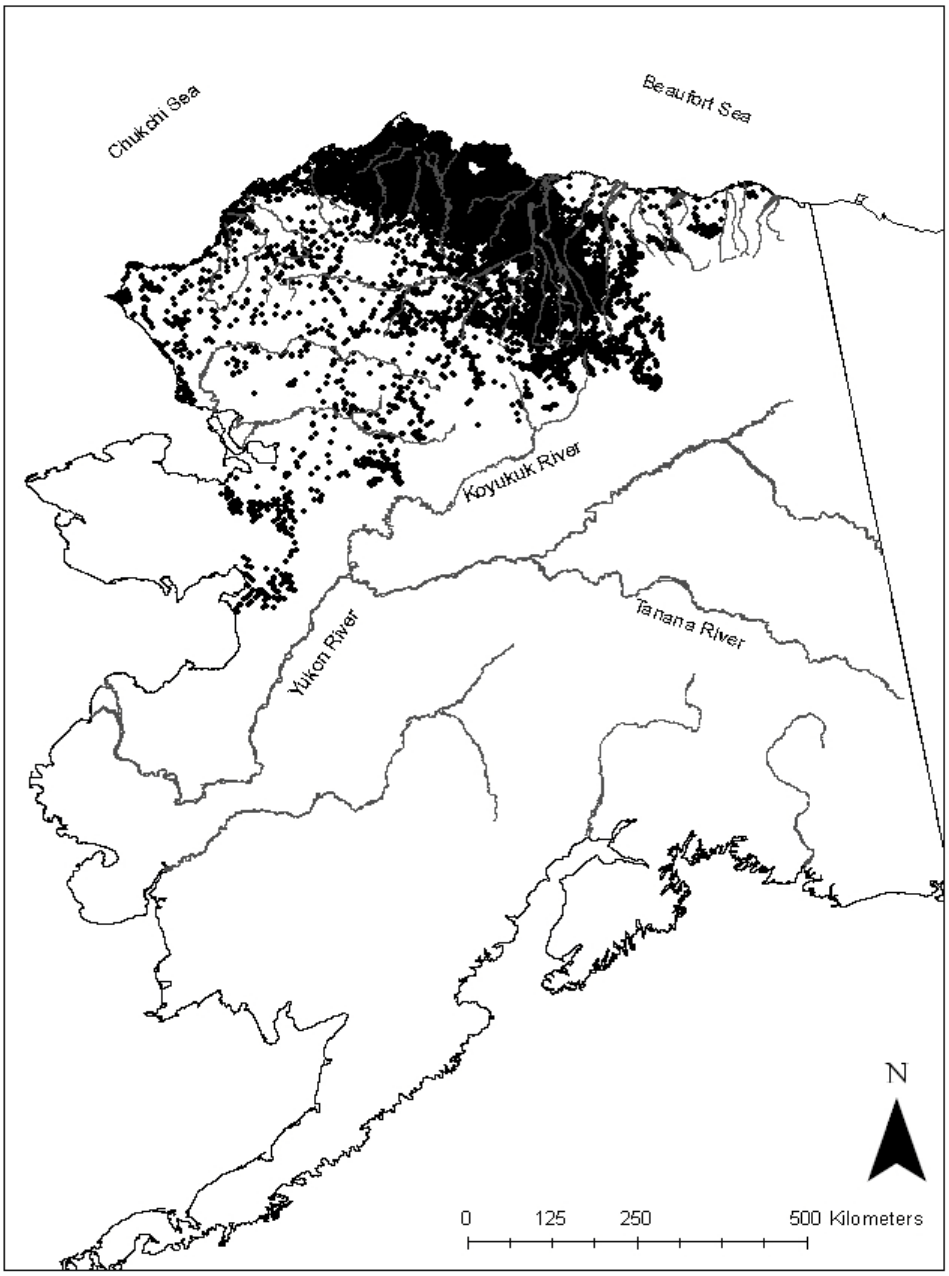


Figure 1 Locations of satellite collared TCH caribou (GPS and PTT), 1990-2007. Locations were filtered for accuracy and the data set was reduced to no more than one location per-day per-caribou (Prichard et al. 2007).

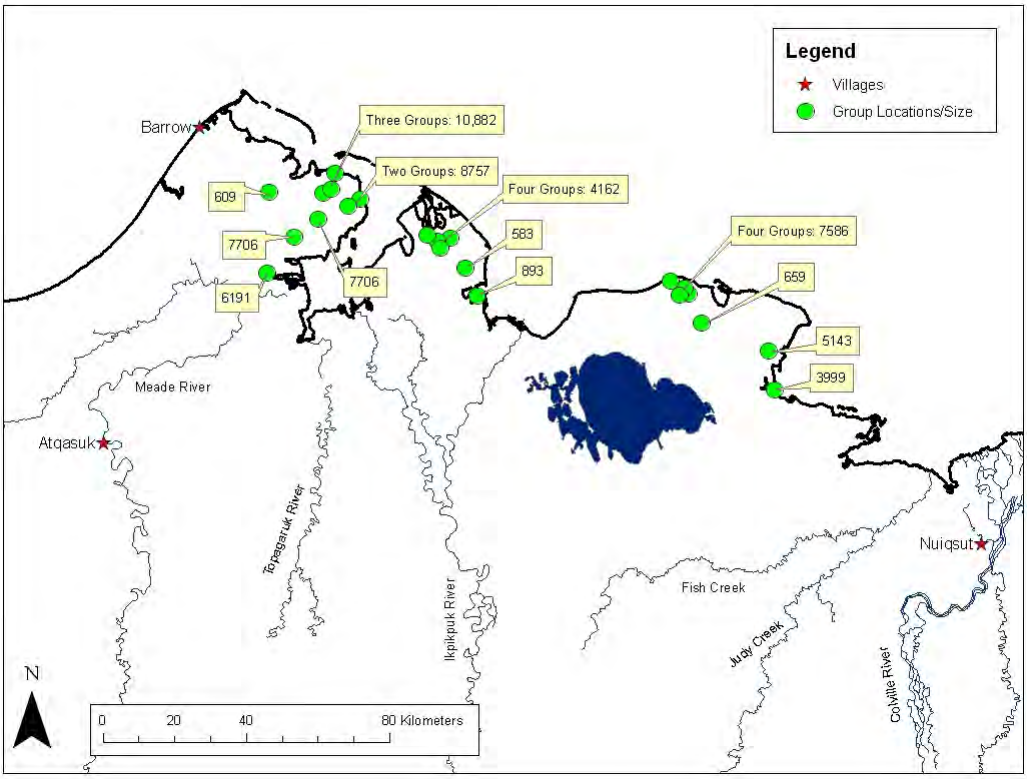


FIGURE 2 Locations and sizes of groups observed during the July 8, 2008 Teshekpuk caribou herd photocensus

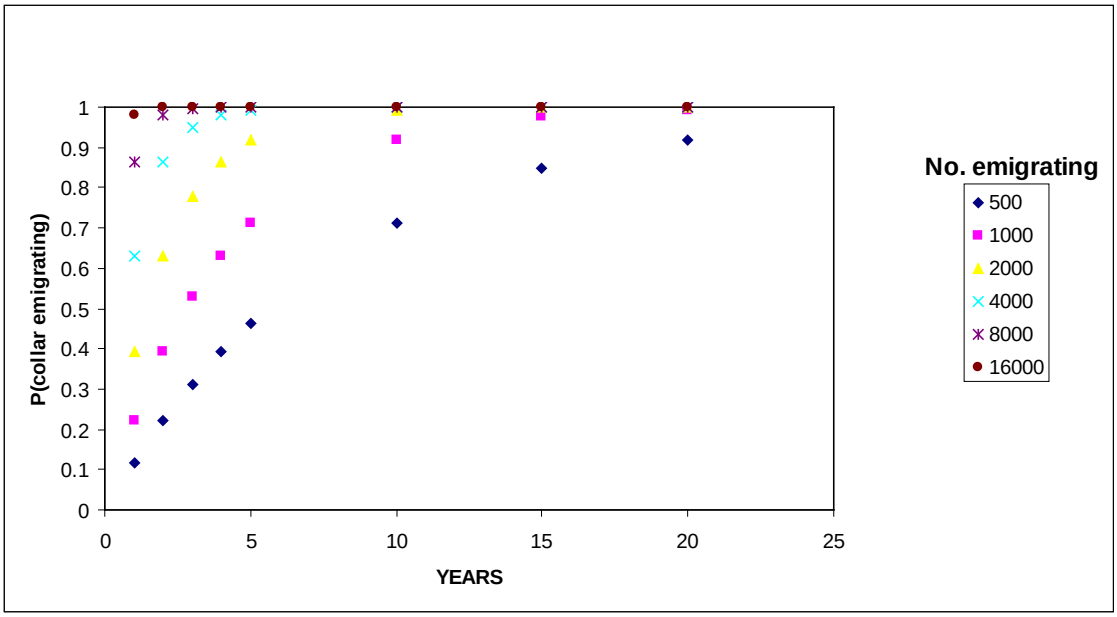


FIGURE 3 The probability that an emigrating group of caribou will have at least one collar in the group, given that the source population is 400,000, and there are 100 randomly distributed active collars in the herd.

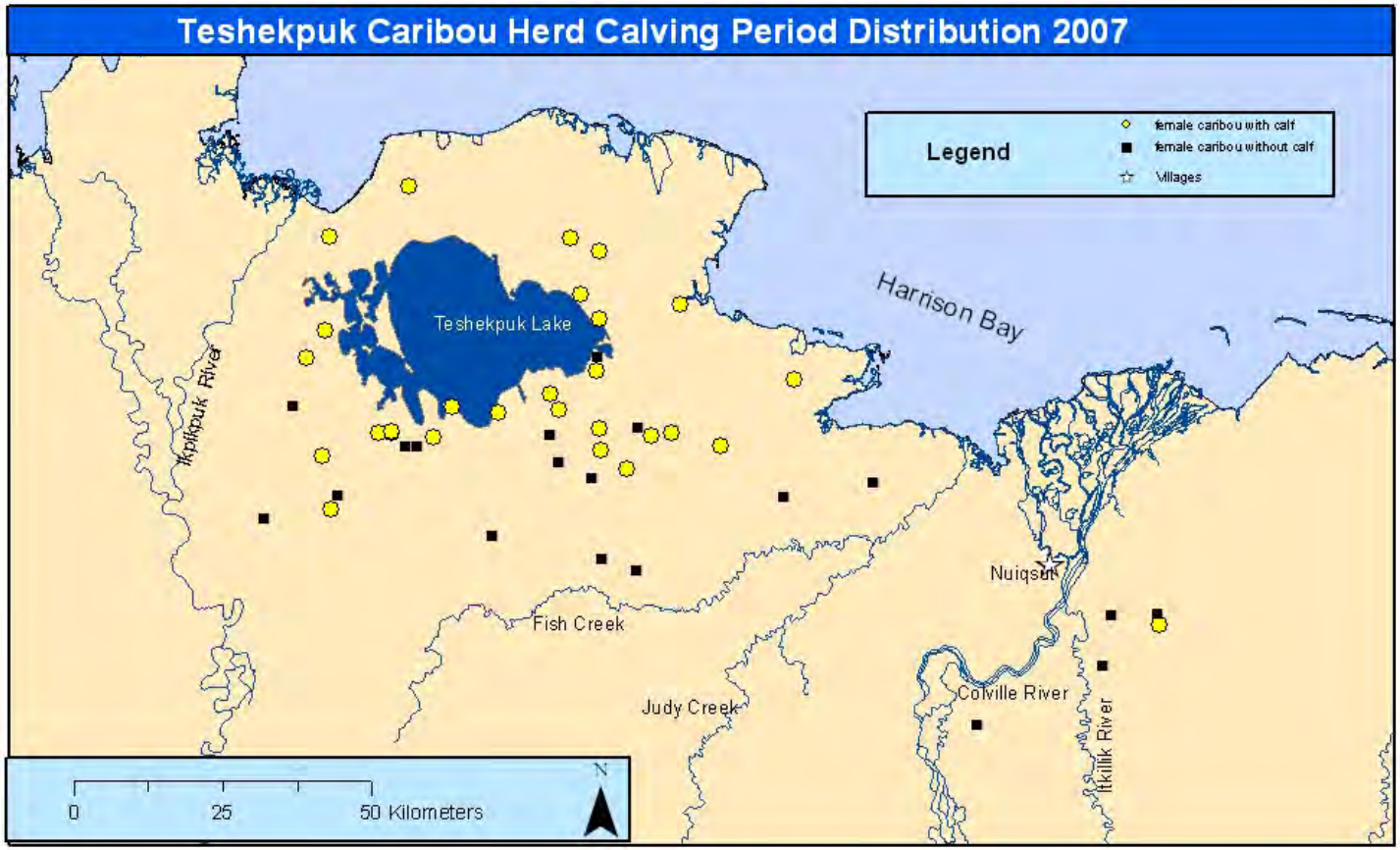


FIGURE 4 Distribution of collared female TCH caribou during the 2007 calving season. Locations are the first location where a cow was seen with a calf, or the location nearest the median date of calving, in the case of caribou not seen with calves.

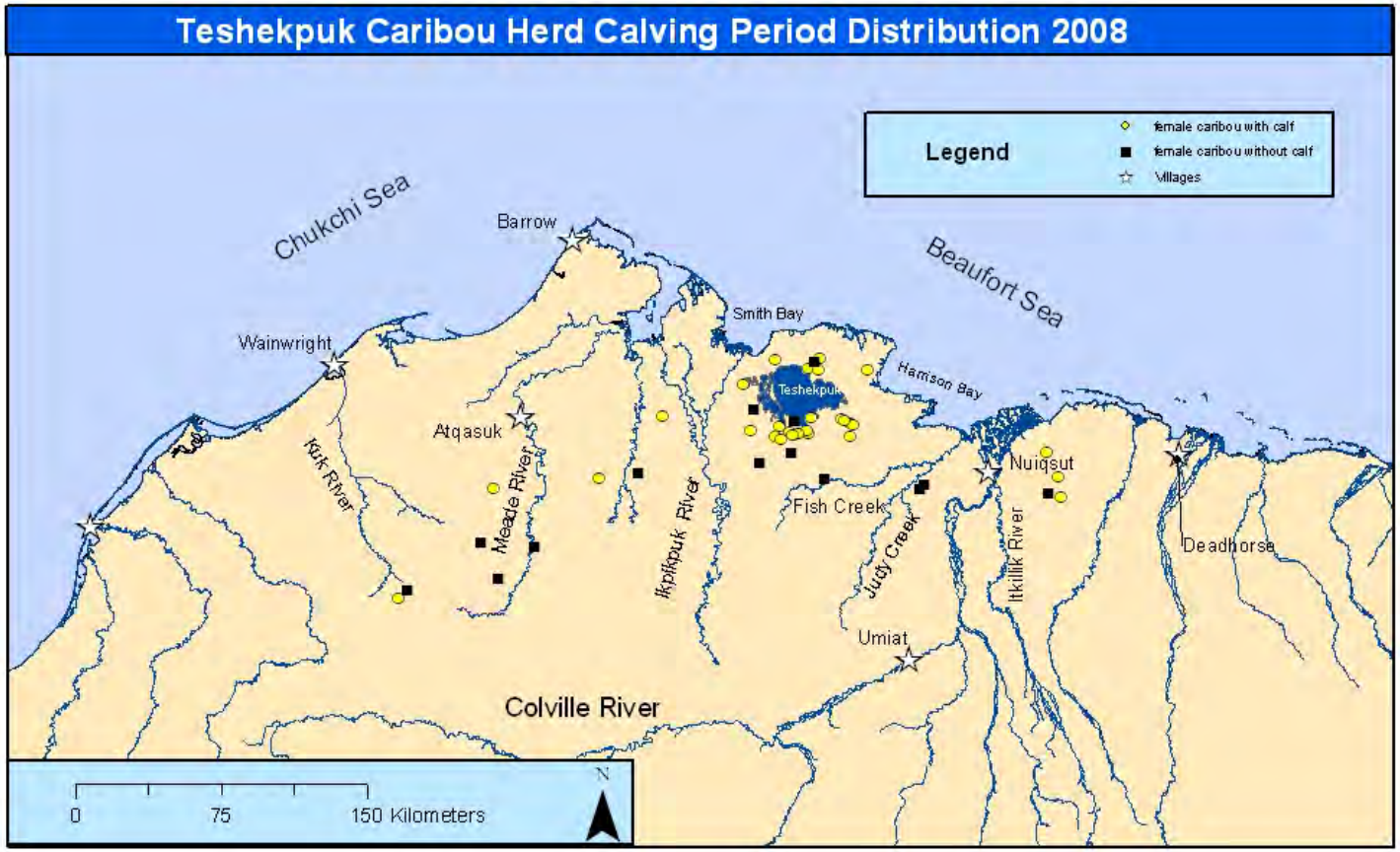


FIGURE 5 Distribution of collared female TCH caribou during the 2008 calving season. Locations are the first location where a cow was seen with a calf, or the location nearest the median date of calving, in the case of caribou not seen with calves.

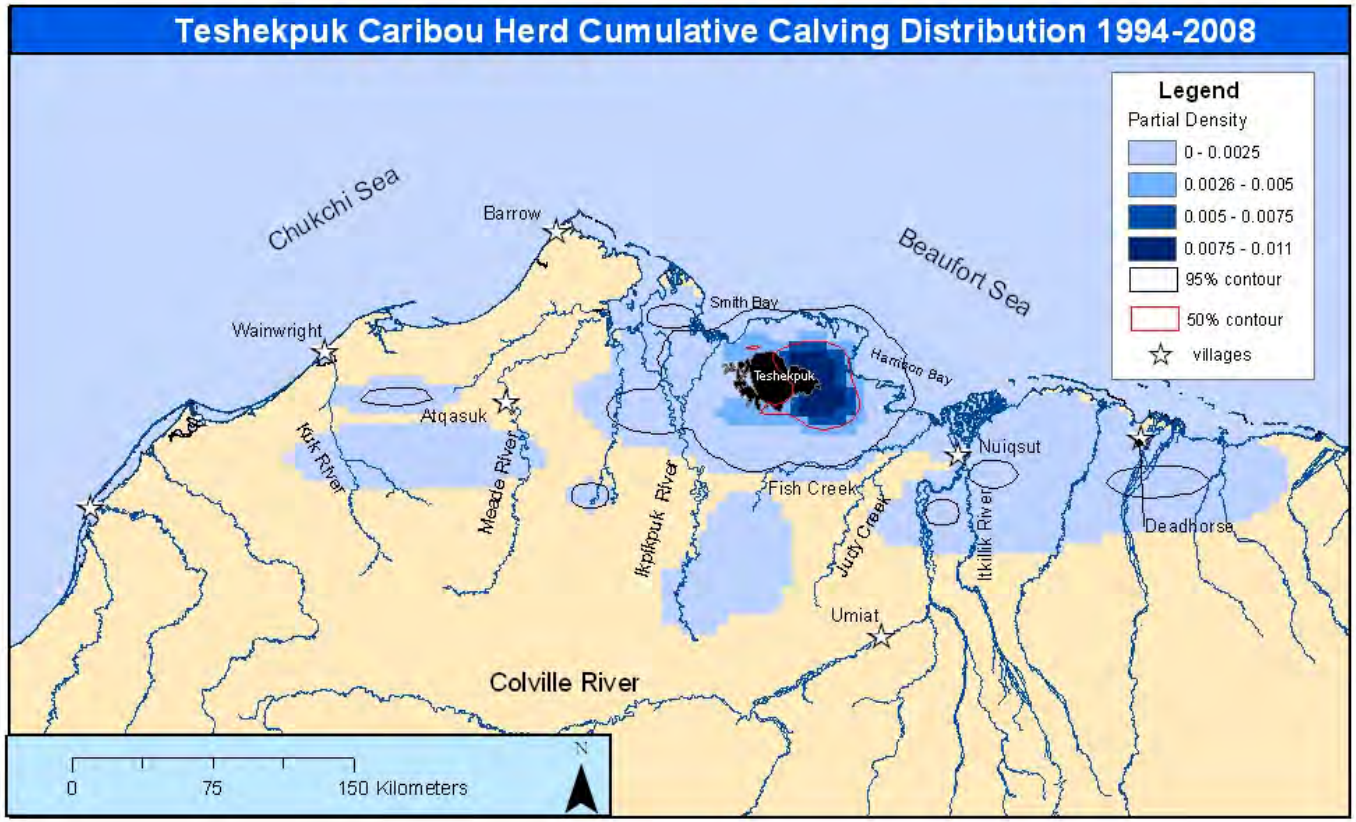


FIGURE 6 The cumulative TCH calving distribution, 1994–2008. Annual fixed kernel utilization distributions were summed and rescaled to present a historical distribution unbiased by annual sample size. Contours enclosing the 50% and 95% utilization distributions are indicated in red and black, respectively

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO Box 115526
Juneau, AK 99811-5526

CARIBOU MANAGEMENT REPORT

From: 1 July 2006
To: 30 June 2008[1]

LOCATION

GAME MANAGEMENT UNITS: 26B and 26C (25,787 mi^2)

HERD: Central Arctic

GEOGRAPHIC DESCRIPTION: Central Arctic Slope and Brooks Range

BACKGROUND

In the mid 1970s the Central Arctic caribou herd (CAH) was recognized as a discrete herd, and in 1975 it was estimated at 5000 caribou (Cameron and Whitten 1979). By 1983 the CAH increased to approximately 13,000 and by 1992 to more than 23,000 caribou (Valkenburg 1993). In 1995 the herd declined to 18,100 and then stabilized for a few years. By 2000, herd size increased substantially to more than 27,000 animals, and in 2002 the herd was estimated at 31,857 caribou (Table 1). The recent increase was due to low adult mortality (<10%), high parturition rates (≥85%), and high calf survival to October (≥50 calves:100 cows) during 1998–2002 (Lenart 2007).

Reported harvest on the CAH changed over time, probably as a result of regulatory modifications and changes in hunting pressure. In regulatory year (RY) 1986 (RY = 1 Jul through 30 Jun, e.g., RY86 = 1 Jul 1986 through 30 Jun 1987), more restrictive regulations were adopted, and harvest decreased substantially through RY90. Beginning in RY91, harvest and hunting pressure increased on the CAH, probably because 1) hunting was severely restricted on several Interior Alaska caribou herds (e.g., Delta, Macomb, Fortymile), which displaced hunters to hunt the CAH, and 2) the CAH was accessible by road because the Dalton Highway was officially open to public traffic in 1991. Reported harvest increased moderately beginning in RY00. Some of this increase was due to the increasing popularity of bowhunting along the Dalton Highway.

The CAH traditionally calved between the Colville and Kuparuk rivers on the west side of the Sagavanirktok River and between the Sagavanirktok and the Canning rivers on the east side. During the early 1990s, the greatest concentration of caribou that calved in western Unit 26B shifted southwest as development of infrastructure related to oil production occurred in what was

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

originally a major calving area (Lawhead and Johnson 2000; Wolfe 2000). No directional shift in distribution of caribou that calved east of the Sagavanirktok River was noted (Wolfe 2000). The CAH summer range extends from Fish Creek, just west of the Colville River, eastward along the coast (and inland approximately 30 miles) to the Katakturuk River. The CAH winters in the northern and southern foothills and mountains of the Brooks Range. The herd's range often overlaps with the Porcupine caribou herd (PCH) on summer and winter range to the east and with the Western Arctic (WAH) and Teshekpuk (TCH) herds on summer and winter range to the west.

Within the range of the CAH, oil exploration and development began in the late 1960s and continues to the present. Beginning in the late 1970s, the Alaska Department of Fish and Game (ADF&G) implemented long-term studies on population dynamics, distribution, movements, and effects of development on the CAH. During the 1980s, calving activity was rare in the Prudhoe Bay oil field, where it was known to occur before development (Whitten and Cameron 1983). In addition, cows and newborn calves were underrepresented along the trans-Alaska pipeline corridor and around oil production facilities in the early 1990s (Cameron and Smith 1992; Cameron et al. 1992). By the mid 1980s, major movements of CAH caribou through the Prudhoe Bay oil field in summer had ceased, and caribou distribution and movements within the Kuparuk oil field were altered substantially (Smith and Cameron 1983, 1985*a,b*; Whitten and Cameron 1983, 1985; Curatolo and Murphy 1986). In the mid 1990s, research on the CAH was reduced substantially, and efforts were focused on monitoring population parameters and their relationship to management objectives. Beginning in 2001, research efforts were renewed to look at the effects of oil field development on production, growth, survival, and movements of caribou calves (Arthur and Del Vecchio 2007).

MANAGEMENT DIRECTION

Some of the CAH management goals and objectives were developed in response to concerns arising from research conducted during 1978–1993. Based on the hypothesis that displacement of sufficient magnitude would be harmful to the CAH (Cameron 1983), we worked with the oil industry to minimize disturbance to caribou movement due to physical barriers created by oil development. In addition, given that stress is cumulative, ADF&G reduced hunting activity in areas adjacent to the oil field and the Dalton Highway and also restricted the cow harvest. The current management objectives reflect these concerns. In addition, during the March 2000 Alaska Board of Game (board) meeting, the board established intensive management (IM) population and harvest objectives for the CAH. This designation means the board must consider IM if a reduction in harvest becomes necessary because of dwindling caribou numbers or productivity. The IM population objective for the CAH is 18,000–20,000 caribou, and the harvest objective is 600–800 caribou (5 AAC 92.108).

MANAGEMENT GOALS

Goal 1: Minimize the adverse effects of development on CAH caribou.

Goal 2: Maintain a CAH population level that will support a harvest of at least 600 caribou without precluding population growth.

Goal 3: Provide the opportunity for a subsistence harvest of CAH caribou.

Goal 4: Maintain opportunities to view and photograph CAH caribou.

MANAGEMENT OBJECTIVES

Objective 1: Maintain a population of at least 18,000–20,000 caribou. (Goals 1, 2, 3)

Objective 2: Maintain accessibility of seasonal ranges for CAH caribou. (Goal 1)

Objective 3: Maintain a harvest of at least 600 caribou if the population is ≥18,000 caribou. (Goal 2)

Objective 4: Limit the annual harvest of cows to a maximum of 3% of the cows in the population. (Goals 1, 2, 3)

Objective 5: Maintain a ratio of at least 40 bulls:100 cows. (Goals 1, 2, 3)

Objective 6: Reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. (Goal 4)

MANAGEMENT ACTIVITIES

- Conduct a photo census every 2–3 years. (Objective 1)
- Conduct annual fall composition counts. (Objectives 3, 4, 5)
- Radiocollar 10–20 yearling females every 1–2 years. (Objectives 1 and 2)
- Radiotrack during early summer, fall, and winter to determine seasonal distribution. (Objectives 1 and 2)
- Radiotrack and estimate parturition rate and late June calf:cow ratios for radiocollared females. (Objective 1)
- Monitor harvest through harvest ticket reports and Division of Subsistence harvest surveys. (Objectives 3 and 4)
- Work with the oil industry and other agencies to minimize disturbance to caribou from resource development. (Objectives 1 and 2)
- Regulate hunting to maintain a maximum annual harvest rate of 3% of cows in the population. (Objective 4)
- Regulate caribou hunting along the Dalton Highway to reduce conflicts between consumptive and nonconsumptive uses. (Objective 6)

METHODS

POPULATION STATUS AND TREND

Population Size

Population size was estimated in July 1997, 2000, 2002, and 2008 using the modified aerial photo-direct count technique (Davis et al. 1979). Postcalving aggregations of caribou were located by radiotracking collared animals. These aggregations usually occurred when temperatures were >55°F and wind was <8 mph. Groups of caribou were photographed with a Zeiss RMK-A aerial camera mounted in a DeHavilland Beaver aircraft. Caribou were counted directly from photographs. No population estimates were conducted during 2002–2007 due to lack of suitable weather, poor aggregation quality, or both.

Radiocollaring

We maintain 60–80 radiocollars (VHF, GPS, or satellite) in the CAH. Central Arctic herd caribou were captured using a shoulder mounted netgun from an R-44 helicopter and manually restrained with hobbles and hood while we collected measurements and fitted the radiocollar. Up to ten 10-month-old calves were captured annually and fitted with a conventional VHF radiocollar in March–April or June–July. Calves captured in March or April were weighed. Adult female caribou were recaptured and fitted with new VHF radiocollars when deemed necessary. Approximately 25–50 GPS radiocollars were deployed and maintained during 2003–2006 related to a research project (Arthur and Del Vecchio 2007). Following completion of the research project, all but 4 GPS radiocollars were removed in March 2006, and the 4 remaining automatically released on 10 June 2006. Therefore, no GPS or satellite radiocollars were on CAH caribou during June 2006 through late June 2008. In June 2008, 10 GPS radiocollars were deployed on adult females as part of the survey and inventory program to aid in locating the herd during photo censuses, spring and fall migrations, and winter distribution. These radiocollars will automatically release in June 2011. During captures, we measured the metatarsus and jaw of all caribou, assessed general body condition, and recorded sex, age, chase time, and handling time. Beginning in 2008, we drew blood from either the jugular or cephalic veins for serology, disease surveillance, and trace mineral analysis.

Parturition and Early Calf Survival

Parturition and early calf survival (survival to 2 weeks) data were stratified as Unit 26B West (west of the west bank of the Sagavanirktok River) or Unit 26B East (east of the west bank of the Sagavanirktok River) because we estimated that 80% of CAH cows maintain fidelity to these calving areas from year to year (R. Cameron, ADF&G, unpublished data). Because some overlap occurred, we arbitrarily chose the Sagavanirktok River as the line separating Unit 26B West, where there was substantial oil exploration and development, from Unit 26B East, where little exploration and development occurred.

Parturition rate was determined by observing radiocollared females ≥2 years old from a fixed-wing aircraft during the first half of June. Caribou observed with calves, hard antlers, or distended udders were classified as parturient (Whitten 1991). During 1988–1993, caribou were relocated 2–3 times during 30 May–14 June. During 1995–2002, caribou were located once each year, the target date being pre-peak calving between 3 June and 9 June. During this period of

reduced relocation frequency, parturient caribou may have been misclassified because some cows did not have hard antlers or distended udders, particularly if a calf was born early and died or was born late and not observed (Whitten 1995). During 2003–2006, caribou were located 2–3 times during 30 May–14 June in collaboration with an ongoing research project (Arthur and Del Vecchio 2007). In 2007 and 2008, caribou were located twice during the first week of June. Data were stratified based on the location of caribou east and west of the Sagavanirktok River, as described above.

The proportion of calves:100 cows (early calf survival) was determined by observing radiocollared females ≥2 years old from a fixed-wing aircraft after most calving should have occurred. If a cow was observed with a calf, she was classified as "with calf." If distended udders were detected but no calf was seen, we assumed the cow had recently lost a calf and she was classified as "without calf." Thus, these proportions are a conservative estimate of early calf survival. During 1988–1994, calves:100 cows were determined from the last half of June through mid August. Since 1994, calves:100 cows has been determined during 15–30 June. This technique provides an indication of early calf survival or overall calf production and is referred to as late June calf:cow ratios. In addition, data were stratified based on the location of caribou east and west of the Sagavanirktok River (as described above) using locations from the current summer. In 2004 only GPS-collared females with radiocollared calves were relocated (in conjunction with an ongoing research project; Arthur and Del Vecchio 2007). In that year we were unable to observe whether a cow was with a calf unless both were radiocollared because the caribou were aggregated too tightly.

Parturition rates and the proportion of calves:100 cows were calculated for 2 categories: known–age females and females ≥4 years old. Beginning in 2004, some random captures of adults were made and classified as "young," "medium," and "old" based on tooth wear. Caribou classified as "medium" or "old" were included in the "females ≥4 years old" category. Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River.

Population Composition

No fall composition survey was conducted during 2003–2007. Fall composition was estimated from a helicopter in mid October 2000, 2001, and 2002. Caribou were classified as cows; calves; and small, medium, or large bulls.

Distribution and Movements

Distribution of the CAH was monitored during calving, postcalving, summer, rut, and winter by relocating radiocollared females during June, July, mid October, and late March or early April.

HARVEST

Harvest and hunting pressure by Alaska residents who lived south of the Yukon River and by nonresidents were monitored using harvest reports submitted by hunters. Total harvest, residency and success, chronology, and transportation were summarized by regulatory year.

Alaska residents who lived north of the Yukon River were not required to obtain caribou harvest tickets and report cards. However, they were required to register with ADF&G or an authorized vendor. ADF&G–Division of Subsistence estimated caribou harvested by residents of Kaktovik and Nuiqsut. Caribou harvested by hunters from Nuiqsut included animals from the Teshekpuk and Western Arctic caribou herds, as well as some CAH caribou.

A hunter checkstation was operated on the Dalton Highway near the Yukon River Bridge during August and September 1991–1993 and 1996–1998. Checkstation reports are on file at ADF&G, Fairbanks.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We completed a photo census on 3–4 July 2008. From those photographs we counted 66,475 caribou (including 11,037 calves). An additional 297 caribou not photographed were counted from airplanes, for a total of 66,772 caribou (Table 1). The 66,772 animals represented a 110% increase (13% annually) from the 2002 estimate of 31,857.

During the 2008 photo census, the temperature was 60°F, sunny and clear with an estimated 10–15 mph wind. We considered conditions to be "very buggy," which initiated the tight grouping of caribou necessary for a census. Fourteen groups were photographed, 10 of which were located from the Canning and Staines rivers east to the mouth of the Hulahula River (groups contained 55 CAH, 1 TCH, and 2 PCH radiocollars). Four groups were photographed near Prudhoe Bay (5 CAH and 1 TCH radiocollars). We considered photographs to be of excellent quality. We believe we located all possible active radiocollars and did not miss any large groups. We may have missed some bull/yearling groups; likely less than 1000 animals. Two radiocollared caribou from the PCH that had been missing from the Porcupine radiotracking flights since the end of June 2007 were located with CAH animals during the 23 June radiotracking flight and again during the photo census. It is possible that these PCH animals wintered in the Sadlerochit Mountains and joined the CAH during calving or postcalving. The remaining 97 PCH radio collars were in the mountains in Unit 26C at the time of the CAH photocensus. The 2 radiocollared TCH caribou were on the CAH calving grounds in early June and when the TCH photo census was conducted. The remaining TCH radio collars were west of Fish Creek (approximately 75 miles from any CAH radio collars). Thus, it is possible that some temporary immigration from the TCH and PCH occurred during this photo census. If we estimate that each collar represents 1000–1200 caribou based on the number of collars deployed per herd size, then it is possible that approximately 4000–5000 caribou counted on photographs were not CAH animals.

Population size was not estimated during 2003–2007; however, the CAH increased substantially since 1995 when the herd was estimated at 18,100 caribou. The annual rate of increase between 1995 and 2008 (13 years) was 10.6%. We also noted the annual rates of increase between photo censuses: 4% from 1995 to 1997, 11.2% from 1997 to 2000, 8.4% from 2000 to 2002 and most recently, 13.1% from 2002 to 2008 (Table 1). Continued high parturition rates, high late-June calf:cow ratios, and low adult mortality since 1997 contributed to the increase in population size

(Tables 2 and 3). High annual rates of increase (≥12%) have been reported for other Arctic caribou herds (Carroll 2007, Dau 2007).

Parturition and Early Calf Survival

Parturition rates of radiocollared females ≥4 years old throughout Unit 26B in 2007 and 2008 were 93% (n = 56) and 98% (n = 46), respectively, and have been high since 1998 (≥83%; Table 2). High parturition rates such as these contributed to the increase in population size observed in the 2000, 2002, and 2008 censuses (Tables 1 and 2). Parturition rates for 3-year-olds were 100% (n = 4) in 2007. No 3-year-olds were radiocollared in 2008. In general, parturition rates for 3-year-olds were good from 1998 through 2007 (≥71%, n = 4–13; Table 4), when the herd was increasing. A high parturition rate, particularly in 3-year-olds, is indicative of good nutritional condition, although variability in parturition rates can be relatively high among 3-year-old cows (Valkenburg et al. 2000). In 1995, when the population appeared to decline, no 3-year-old females were pregnant (n = 4), and the parturition rate for females ≥4 years old was also low (56%, Tables 1 and 2).

Mean fidelity to a specific calving area (Unit 26B West or Unit 26B East) was determined for radiocollared cows with calving locations obtained in ≥5 calving seasons during 1997–2006. Mean fidelity was 92% (n = 46; Arthur and Del Vecchio 2007). We observed no significant differences in parturition rates between Unit 26B West and Unit 26B East (95% CI) during 1994–2008, although Unit 26B East had higher point estimates most years. For 1988–1994, Cameron (1995) and Cameron et al. (2002) detected a significantly lower mean parturition rate in Unit 26B West than in Unit 26B East (P = 0.003; Table 2). This occurred during part of the period when the herd was declining (1992–1995).

The peak of calving was after 6 June in 2007 and approximately 1 June 2008. Peak of calving was later in 2007 compared to the previous 5 years (2002–2006), when it was between 2 June and 6 June (Lenart 2007). However, it is similar to peak of calving in 2001 at approximately 9–10 June, which may have been due to late snowmelt on the coastal plain (Arthur and Del Vecchio 2007).

The late June calf:cow ratio of radiocollared females ≥4 years old throughout Unit 26B was 81:100 (n = 53) in 2007 and 91:100 (n = 45) in 2008. The ratio has been high since 1997 (≥75:100; Table 3), indicating consistently high early calf survival, which also contributed to the increase in population size observed in 2000, 2002, and 2008. During years when the herd was declining or stable (1994–1996), late June calf:cow ratios were lower (<65%; Table 3). The late June calf:cow ratio for radiocollared 3-year-olds was 75:100 (n = 4) in 2007. No 3-year-olds were radiocollared in 2008. During 1998–2007, calf:cow ratios for 3-year-olds appeared to be lower (33–71:100) and more variable than for older cows in the herd (Table 5). Calves born to 3-year-olds tended to have lower survival rates, although our sample sizes were small (n = 4–14). We also reported calf:cow ratios between Unit 26B West and Unit 26B East but noted no pattern among years (Table 3).

Our analyses used the Sagavanirktok River to separate Unit 26B West and Unit 26B East based on historical calving location data and oilfield infrastructure. However, there are several reasons

to view this approach and the results with caution. Even though density of calving caribou was lower near the Sagavanirktok River than in areas farther east or west, there was not complete separation between calving concentrations, and there may be no biological reason to separate caribou based on calving areas. Also, this may not be the best dividing line if calving distribution changes. Finally, we may not be able to detect differences between areas because of small sample sizes in some years.

Population Composition

No fall composition surveys were conducted during 2003–2008. The fall composition survey in October 2002 indicated a bull:cow ratio of 67:100 and a calf:cow ratio of 72:100 (Table 6). Bull:cow ratios have been high since 1976 (>50:100), indicating harvest had little effect on sex ratios. Calf:cow ratios were high in 2000, 2001, and 2002 (>50:100), indicating summer calf survival rates were relatively high. The composition surveys occurred in the Brooks Range in the Chandalar Shelf, Atigun Pass, Galbraith Lake, and upper Sagavanirktok River areas.

Distribution and Movements

Calving distribution. Distribution of calving in 2007 and 2008 was similar to the 5 previous years. During 2002–2008 the greatest concentration of calving in Unit 26B West occurred between the headwaters of the Kachemach and Miluveach rivers and the Kuparuk River, on the north side of the White Hills. In Unit 26B East the greatest concentration of caribou calving occurred between the Shaviovik and Canning rivers in 2002, and between the Sagavanirktok and Shaviovik in 2003–2008 (Arthur and Del Vecchio 2007). In 2001, snowmelt and spring migration was delayed and calving occurred over a larger area than during most years (Lenart 2003; Arthur and Del Vecchio 2007).

Summer and Early Fall Distribution. In most years, the CAH summer range extends from the Colville River to just east of the Canning River and from the coast inland to the foothills. Post calving movements during summer are influenced by insect abundance, which largely depends on temperature and wind speed (Dau 1986). Generally, when the temperature is >55°F and wind speed is <8 mph, caribou are found along the coast or on large gravel bars. Caribou tend to concentrate along the coast during warm weather but move inland on cool and windy days. In general, the CAH begins migrating toward the foothills of the Brooks Range during August, and by September most caribou are found along the foothills of the Brooks Range, particularly around Toolik Lake, Galbraith Lake, Accomplishment Creek, the Ivishak River, and the upper Sagavanirktok River. When unusually warm temperatures persist in September, the CAH sometimes remains on the coastal plain as far north as the White Hills and Franklin Bluffs until about mid October.

No unusual summer movements were noted during 2005–2007. In July 2004 most of the GPS radiocollared caribou that had calved in Unit 26B West moved into Unit 26B East (Arthur and Del Vecchio 2007), and CAH caribou were found as far east as the Hulahula River. By early September they migrated back to Unit 26B West. Then, many caribou crossed the Brooks Range and continued eastward to the Coleen River. In 2003 no unusual movements were detected for the CAH. However, in September 2003, approximately one-third of the Teshekpuk caribou herd made an unprecedented movement from the Teshekpuk Lake area across the coastal plain in

Unit 26B, continued east into the Arctic National Wildlife Refuge and to Barter Island, and spent the winter in that region (Carroll 2005). Other unusual movements have also been noted in the past for the CAH. In 2002, caribou persisted on the coastal plain through August and the first week of September because of warm weather. By mid September, most of the caribou were headed for the foothills of the Brooks Range. In late July 2001 an estimated 5000 Central Arctic caribou were found inland in the Fish Creek drainage in Unit 26A.

During postcalving surveys (23–24 Jun) in 2008, 17% of radiocollared CAH caribou (n = 46) were distributed on the east fork of the Sagavanirktok River, 56% were between Bullen Point and on the Canning River and 7% were west of Prudhoe Bay. By 2 July, 92% (n = 60) of the radiocollared animals were distributed between the Canning and Hulahula rivers. We continued to document this eastward movement during 4–7 July through satellite telemetry, as 9 of 14 GPS collared CAH caribou moved eastward to Demarcation Bay. A movement of this magnitude to the east has not been documented previously for the CAH. By 13 July, they began returning westward. By the end of July, most of the GPS radiocollared caribou returned to the area west of the Canning River. During August and September, the CAH was spread out from the Itkillik River to east of the Canning River and from just south of the Kuparuk oilfield to the mountains.

Fall Distribution. During the rut in October, large concentrations of caribou can be found on Chandalar Shelf in Your and Thru Creeks and the North Fork and Middle Fork Chandalar River on the south side of the Brooks Range. On the north side of the Brooks Range, caribou can be located around Galbraith Lake, Accomplishment Creek, and in the upper Sagavanirktok River.

In 2008, by early October, some GPS radiocollared caribou had moved to the south side of the Brooks Range. More caribou continued to move south during the month of October and by November, all but 1 GPS radiocollar was on the south side. In 2007, no radiotracking flights were conducted during mid October and no satellite or GPS radiocollars were on CAH animals. In fall 2006, most CAH animals remained on the north side of the Brooks Range during rut. In 2004 the caribou that had moved east to the Coleen River in September returned to their traditional rutting grounds in the Middle Fork Chandalar River by mid October.

Winter Distribution. In RY08, 55 radiocollared caribou were located on the south side of the Brooks Range (95%, n = 58). It is possible that a few more wintered on the north side because we did not radiotrack west of the Dalton Highway and 10 radiocollars were missing. During winter RY07 only 1 radiocollared caribou (2%, n = 43) was located on the south side of the Brooks Range near Arctic Village. The remaining 42 radiocollared caribou were located on the north side. It is possible that some caribou moved to the south side during fall or early winter and returned to the north side by the end of March. We located 1 radiocollared mortality on the south side in upper Your Creek. This caribou was alive on the north side in June 2007; indicating that at some point between July 2007 and March 2008 she moved to the south side where she died. In RY06, approximately 60% (n = 54) of the radiocollared caribou wintered on the south side of the Brooks Range between the North Fork and East Fork Chandalar rivers and in the Tinayguk River drainage in Gates of the Arctic National Park and Preserve (GAAR). In RY05 caribou wintered in the Chandalar Shelf area as far east as the area between the Middle Fork Chandalar River and the Wind River and also westward into GAAR. During RY01–RY05, more than 50% of the radiocollared caribou wintered between the North Fork and Middle Fork Chandalar rivers.

Caribou have also wintered as far south as Ackerman Lake. Additionally in RY04, another large concentration of caribou wintered farther east, just south of Arctic Village.

Distribution of CAH caribou south of the Brooks Range varied each year, as indicated below:

Regulatory year	Date of radiotracking	Percent CAH on south side of Brooks Range	Number of radiocollars located
2001–2002	29–31 Mar	69	103
2002–2003	26 Feb	68	89
2003–2004	15 Mar	87	100
2004–2005	11 & 17 Mar	60	111
2005–2006	9 Mar	54	76
2006–2007	Mar	60	54
2007–2008	27 Mar	2	43
2008–2009	10 Mar	95	58

The caribou that wintered on the north side of the Brooks Range were usually found east of the Dalton Highway, along the foothills in the upper Sagavanirktok River, Accomplishment Creek, and Lupine River drainages, with some caribou as far east as the Canning River. In some years, CAH caribou can also be found west of the Dalton Highway in the foothills of the Brooks Range along the Itkillik, Kuparuk, and Toolik rivers.

Winter distribution of the CAH during 2002–2007 was somewhat similar to that observed during the late 1990s, and the CAH appeared to expand their winter range, mostly eastward. During the mid 1990s, many CAH caribou wintered in the Chandalar Shelf area and east into the Wind River drainage, and in the Tinyaguk and upper North Fork Koyukuk rivers (ADF&G files). In March 2003 heavy snows fell on the south side of the Brooks Range, and it appeared that northward spring migration was delayed.

Mixing with Other Herds. Mixing with Teshekpuk caribou frequently occurs in both summer and winter because herd ranges overlap along the Colville River. Since 2002 there has been extensive overlap during winter in Unit 26B West and on the south side of the Brooks Range in the North Fork Chandalar River and west of the Dalton Highway in GAAR. In RY03 some mixing occurred when the TCH traveled to the Arctic National Wildlife Refuge for the winter. On their return spring migration, 3 Teshekpuk satellite radiocollared caribou remained on the CAH calving grounds during June and July. It is likely that several thousand caribou remained with them (Carroll 2005). In summer 2008, 3 radiocollared TCH cows calved on the CAH calving grounds and remained with the CAH at least through early July. Annually since 2004, 1–5 radiocollared TCH cows have calved with the CAH.

Some mixing with Western Arctic caribou may have occurred during winter 2003–2004 when approximately one-third of the WAH wintered on the south side of the Brooks Range, west of the Dalton Highway in GAAR (J. Dau, ADF&G, personal communication; ADF&G files). This occurrence was not repeated in winters RY04–RY07. In RY08, a few WAH satellite radiocollars were near the Dalton Highway and some mixing with the CAH may have occurred. During the early 1990s, we suspected some mixing with the WAH occurred during September on the north

side of the Brooks Range when large groups of caribou (>5000) were observed. No mixing of CAH and WAH during summer has been documented.

Mixing with the PCH during winter 2008–2009 occurred extensively west of Arctic Village to the Dalton Highway. During 2001–2007, mixing occurred in years when a large proportion of the PCH wintered in Alaska, near Arctic Village, and most of the CAH wintered on the south side of the Brooks Range (Lenart 2007). Additionally, in 2002 one radiocollared PCH caribou was found on the Ribdon River near some CAH animals. In 2004, a GPS radiocollared CAH caribou followed the PCH eastward during its spring migration in March and remained with the PCH during summer 2004, wintered with the PCH in RY04, had a calf on the PCH calving grounds in June 2005 and died shortly after calving.

Mixing with the PCH during summer occurs less frequently. In 2008, 2 radiocollared PCH caribou were located among 10,000–20,000 CAH caribou during CAH postcalving flights and a CAH photocensus. These 2 PCH radiocollars had been missing and it is possible that a group of PCH wintered in the Sadlerochit Mountains and joined the CAH in the summer. It is unlikely that mixing with the PCH occurred during summers 2002–2007. However, in 2001 some mixing may have occurred during the summer when approximately 10,000 Porcupine caribou inhabited the Sadlerochit Mountains, and Central Arctic caribou were located near the Canning River, 10–20 miles away.

MORTALITY

Harvest

Most harvest occurred in Unit 26B, but some also occurred in Units 24, 25A, 26A, and 26C. However, harvest in units other than Units 26B and 26C (in summer and early fall) may be recorded as harvest from a different herd (e.g., PCH). In addition, parts of the WAH occasionally mixed with the CAH in fall and winter, and some of these animals may have been harvested and recorded as harvest from the CAH.

Season and Bag Limit.

Regulatory years 1996–1997 through 2007–2008:

Unit/Location	Resident open season/Bag limit	Nonresident open season/Bag limit
Unit 25A	1 Jul–30 Apr; 10 caribou	1 Jul–30 Apr; 5 caribou
Unit 26B, within the Dalton Highway Corridor Management Area	1 Jul–30 Apr; 2 caribou; however, only 1 bull caribou may be taken 1 Jul–30 Sep, and cow caribou may be taken 1 Oct–30 Apr	1 Jul–30 Apr; 2 bulls; however, only 1 bull may be taken 1 Jul–30 Sep
Unit 26B, that portion north of 69°30´ and west of the east bank of the Kuparuk River to a point at 70°10´N latitude 149°04´W longitude, then west approximately 22 miles to 70°10´ latitude 149°56´W longitude, then following the east bank of the Kalubik River to the Arctic Ocean	1 Jul–30 Apr; 10 caribou	1 Jul–30 Apr; 5 caribou

Unit/Location	Resident open season/Bag limit	Nonresident open season/Bag limit
Remainder of Unit 26B	1 Jul–30 Apr; 2 caribou; however, only bulls may be taken 1 Jul–30 Sep, and cow caribou may be taken only 1 Oct–30 Apr	1 Jul–30 Apr; 2 bulls
Unit 26C	1 Jul–30 Apr; 10 caribou; however, only bull caribou may be taken 23–30 Jun	1 Jul–30 Apr; 5 caribou

Regulatory year 2008–2009:

Unit/Location	Resident open season/Bag limit	Nonresident open season/Bag limit
Unit 25A	1 Jul–30 Apr; 10 caribou	1 Jul–30 Apr; 5 caribou
Unit 26B, that portion north of 69°30´ and west of the east bank of the Kuparuk River to a point at 70°10´N latitude 149°04´W longitude, then west approximately 22 miles to 70°10´ latitude 149°56´W longitude, then following the east bank of the Kalubik River to the Arctic Ocean	1 Jul–30 Apr; 10 caribou	1 Jul–30 Apr; 5 caribou
Remainder of Unit 26B	1 Jul–30 Apr; 2 caribou; however, only bulls may be taken 1 Jul–30 Sep, and cow caribou may be taken only 1 Oct–30 Apr	1 Jul–30 Apr; 2 bulls
Unit 26C	1 Jul–30 Apr; 10 caribou; however, only bull caribou may be taken 23–30 Jun	1 Jul–30 Apr; 5 caribou

Additional state regulations that affect caribou hunting include special restrictions along the Dalton Highway. These restrictions conform to Alaska Statutes (AS) 16.05.789 and 19.40.210. The Dalton Highway Corridor Management Area (DHCMA) extends 5 miles from each side of the Dalton Highway from the Yukon River to the Prudhoe Bay Closed Area, which encompasses most of the Prudhoe Bay oil field. The DHCMA is closed to hunting with firearms. Big game, small game, and fur animals can be taken by bow and arrow only, but hunters must possess a valid Alaska Bowhunter Education Program card or a recognized equivalent certification. In addition, no motorized vehicles except aircraft, boats, and licensed highway vehicles may be used to transport game or hunters within the DHCMA.

Federal subsistence hunting regulations also apply on federal lands within the DHCMA. Beginning in RY92, federal regulations allowed the use of firearms for hunting on federal land within the DHCMA by qualified rural subsistence hunters. During the first year of the regulation, qualified hunters included any rural resident. Subsequently, qualified hunters included residents of the corridor and the nearby villages of Anaktuvuk Pass, Wiseman, Nuiqsut, and Kaktovik.

Alaska Board of Game Actions and Emergency Orders. During the March 2004 Board of Game (BOG) meeting, the BOG rescinded several of the regulations related to bow hunting along the Dalton Highway that were put into effect in RY02. The North Slope Closed Area (the portion of Unit 26B within ¼ mile of the Dalton Highway from Atigun Pass north to the Prudhoe Bay Closed Area was closed to big game hunting) was eliminated, along with the requirement that hunters mark their arrows. In addition, the BOG more clearly defined licensed highway vehicle use in the DHCMA, limiting them to publicly maintained roads, and allowed no motorized vehicles, except licensed highway vehicles on the following designated roads: 1) Dalton Highway; 2) Bettles Winter Trail during periods when BLM and the City of Bettles announce that the trail is open to winter travel; 3) Galbraith Lake road from the Dalton Highway to the BLM campground at Galbraith Lake, including the gravel pit access road when it is open; 4) Toolik Lake road, excluding the driveway to Toolik Lake Research Facility; 5) Sagavanirktok River access road 2 miles north of Pump Station 2; and 6) any constructed roadway or gravel pit within ¼ mile of the Dalton Highway. Caribou seasons and bag limits within the CAH range have remained the same during RY96–RY07.

During the March 2008 BOG meeting, the bag limit for caribou within the DHCMA during 1 July–30 September was changed from 1 bull caribou to 2 bull caribou.

Hunter Harvest, Success, and Residency. In RY06, 1331 hunters reported hunting and 709 hunters reported harvesting 841 caribou, indicating an overall success rate of 53%. In RY07, 1380 hunters reported hunting and 580 hunters reported harvesting 690 caribou indicating an overall success rate of 42%. Reported harvest increased beginning in RY04 compared to the previous 4 years (RY00–RY03; Table 7); but is still <2% of the herd at its current population level. Success rates in RY06 and RY07 were similar to previous years and success by hunters who hunt the CAH has always been good (at least ≥40% and frequently ≥50%; Tables 7 and 8). Fluctuation in success rates and harvest numbers are related to caribou distribution and accessibility.

During RY06 and RY07, a small proportion of hunters were nonresidents (23% and 24% both years), similar to previous years (Lenart 2005, 2007). Nonresidents took 25% and 27% of the harvest, which was slightly higher compared to RY00–RY05 (range: 20–22%; Tables 7 and 8). In general, nonresident hunters were highly successful in RY06 and RY07 (68% and 57%, respectively). Nonlocal Alaska resident hunters also had good success in RY06 (49%) and lower success in RY07 (37%; Table 8). In RY07, a larger proportion of resident hunters hunted near the Dalton Highway and few caribou were in the vicinity of the road.

It is difficult to accurately assess harvest of CAH animals by local residents because the TCH mix with the CAH during periods when much of the harvest occurs. However, Pedersen (2008) estimated a 5-year average of 120 caribou annually (RY02–RY06) by Nuiqsut residents whom likely represent most of the local harvest.

Reported harvest of cows during RY06 and RY07 (37 and 68, respectively) was considered low (Table 7). The harvest of cows by Nuiqsut residents was estimated at 8% annually during RY02–RY06 (ADF&G–Division of Subsistence files).

Bowhunters accounted for 36% and 26% of the harvest in RY06 and RY07 (Table 7). In general, the number of successful bowhunters using the DHCMA has remained stable since RY00, ranging 23–43% in most years. In RY02 and RY07, success was lower (23% and 26%, respectively) because caribou were not accessible to bowhunters within the DHCMA.

Harvest Chronology. During RY06 and RY07, most reported harvest occurred in August (51% and 48%, respectively), similar to previous years (Table 9). The remaining harvest occurred primarily in September and then in October. In RY01, October harvest increased substantially to 25%, likely because warmer weather persisted into October. A small number of caribou were taken in late winter and spring, primarily in March and April (1–5%). In RY07 a slightly larger proportion of caribou were taken in April (10%).

Harvest by Nuiqsut residents typically occurs in July, August, September, March and April. A little over 50% of the harvest taken by Nuiqsut hunters occurs in summer and fall. When unusually cold weather persists and spring arrives late, caribou are harvested in May (S. Pedersen, ADF&G, personal communication).

Transport Methods. Because of restrictions on the use of off-road vehicles within the DHCMA and the remoteness of Unit 26B, most hunters used highway vehicles and aircraft for access. During RY06–RY07, the proportion of successful hunters who used highway vehicles to access caribou was 51% and 48%, respectively. This value was slightly lower than previous to RY00 when it ranged 57–70% during RY92–RY01 (Lenart 2007). This is probably related to an increase in the use of boats (including airboats) in the Ivishak and Echooka drainages. During RY02–RY07, the proportion of successful hunters who used boats increased to 16–29% compared with 5–15% during RY92–RY01 (Lenart 2007). In RY06, boats (including airboats) and airplanes tied as the second most common transport method (23% each; Table 10). In RY07, airplanes were the second most common transport method (30%); mostly because caribou were inaccessible from the highway and very low water made travel difficult for boats. In previous years, either airplanes or boats (including airboats) were the second most common transport method. Few hunters used horses, dogs, snowmachines, or ATVs as a transport method (Table 10). Residents of Unit 26 used boats during summer and fall and snowmachines during the spring. Nuiqsut residents primarily hunted from the Colville River and Fish Creek in Unit 26A during summer, and Kaktovik residents hunted along the coast to Camden Bay (S. Pedersen, personal communication; ADF&G files).

Natural Mortality

Radiocollared caribou were relocated infrequently in fall and winter, making it difficult to estimate adult mortality or determine causes of mortality. Wolves, grizzly bears, and golden eagles were the 3 most common predators on PCH caribou calves (Whitten et al. 1992). However, natural mortality of CAH caribou during calving and postcalving is relatively low because calving occurs in areas near the coast where there are few wolves, and predation by golden eagles appears to be rare compared to the Porcupine caribou herd (Murphy and Lawhead 2000). Winter mortality was probably higher during the 1990s than in previous years because more CAH caribou wintered on the south side of the Brooks Range, where wolves were probably more abundant than on the north side of the range and where snowfall is deeper. However, there

have been no studies of predation rates on the CAH. During RY97–RY07 we determined crude mortality rates of 4–19% among cow caribou ≥1 year old with functioning radiocollars:

Regulatory year	Number of mortalities	Number of radiocollars located	% Mortality
1997–1998	2	44	4
1998–1999	2	53	4
1999–2000	7	53	13
2000–2001	12	66	18
2001–2002	4	64	6
2002–2003	11	76	14
2003–2004	4	65	6
2004–2005	17	91	19
2005–2006	8	73	11
2006–2007	5	64	8
2007–2008	7	52	13

CONCLUSIONS AND RECOMMENDATIONS

High parturition rates, high late June calf:cow ratios, and low adult mortality during 2002–2008 contributed to a population increase of 110% in the CAH in 6 years (13% annually; Tables 1–3). Distribution of calving and postcalving distribution during 2002–2008 was similar among years. During summer, a large proportion the herd was distributed to the east of Prudhoe Bay, particularly near the Canning River. The CAH appears to have expanded its winter range on the south side of the Brooks Range, south into more timbered areas, and east toward Arctic Village. In some years, substantial overlap with the PCH occurs on the wintering grounds.

Harvest increased beginning in RY00 but remained well below maximum sustained yield of 5% (<2% of the herd; Table 7, Lenart 2007). Most hunters who lived outside of Unit 26 primarily used highway vehicles as a means of access, and most harvest occurred in August. However, the use of boats (including airboats) in the Ivishak and Echooka drainages increased substantially during RY03–RY07; an average of 24% of successful hunters used boats as a method of transport. The DHCMA is valued by bowhunters because caribou are accessible from the road and there is no competition with rifle hunters within 5 miles of either side of the road. Harvest by bowhunters averaged 30% of the overall harvest since RY00. Hunters who resided in Unit 26 used boats to take approximately half of their caribou harvest in July, August, and September and used snowmachines in March and April to take the other half of their harvest. The CAH has provided substantial hunting opportunity. The recent regulatory change in 2008 to increase the bag limit of bull caribou from 1 to 2 within the DHCMA during the 30 July–1 September season added to this opportunity. We recommend no regulatory changes.

We met our first goal—to minimize adverse effects of development on caribou—by working with ConocoPhillips Alaska, Inc. in developing mitigation measures to decrease disturbance of caribou particularly during calving. We met our second goal—to maintain a population level that will support a harvest of at least 600 caribou without precluding population growth—because the herd grew and harvest exceeded 600. We met our third goal—maintaining an opportunity for a

subsistence harvest—by providing liberal hunting seasons. We met our fourth goal—to maintain viewing and photographing opportunities—because these opportunities were adequate when taking into account the unpredictability of caribou movements.

Our first and third objectives—to maintain a population of at least 18,000–20,000 caribou and a harvest of at least 600 caribou if the population is ≥18,000 caribou—were met because in 2008 population size was 66,772 caribou and since RY00, reported and estimated harvest combined exceeded 600 caribou. We met our second objective—to maintain accessibility of seasonal ranges for CAH caribou—because, based on radiotelemetry and anecdotal observations, CAH animals were able to access their calving, postcalving, summer, fall, and winter ranges. We met our fourth objective—of limiting the annual harvest of cows to a maximum of 3% of the cows in the population—because cow harvest has been <1% of the population since RY92. This was partially accomplished by maintaining a bulls-only season during the time of year when hunting pressure was highest. We do not know if we met our fifth objective—to maintain a ratio of at least 40 bulls:100 cows. However, because the herd has grown substantially and hunting mortality was low, it is likely bulls were abundant and the bull:cow ratio was at least 40 bulls:100 cows. We met our sixth objective—to reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway—because few conflicts between consumptive and nonconsumptive appeared to arise during RY06–RY07, even though the North Slope Closed Area was rescinded by the Board of Game in 2004.

For the next report period, management objectives 1 and 3 will be revised to reflect Intensive Management objectives that were reestablished for the CAH in 2004 (5 ACC 92.108; 2008–2009 edition). I will eliminate objective 4 to limit the annual harvest of cows to a maximum of 3% of cows in the population because the population is robust.

Objective 1: Maintain a population of at least 28,000–32,000 caribou. (Goals 1, 2, 3)

Objective 3: Maintain a harvest of at least 1,400 caribou if the population is ≥ 28,000 caribou.

I recommend submitting a proposal to the March 2010 Board of Game to liberalize the bag limit to allow the harvest of cow caribou during the July, August, and September seasons. Few management options currently exist to substantially increase harvest because AS 16.05.789 prohibits hunting with firearms and AS 19.40.210 prohibits off-road vehicle use within 5 miles of the Dalton Highway.

LITERATURE CITED

ARTHUR, S. M., AND P. A. DEL VECCHIO. 2007. Effects of oilfield development on calf production and survival in the Central Arctic caribou herd. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Interim Technical Report. Grant W-27-5. Project 3.46. Juneau, Alaska, USA.

CAMERON, R. D. 1983. Issue: caribou and petroleum development in arctic Alaska. Arctic 36:277–231.

———. 1995. Can petroleum development depress the productivity of Arctic caribou? Paper presented at the second international arctic ungulate conference, Fairbanks, Alaska, 13–17 August 1995. Book of abstracts, p. 36.

———, D. J. REED, J. R. DAU, AND W. T. SMITH. 1992. Redistribution of calving caribou in response to oilfield development on the arctic slope of Alaska. Arctic 45:338–342.

———, AND W. T. SMITH. 1992. Distribution and productivity of the Central Arctic caribou herd in relation to petroleum development: case history studies with a nutritional perspective. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Grant W-23-5. Study 3.35. Juneau, Alaska, USA.

———, ———, R. G. WHITE, AND B. GRIFFITH. 2002. The Central Arctic caribou herd. Pages 38–45 i*n* D. C. Douglas, P. E. Reynolds, and E. B. Rhode, editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001.

———, AND K. R. WHITTEN. 1979. Seasonal movements and sexual aggregation of caribou determined by aerial survey. Journal of Wildlife Management 43:626–633.

CARROLL, G. M. 2005. Unit 26A Teshekpuk caribou. Pages 246–268 *in* C. Brown, editor. Caribou management report of survey–inventory activities 1 July 2002–30 June 2004. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

———. 2007. Unit 26A Teshekpuk caribou herd. Pages 262–283 *in* P. Harper, editor. Caribou management report of survey–inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

CURATOLO, J. A., AND S. M. MURPHY. 1986. The effects of pipelines, roads, and traffic on the movement of caribou, *Rangifer tarandus*. Canadian Field-Naturalist 100:218–224.

DAU, J. 1986. Distribution and behavior of barren-ground caribou in relation to weather and parasitic insects. Thesis, University of Alaska Fairbanks, Alaska, USA.

———. 2007. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24, and 26A Western Arctic caribou herd. Pages 174–231 *in* P. Harper, editor. Caribou management report of survey–inventory activities 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

DAVIS, J. L., P. VALKENBURG, AND S. HARBO. 1979. Refinement of the aerial photo-direct count-extrapolation caribou census technique. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Research Progress Report. Project W-17-11. Job 3.25R. Juneau, Alaska, USA.

GASAWAY, W. C., S. D. DUBOIS, D. J. REED, AND S. J. HARBO. 1986. Estimating moose population parameters from aerial surveys. Biological paper 22. University of Alaska Fairbanks, Alaska, USA.

LAWHEAD, B. E., AND C. B. JOHNSON. 2000. Surveys of caribou and muskoxen in the Kuparuk–Colville region, Alaska, 1999, with a summary of caribou calving distribution since 1993. Final Report prepared for Phillips Alaska, Inc. ABR, Inc., Fairbanks, Alaska, USA.

LENART, E. A. 2003. Units 26B and 26C Central Arctic caribou. Pages 304–326 *in* C. A. Healy, editor. Caribou management report of survey and inventory activities, 1 July 2000–30 June 2002. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

———. 2005. Units 26B and 26C Central Arctic caribou. Pages 269–292 *in* C. Brown, editor. Caribou management report of survey and inventory activities, 1 July 2002–30 June 2004. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

———. 2007. Units 26B and 26C Central Arctic caribou. Pages 284–308 *in* P. Harper, editor. Caribou management report of survey and inventory activities, 1 July 2004–30 June 2006. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

MURPHY, S. M., AND B. E. LAWHEAD. 2000. Caribou. Pages 59–84 *in* J. C. Truett and S. R. Johnson, editors. The natural history of an arctic oil field – Development and the Biota. Academic Press, San Diego, California, USA.

PEDERSEN, S. 2008. Monitoring of annual caribou harvests in three communities (Atqasuk, Barrow, and Nuiqsut) within the National Petroleum Reserve–Alaska: 2002–2007. Open file report: harvest summary report no.4. Alaska Department of Fish and Game–Division of Subsistence. Fairbanks, Alaska.

SMITH, W. T., AND R. D. CAMERON. 1983. Responses of caribou to industrial development on Alaska's arctic slope. Acta Zoologica Fennica 175:43–45.

———, AND ———. 1985*a*. Factors affecting pipeline crossing success of caribou. Pages 40–46 *in* A. M. Martell and D. E. Russell, editors. Proceedings First North American Caribou Workshop, Whitehorse, 1983. Canadian Wildlife Service. Special Publication, Ottawa, Canada.

———, AND ———. 1985*b*. Reactions of large groups of caribou to a pipeline corridor on the Arctic coastal plain of Alaska. Arctic 38:53–57.

VALKENBURG, P. 1993. Central Arctic caribou. Pages 225–233 *in* S. M. Abbott, editor. Caribou management report of survey and inventory activities 1 July 1990–30 June 1992. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska, USA.

———, T. H. SPRAKER, M. T. HINKES, L. H. VAN DAELE, R. W. TOBEY, AND R. A. SELLERS. 2000. Increases in body weight and nutritional status of transplanted Alaskan caribou. Rangifer Special Issue 12:133–138.

WHITTEN, K. 1991. Antler retention and udder distension as indicators of parturition I free-ranging caribou. Pages 170–173 *in* C. E. Butler and S. P. Mahoney, editors. Proceedings of the Fourth North American Caribou Workshop, 31 Oct–3 Nov 1989,

St John's, Newfoundland. Newfoundland and Labrador Wildlife Division, St. John's, Canada.

———. 1995. Antler loss and udder distention in relation to parturition in caribou. Journal of Wildlife Management 59:273–277.

———, AND R. D. CAMERON. 1983. Movements of collared caribou, *Rangifer tarandus*, in relation to petroleum developments on the arctic slope of Alaska. Canadian Field-Naturalist 97:143–146.

———, AND ———. 1985. Distribution of caribou calving in relation to the Prudhoe Bay oilfield. Pages 35–39 *in* A. M. Martell and D. E. Russell, editors. Proceedings of the First North American Caribou Workshop, Whitehorse, 1983. Canadian Wildlife Service. Special Publication, Ottawa, Canada.

———, G. W. GARNER, F. J. MAUER, AND R. B. HARRIS. 1992. Productivity and early calf survival in the Porcupine caribou herd. Journal of Wildlife Management 56:201–212.

WOLFE, S. A. 2000. Habitat selection by calving caribou of the Central Arctic herd, 1980–1995. Thesis, University of Alaska Fairbanks, Alaska, USA.

PREPARED BY:

Elizabeth A. Lenart
Wildlife Biologist III

SUBMITTED BY:

Doreen I. Parker McNeill
Assistant Management Coordinator

REVIEWED BY:

Lincoln S. Parrett
Wildlife Biologist II

Laura A. McCarthy
Publications Technician II

Please cite any information taken from this section, and reference as:

LENART, E. A. 2009. Units 26B and 26C caribou. Pages 299–325 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

TABLE 1 Central Arctic herd estimated population size, 1978–2008

	Population survey		Estimated
Year	Date	Method[a]	size
1978	Jul	STS	5,000
1981	Jul	AC	8,537
1983	Jul	APDCE	12,905
1991	18–20 Jun	GM	19,046[b]
1992	8–9 Jul	APDCE	23,444
1995	13 Jul	APDCE	18,100
1997	19–20 Jul	APDCE	19,730
2000	21 Jul	APDCE	27,128
2002	16 Jul	APDCE	31,857
2008	2–3 Jul	APDCE	66,772

[a] STS = Systematic transect surveys; AC = Aerial count; APDCE = Aerial Photo Direct Count Extrapolation (Davis et al. 1979); GM = Gasaway method (Gasaway et al. 1986; Valkenburg 1993).
[b] Ninety-percent confidence interval was 14,677–23,414.

TABLE 2 Central Arctic herd caribou percent parturition of radiocollared females, 1994–2008

		Percent parturition by subunit		
		≥4 years old[a]		
Year	Date	26B West (*n*)	26B East (*n*)	All 26B (*n*)
1994	10–14 Jun	67 (6)	78 (9)	73 (15)
1995	7–8 Jun	75 (4)	40 (5)	56 (9)
1996[b]				
1997	6–7 Jun	77 (13)	46 (13)	61 (26)
1998	3–4 Jun	93 (14)	83 (12)	88 (26)
1999	5, 9 Jun	94 (16)	92 (12)	93 (28)
2000	6–7 Jun	89 (9)	100 (16)	96 (25)
2001	3–9 Jun	90 (20)	93 (15)	91 (35)
2002	4–7 Jun	89 (27)	96 (23)	92 (50)
2003	30 May–8 Jun	93 (29)	100 (25)	96 (54)
2004	31 May–11 Jun	88 (40)	96 (28)	91 (68)
2005	31 May–9 Jun	86 (35)	80 (25)	83 (60)
2006	29 May–8 Jun	94 (32)	100 (22)	96 (54)
2007	2–6 Jun	88 (32)	100 (24)	93 (56)
2008	2–4 Jun	100 (26)	96 (20)	98 (46)

[a] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River. In some years, we captured unknown age adult females and these were included in the ≥4 years old sample.
[b] Survey not completed.

TABLE 3 Central Arctic herd caribou late June calf cow ratios (calves:100 cows) of radiocollared females ≥4 years old, 1994–2008

		Late June calf:cow ratios (calves:100 cows) by subunit					
		≥4 years old[a]					
Year	Date	26B West[b]	(*n*)	26B East	(*n*)	All 26B	(*n*)
1994	27–29 Jun	50	(6)	75	(8)	64	(14)
1995	27, 30 Jun	75	(4)	50	(4)	63	(8)
1996	15–16 Jun	60	(10)	83	(6)	69	(16)
1997	29–30 Jun	85	(13)	64	(11)	75	(24)
1998	29–30 Jun	79	(14)	80	(15)	79	(29)
1999	22–24 Jun	92	(13)	67	(12)	80	(25)
2000	17–19 Jun	79	(14)	72	(18)	75	(32)
2001	23–25 Jun	78	(18)	81	(16)	79	(34)
2002	23–25 Jun	78	(28)	83	(24)	81	(52)
2003	24–26 Jun	77	(26)	78	(27)	77	(53)
2004[c]	24 Jun	78	(27)	87	(17)	82	(44)
2005	24 Jun	77	(35)	61	(23)	71	(58)
2006	23–24 Jun	82	(22)	94	(33)	89	(55)
2007	22–23 Jun	87	(32)	71	(21)	81	(53)
2008	23–24 Jun	100	(3)	90	(42)	91	(45)

[a] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River. In some years, we captured unknown age adult females and these were included in the ≥4 years old sample.
[b] Unit 26B West is west of the west bank of the Sagavanirktok River and Unit 26B East is east of the west bank of the Sagavanirktok River.
[c] Only GPS collared females with radiocollared calves were relocated because the caribou were aggregated tightly, making identifying a calf with the correct cow impossible.

TABLE 4 Central Arctic herd caribou known-age percent parturition of radiocollared females, 1994–2008

Year	Date	2-year-olds (*n*)[a]	3-year-olds (*n*)	4-year-olds (*n*)	5-year-olds (*n*)	≥6-year-olds (*n*)
1994	10–14 Jun	0 (5)				73 (15)
1995	7–8 Jun	0 (8)	0 (4)			56 (9)
1996						
1997	6–7 Jun	0 (2)	0 (1)	29 (7)	100 (2)	67 (3)
1998	3–4 Jun	0 (6)	100 (2)	0 (1)	88 (8)	100 (3)
1999	5, 9 Jun	9 (11)	100 (7)	100 (2)	100 (1)	100 (17)
2000	6–7 Jun	13 (8)	80 (10)	100 (5)		94 (16)
2001	3–8 Jun	8 (13)	77 (13)	100 (10)	75 (4)	94 (16)
2002	4–7 Jun	(0)	77 (12)	73 (11)	100 (9)	100 (20)
2003	30 May–8 Jun	0 (8)	(0)	100 (12)	85 (13)	100 (23)
2004	31 May–11 Jun	0 (6)	88 (8)	(0)	90 (10)	88 (32)
2005	31 May–9 Jun	0 (7)	86 (7)	83 (6)	(0)	82 (34)
2006	29 May–8 Jun	0 (7)	71 (7)	100 (6)	100 (6)	96 (25)
2007	2–6 Jun	– 0	100 (4)	100 (6)	100 (7)	96 (25)
2008	2–4 Jun	0 (6)	– 0	66 (3)	100 (7)	100 (24)

[a] A 2-year-old parturient caribou was classified based on presence of hard antlers only. No calf or udder was observed.

TABLE 5 Central Arctic herd caribou known-age late June calf:cow ratios (calves:100 cows) of radiocollared females, 1994–2008

Year	Date	2-year-olds (*n*)	3-year-olds (*n*)	4-year-olds (*n*)	5-year-olds (*n*)	≥ 6-year-olds (*n*)
1994	27–29 Jun	0 (4)	(0)	(0)	(0)	64 (14)
1995	27–30 Jun	0 (6)	0 (3)	(0)	(0)	62 (8)
1996	15–16 Jun	(0)	71 (7)	50 (4)	(0)	83 (6)
1997	29 Jun	(0)	0 (1)	57 (7)	100 (3)	100 (3)
1998	29–30 Jun	<1 (7)	50 (2)	0 (1)	86 (7)	100 (5)
1999	22–24 Jun	<1 (10)	33 (6)	100 (2)	100 (1)	80 (15)
2000	17–18 Jun	0 (11)	60 (10)	71 (7)	0 (1)	75 (20)
2001	23–25 Jun	0 (3)	38 (13)	78 (9)	80 (5)	80 (20)
2002	23–25 Jun	(0)	57 (14)	75 (12)	100 (10)	82 (22)
2003	24–26 Jun	(0)	(0)	100 (12)	50 (12)	78 (23)
2004[a]	24 Jun	(0)	(0)	(0)	100 (1)	75 (20)
2005	24 Jun	(0)	40 (5)	83 (6)	(0)	74 (31)
2006	23–24 Jun	(0)	71 (7)	100 (6)	83 (6)	96 (25)
2007	22–23 Jun	(0)	75 (4)	86 (7)	83 (6)	80 (25)
2008	23–24 Jun	(0)	(0)	50 (4)	83 (6)	95 (23)

[a] Only GPS collared females with radiocollared calves were relocated because the caribou were aggregated tightly, making identifying a calf with the correct cow impossible.

TABLE 6 Central Arctic caribou herd fall composition counts, 1976–2002

Survey date	Bulls:100 cows	Calves:100 cows	Percent calves	Percent cows	Percent small bulls (% bulls)	Percent medium bulls (% bulls)	Percent large bulls (% bulls)	Percent bulls	Composition sample size
Oct 1976	122	44	17	38				46	1223
Oct 1977	118	55	20	37				43	628
Oct 1978	96	58	23	39				38	816
Oct 1980	132	49	18	35				47	1722
Oct 1981	81	64	26	41	22	41	36	33	1712
16–18 Oct 1992	96	47	19	41	36	37	27	40	2469
22 Oct 1996	61	67	29	44	15	43	43	27	3062
12 Oct 2000	84	57	24	42	45	40	14	35	3335
13 Oct 2001	73	54	24	44	38	39	23	32	4092
24 Oct 2002[a]	67	72	30	42	36	43	21	28	1732

[a] This survey was conducted later in the fall than usual, and caribou were more widely distributed; thus, we were unable to obtain a large sample size.

TABLE 7 Central Arctic caribou herd harvest and hunter success, regulatory years 2000–2001 through 2007–2008[a]

Regulatory year	Reported harvest				Total hunters	Percent successful hunters[c]	Estimated unreported harvest[d]	Total harvest
	Male	Female	Unk	Total (harvest by bow)[b]				
2000–2001	465	28	1	494 (214)	804	52	200–250	694–744
2001–2002	496	16	4	516 (192)	918	47	200–250	716–766
2002–2003	389	23	3	415 (96)	851	41	200–250	615–665
2003–2004	389	11	4	404 (136)	717	48	200–250	604–654
2004–2005	588	42	4	634 (228)	989	52	200–250	834–884
2005–2006	635	45	7	687 (239)	1104	52	200–250	887–937
2006–2007	798	37	6	841 (301)	1331	53	200–250	1041–1091
2007–2008	620	68	2	690 (183)	1380	42	200–250	890–940

[a] Source: Harvest ticket reports in ADF&G WINFONET database.
[b] Harvest by bow is also included in total harvest.
[c] Percent successful hunters calculated by dividing successful hunters by number of total hunters.
[d] Estimated by area biologist and Division of Subsistence.

TABLE 8 Central Arctic caribou herd hunter residency and success, regulatory years 2001–2002 through 2007–2008[a]

Regulatory year	Successful				Unsuccessful				Total hunters
	Alaskan resident	Nonresident	Unk	Total (%)	Alaskan resident	Nonresident	Unk	Total (%)	
2000–2001	339	74	3	416 (52)	354	32	2	388 (48)	804
2001–2002	331	101	4	436 (47)	403	76	3	482 (53)	918
2002–2003	247	103	2	352 (41)	428	70	1	499 (59)	851
2003–2004	249	90	5	344 (48)	313	58	2	373 (52)	717
2004–2005	381	127	9	517 (52)	385	78	9	472 (48)	989
2005–2006	421	154	1	576 (52)	425	100	3	528 (48)	1104
2006–2007	476	213	20	709 (53)	498	98	26	622 (47)	1331
2007–2008	383	189	8	580 (42)	649	141	10	800 (58)	1380

[a] Source: Harvest ticket reports in ADF&G WINFONET database.

TABLE 9 Central Arctic caribou herd harvest chronology, regulatory years 2000–2001 through 2007–2008[a]

Regulatory year	Harvest chronology by month (%)										Unk[b]	Total
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr		
2000–2001	42 (8)	263 (53)	109 (22)	32 (6)	11 (2)	0 (0)	2 (<1)	3 (<1)	4 (1)	24 (5)	4	494
2001–2002	28 (5)	218 (42)	117 (23)	127 (25)	7 (1)	0 (0)	0 (0)	2 (<1)	5 (1)	7 (1)	5	516
2002–2003	24 (6)	181 (44)	127 (31)	43 (10)	8 (2)	1 (<1)	1 (<1)	1 (<1)	4 (1)	21 (5)	4	415
2003–2004	17 (4)	223 (55)	116 (29)	24 (6)	3 (<1)	0 (0)	1 (<1)	2 (<1)	1 (<1)	12 (3)	5	404
2004–2005	22 (3)	371 (58)	118 (19)	77 (12)	6 (1)	1 (<1)	0 (0)	0 (0)	17 (3)	19 (3)	3	634
2005–2006	43 (6)	369 (54)	136 (20)	74 (11)	10 (1)	2 (<1)	3 (<1)	2 (<1)	18 (3)	22 (3)	8	687
2006–2007	63 (7)	432 (51)	219 (26)	38 (4)	31 (4)	2 (<1)	4 (<1)	0 (<1)	8 (1)	32 (4)	12	841
2007–2008	27 (4)	333 (48)	165 (24)	65 (9)	8 (1)	6 (1)	1 (<1)	3 (<1)	12 (2)	67 (10)	3	690

[a] Source: Harvest ticket reports in ADF&G WINFONET database.
[b] Includes the occasional animal reported taken in May and June.

TABLE 10 Central Arctic caribou herd successful hunter transport methods, regulatory years 2000–2001 through 2007–2008[a]

Regulatory year	Transport methods (%)								
	Airplane	Horse/Dog	Boat	Airboat	Snowmachine	4-Wheeler/ Other ORV	Highway vehicle	Unk	Total
2000–2001	91 (18)	17 (3)	57 (11)	17 (3)	4 (<1)	1 (<1)	302 (61)	5 (1)	494
2001–2002	108 (21)	7 (1)	50 (10)	18 (4)	0 (0)	5 (1)	324 (63)	4 (<1)	516
2002–2003	112 (27)	10 (2)	54 (13)	11 (3)	1 (<1)	14 (3)	206 (50)	7 (2)	415
2003–2004	78 (19)	2 (<1)	61 (15)	36 (9)	0 (0)	3 (<1)	219 (54)	5 (1)	404
2004–2005	97 (15)	10 (2)	101 (16)	82 (13)	1 (<1)	3 (<1)	335 (53)	5 (<1)	634
2005–2006	120 (17)	7 (1)	119 (17)	60 (9)	0 (0)	2 (<1)	362 (53)	17 (2)	687
2006–2007	191 (23)	10 (1)	133 (16)	56 (7)	0 (0)	1 (<1)	433 (51)	17 (2)	841
2007–2008	205 (30)	22 (3)	72 (10)	40 (6)	3 (<1)	1 (<1)	333 (48)	14 (2)	690

[a] Source: Harvest ticket reports in ADF&G WINFONET database.

The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge and attitudes for responsible hunting.

Photo by Geoff Carroll, ADF&G