Caribou

Management Report

of survey-inventory activities

1 July 2008–30 June 2010

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

Funded through
Federal Aid in Wildlife Restoration
Grants W-33-7, and W-33-8, Project 3.0
2011 Set

STATE OF ALASKA
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DEPARTMENT OF FISH AND GAME
Cora Campbell, Commissioner

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

Cover Photo: A young caribou bull. ©*2010 Jim Dau.*

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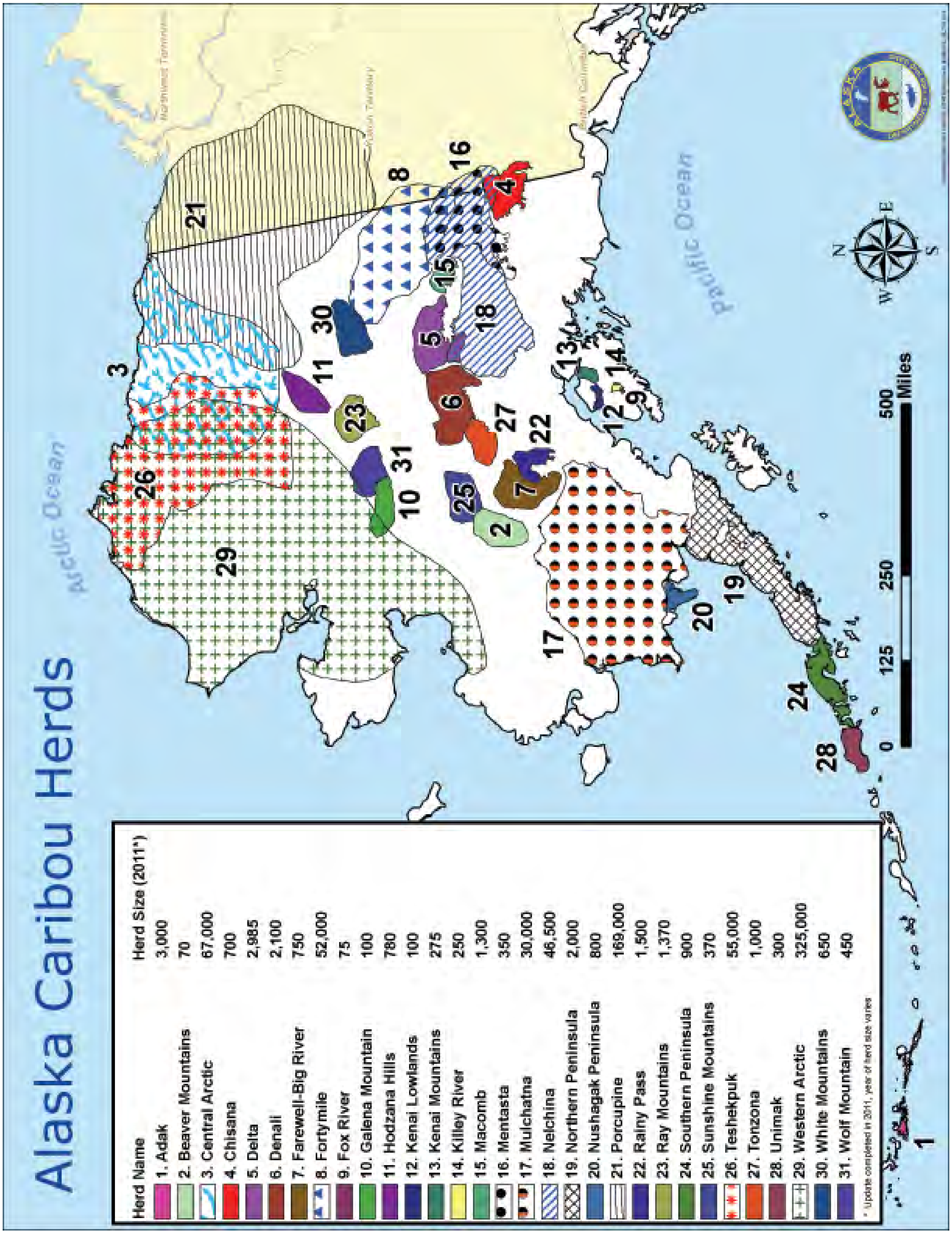
To: 30 June 2010



Alaska Caribou Herds
Herd Name
Herd Size (2011*)
1. Adak 3,000
2. Beaver Mountains 70
3. Central Arctic 67,000
4. Chisana 700
5. Delta 2,985
6. Denali 2,100
7. Farewell-Big River 750
8. Fortymile 52,000
9. Fox River 75
10. Galena Mountain 100
11. Hodzana Hills 780
12. Kenai Lowlands 100
13. Kenai Mountains 275
14. Killey River 250
15. Macomb 1,300
16. Mentasta 350
17. Mulchatna 30,000
18. Nelchina 46,500
19. Northern Peninsula 2,000
20. Nushagak Peninsula 800
21. Porcupine 169,000
22. Rainy Pass 1,500
23. Ray Mountains 1,370
24. Southern Peninsula 900
25. Sunshine Mountains 370
26. Teshekpuk 55,000
27. Tonzona 1,000
28. Unimak 300
29. Western Arctic 325,000
30. White Mountains 650
31. Wolf Mountain 450
* Update completed in 2011, year of herd size varies
Arctic Ocean
Pacific Ocean
Northwest Territories
Yukon Territory
British Columbia
0 125 250 500 Miles
N
E
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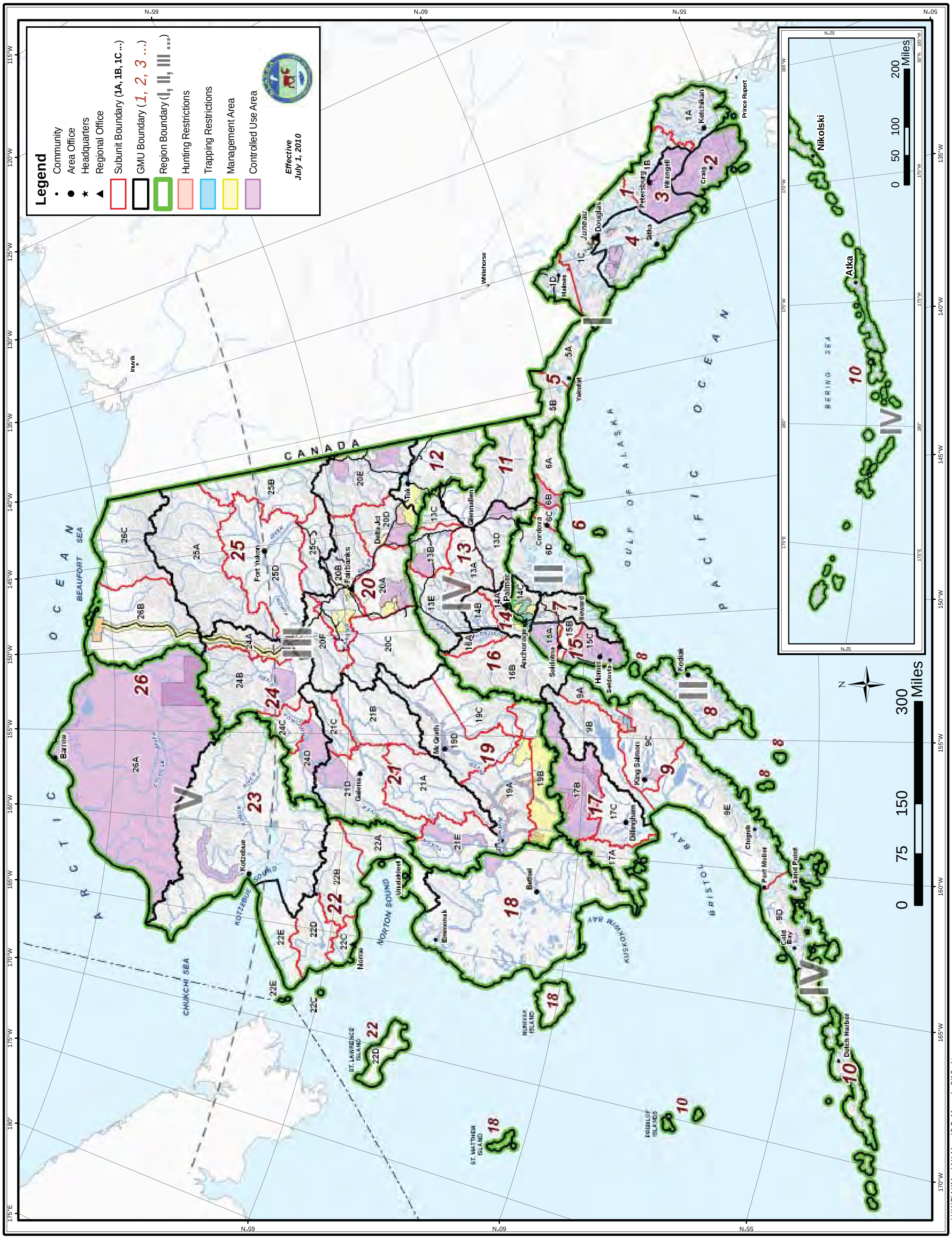
Legend
Community
Area Office
Headquarters
Regional Office
Subunit Boundary (1A, 1B, 1C ...)
GMU Boundary (1, 2, 3 ...)
Region Boundary (I, II, III ...)
Hunting Restrictions
Trapping Restrictions
Management Area
Controlled Use Area
Effective
July 1, 2010
CANADA
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
PACIFIC OCEAN
GULF OF ALASKA
BERING SEA
NORTON SOUND
KOTZEBUE SOUND
BRISTOL BAY
KUSKOKWIM BAY
Barrow
Kotzebue
Nome
Unalakleet
Emmonak
Bethel
McGrath
Galena
Fort Yukon
Fairbanks
Delta Jct
Tok
Glennallen
Palmer
Anchorage
Soldotna
Homer
Seldovia
Seward
Cordova
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King Salmon
Dillingham
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Port Moller
Sand Point
Cold Bay
Dutch Harbor
Yakutat
Haines
Juneau
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Petersburg
Wrangell
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Ketchikan
Prince Rupert
Whitehorse
Inuvik
Nikolski
Atka
ST. LAWRENCE ISLAND
NUNIVAK ISLAND
ST. MATTHEW ISLAND
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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 2008
To: 30 June 2010

LOCATION

GAME MANAGEMENT UNITS: 7 and 15 (8,397 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. Additionally, Allen (1901) reported that "caribou are already very scarce on the Kenai Peninsula, and will doubtless soon be exterminated….native hunters kill the Moose and Caribou for their heads, disposing of them at good prices for shipment to San Francisco." It is likely that large-scale fires coupled with unregulated hunting caused caribou to be extirpated from the Kenai Peninsula by the early twentieth 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 around 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 1,200 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 the 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. 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. The KR herd now numbers around 200 to 300 individuals. This herd grew steadily to more than 700 animals until 2001, when avalanches killed over a quarter of the population. Due to the nature of the habitat, avalanches may be a significant limiting factor for KR caribou and caribou may compete with 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. Recent surveys in 2010 counted about 75 caribou in the herd. A limited number of hunting permits were issued for this herd from 1995 to 2003, when the population could sustain a harvest. During 2004–2010 no hunting permits were issued due to the low number of caribou counted, but the numbers have now increased sufficiently and we will issue permits to hunt this herd in 2011.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

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

Killey River and Fox River caribou: Maintain viable caribou populations throughout suitable habitat and 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. Surveys for the KM, KR, and FR herds typically occur in the fall. KL surveys typically occur postcalving in the spring. 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 300 animals (Table 1). No composition counts have been conducted during the reporting period.

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

Killey River: The population was estimated at about 250 caribou following a survey in the fall of 2008 (Table 3).

Fox River Caribou. An opportunistic survey conducted in 2008 counted around 50 caribou (Table 4). A recent opportunistic survey done after the reporting period in 2010 counted 75 caribou.

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 August 10–December 31 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 August 10 – September 20. 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 but will reopen in 2011.

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. 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. Caribou have been recently reported east of the Harding Icefield 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.

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 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.

In 2010 the Federal Subsistence Board determined customary and traditional use of the KM herd by residents of Hope and established a federal season. This determination was made despite the fact that over 80% of the caribou taken by Hope hunters since 1980 were outside of the Kenai Peninsula. Furthermore, the “long-term use” determination for customary and traditional use was given to Hope residents despite caribou being extirpated from the peninsula 1915–1965 with limited hunting starting only in 1972. Federal seasons will challenge the successful management of small caribou herds on the Kenai as additional communities undoubtedly will obtain customary and traditional use qualification by the Federal Subsistence Board.

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.

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

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Table 1. Kenai Mountains caribou composition counts and estimated population size, 2005–2009.

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2005–06				295	325
2006–07	-no surveys conducted-				
2007–08	-no surveys conducted-				
2008–09					
2009–10				264	300

Table 2. Kenai Lowlands caribou composition counts and estimated population size, 2005–2009.

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2005–06				295	325
2006–07	-no surveys conducted-				
2007–08	-no surveys conducted-				
2008–09					
2009–10				264	300

Table 3. Killey River caribou composition counts and estimated population size, 2005–2009.

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2005–06	-no surveys conducted-				
2006–07				216	250
2007–08	-no surveys conducted-				
2008–09				200	250
2009–10	-no surveys conducted-				

Table 4. Fox River caribou fall composition counts and estimated population size, 2005–2009.

Regulatory year	Bulls:100 cows	Calves: 100 cows	% Calves	Composition sample size	Estimated herd size
2005–06	-no surveys conducted-				
2006–07	-no surveys conducted-				
2007–08	-no surveys conducted-				
2008–09	-no surveys conducted-				
2009–10				47	50–75

Table 5. Kenai Mountains caribou harvest (DC001), 2005–2009.

Regulatory year	Permits issued	Permitees that hunted	Harvest			Total harvest
			bulls	cows	unknown	
2005–06	250	99	16	5		21
2006–07	250	99	10	7		17
2007–08	250	99	9	9	1	19
2008–09	250	99	15	4		19
2009–10	250	111	13	5		18

Table 6. Killey River caribou harvest (DC608), 2005–2009.

Regulatory year	Permits issued	Permitees that hunted	Harvest			Total harvest
			bulls	cows	unknown	
2005–06	25	10	3	0	0	3
2006–07	25	8	6	0	0	6
2007–08	25	12	4	0	0	4
2008–09	25	12	3	0	0	3
2009–10	25	12	6	0	0	6

Table 7. Kenai Mountains caribou, hunter residency and success (DC001), 2005–2009.

Regulatory year	Successful					Unsuccessful				
	Local resident [a]	Nonlocal resident	Non-resident	Total	Percent success	Local resident [a]	Nonlocal resident	Non-resident	Total	Total hunters
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
2008–09	2	17	0	19	19	9	70	1	80	99
2009–10	4	14	0	18	16	1	89	3	93	111

[a] Local = residents of Unit 7.

Table 8. Killey River caribou, hunter residency and success (DC608), 2005–2009.

Regulatory year	Successful					Unsuccessful				
	Local resident [a]	Nonlocal resident	Non-resident	Total	Percent success	Local resident [a]	Nonlocal resident	Non-resident	Total	Total hunters
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
2008–09	0	2	1	3	25	7	2	0	9	12
2009–10	3	2	1	6	50	1	5	0	6	12

[a] Local = residents of Unit 15.

Table 9. Kenai Mountains caribou, harvest chronology (DC001), 2005–2009.

Regulatory year	Harvest Periods				Harvest
	8/10–8/31	9/01–9/30	10/01–10/31	11/01–12/31	
2005–06	11	7	2	1	21
2006–07	4	10	3	0	17
2007–08	11	5	3	0	19
2008–09	13	4	2	0	19
2009–10	10	6	2	0	18

Table 10. Killey River caribou, harvest chronology (DC608), 2005–2009.

Regulatory year	Harvest Periods				Harvest
	8/10–8/15	8/16–8/31	9/01–9/15	9/16–9/30	
2005–06	2	1	0	0	3
2006–07	0	0	6	0	6
2007–08	2	2	0	0	4
2008–09	2	1	0	0	3
2009–10	1	2	3	0	6

Table 11. Kenai Mountains caribou, harvest (DC001) by transport method, 2005–2009.

Regulatory year	Airplane	Horse	Boat	3/4 wheel-ATV-ORV	Highway vehicle	Snow-machine	Other-Unknown	Harvest
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
2008–09	0	2	0	0	11	0	6	19
2009–10	2	3	0	1	10	0	2	18

Table 12. Killey River caribou, harvest (DC608) by transport method, 2005–2009.

Regulatory year	Airplane	Horse	Boat	3/4 wheel-ATV-ORV	Highway vehicle	Snow-machine	Other-Unknown	Harvest
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
2008–09	1	2	0	0	0	0	0	3
2009–10	5	0	1	0	0	0	0	6

Alaska Department of Fish and Game
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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010

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. Photocensus estimates of the MCH since then have been used to document population size. The aerial photo census in July 2008 provided a minimum estimate of 30,000 caribou in the MCH.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

- To maintain a population of 30,000–80,000 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 census was conducted at the beginning 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 each October, using fixed-wing aircraft and helicopters. Groups of caribou are located by radiotracking with the fixed-wing aircraft. 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 from 1980 to the present. Caribou are captured using drug-filled darts fired from a helicopter. These are usually cooperative efforts between ADF&G, TNWR, and YDNWR.

In April 2009, 43 caribou were radiocollared: 10 twenty-two-month-old male calves and 10 adult males were recaptured and radiocollared in Game Management Unit (Unit) 9B near the Alagnak River; 4 ten-month-old male calves, 8 ten-month-old female calves, 5 twenty-two-month-old males and 4 adult males were recaptured and radiocollared, and 2 adult females were captured and radiocollared in Unit 18 between the Eek and Kwethluk rivers. In October 2009, 18 caribou were radiocollared: 2 adult females were captured and radiocollared in Unit 18 near the Kwethluk River; 11 ten-month-old male calves, 1 ten-month-old female calf, and 4 adult females were captured and radiocollared in Unit 17B near the Nushagak and Mulchatna rivers. In April 2010, 34 caribou were radiocollared: 5 ten-month-old female calves and 12 adult males were captured and radiocollared in Unit17B, in the Stuyahok Hills; 4 ten-month-old female calves and 1 adult male were captured and radiocollared in Unit 19, in the Stony River – Tundra Lake area; and, 10 ten-month-old female calves and 2 adult males were captured and radiocollared in Unit 18, in the upper Kasigluk River area. 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. 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 regulatory year (RY) 1998 (RY08 = 1 July 1998 through 30 June 1999) has not been entered into the statewide harvest information system. Beginning in RY98, 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 indicated the herd continued to decline.

Population Size

We conducted a photo census of the MCH just at the beginning of this reporting period, on 7 July 2008. Based on results of this survey, the minimum population estimate for the MCH for summer 2008 was 30,000 (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, making the herd more difficult to count.

Population Composition

We conducted sex and age composition surveys in the upper Nushagak River drainage (GMU 17B) on 7 October 2008, and in the Kisaralik and Kwethluk River drainages (GMU 18) on 8 October 2008. In 2009 composition surveys were conducted in the upper Nushagak River drainages (Units 17B) on 12 October and in the upper Eek and Kwethluk River drainages (Unit 18) on 16 October.

During the fall 2008 surveys, only 13.5 bulls:100 cows were observed in the sample of 1,131 caribou in Unit 17, and 22.1 bulls:100 cows were counted in the sample of 2,597 caribou in Unit 18. Because of the great deal of mixing of the herd throughout the rest of the year that we have observed during recent years, composition data for the 2008 survey were pooled for an overall bull:cow ratio of 19.3 bulls:100 cows (Table 2).

During the fall 2009 surveys, 14.4 bulls:100 cows were observed in the sample of 2,213 caribou in Unit 17, and 22.8 bulls:100 cows were counted in the sample of 2,382 caribou in Unit 18. Composition data for the 2009 surveys were again pooled for an overall bull:cow ratio of 18.5 bulls:100 cows (Table 2).

The fall 2008 calf:cow ratio observed in Unit 17 was 17.1 calves:100 cows and in Unit 18 was 26.6 calves:100 cows. Pooled counts for both areas gave a calf:cow ratio of 23.4 calves:100 cows in fall 2008 (Table 2). The fall 2009 calf:cow ratio in Unit 17 was 25.7 calves:100 cows and in Unit 18 was 36.6 calves:100 cows. Pooled counts from both areas gave a calf:cow ratio of 31.0 calves:100 cows for the Mulchatna herd in fall 2009 (Table 2).

Productivity Surveys

Productivity surveys were flown in May in 2009 and 2010. A total of 36 radiocollared female caribou of calf-bearing age were located in May 2009: 10 two-year-olds (collared as 10-month-old calves in spring 2008); 6 three-year-olds (collared as 10-month-old calves in spring 2007); 10 four-year-old (collared as 10-month-old calves in spring 2006); and 10 five-year-old or older. Of the 36 caribou, 24 were accompanied by calves or had hard antlers. None of the 2-year-olds were accompanied by calves or had hard antlers. Five of the 6 three-year-olds, 9 of the 10 four-year-old, and all 10 of 5-year-old or older cows were accompanied by calves or had hard antlers. (Table 3).

A total of 46 radiocollared female caribou of calf-bearing age were located in May 2010: 5 two-year-olds (collared as 10-month-old calves in spring 2009); 13 three-year-olds (collared as 10-month old calves spring 2008); 9 four-year-olds (collared as calves in spring 2007); and 19 of the 5-year-old or older cows. Of the 46 caribou, 31 were accompanied by calves or had hard antlers. One of the 2-year-old females was observed with hard antlers, the second collared 2-year-old seen with a calf or hard antlers since beginning these surveys in 2000. Nine of the 13 three-year-olds, 5 of the 9 four-year-olds, and 16 of the 19 five-year-old or older cows 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 133 caribou with active radio collars in July 2008. 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 late-summer and early-fall 2008, and again in 2009, approximately half of the Mulchatna caribou traveled westerly 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 2008–2009, 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 2009–2010 was about the same as the previous winter; a large portion in Unit 18 and the rest of the caribou on the eastern side of the herd's range in the lower Nushagak and Mulchatna Rivers, and Kvichak River. In addition, several small groups of caribou were observed wintering near the Tundra Lake-Lime Village area of Unit 19A and in the Bonanza Hills area in Unit 17B.

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 2 years, with the caribou split between the Kemuk Mountain area and Tundra Lake/Stink River area. Calving in May 2009 and 2010 was similar to the previous 4 years.

<u>Seasonal Movements</u>. 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 eastern and western parts of the herd's range, where they will spend the winter.

Postcalving aggregations during summer 2008 were again scattered, with caribou on the east side of the range scattered between the Mulchatna River and Lake Clark until late June, when these caribou formed groups near Tutna Lake. Caribou on the west side of the range moved west north of the upper Tikchik Lakes then southwest to the headwaters of the Kwethluk and Eek Rivers by late June. Though the aggregations were widely scattered, a photo census was accomplished just after the beginning of this reporting period in July 2008.

By mid to late July 2008, caribou on the east side of the range were between the Nushagak River and Lake Iliamna, scattered from the lower Nushagak on the south, on up through the Mulchatna River drainage. Caribou on the west side of the range were scattered between the Kuskokwim Mountains on the east, and the Kuskokwim River to the west.

During fall 2008 and winter of 2008–09, 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 River, milled around in that area for a while, then moved northwest to the area between the Nushagak and Kvichak rivers.

In May 2009 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.

Caribou movements during summer 2009 were much the same as summer 2008, with approximately half the herd on the eastern side of the herd's range, with the other half in GMU 18 south of the Kuskokwim River. Aggregations sufficient for a photo census did not occur during summer 2009.

During fall 2009 and winter of 2009–2010 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 2010, Mulchatna caribou started moving toward the general vicinities of calving areas used the previous 2 years. Postcalving aggregations during summer 2010 were again widely scattered, occurring between the Mulchatna River and lake Iliamna, and in the upper Kwethluk and Eek drainages. The aggregations were widely scattered, and again for summer 2010 there was no photo census accomplished.

Based on observation of movements of radiocollared caribou from 2000 through 2008, it did not appear that individual caribou had any particular affinity to either of the two calving or wintering areas. One individual radiocollared caribou might winter on the western side of the herd's range one year and on the east side the next. It might use the northern calving area one year and the southern calving area the next. Nor did it appear that all animals using one wintering area had any affinity to a particular calving area, or vice versa. Of the caribou wintering on the western side of the range, some would travel to the Kemuk Mountain area to calve and some would travel to the Tundra Lake area. The caribou wintering on the east side of the range would do the same, with some traveling north to calve and some remaining in the Nushagak drainage and calving near Kemuk Mountain.

This type of mixing was not evident in spring 2009 and spring 2010. All the radiocollared cows that wintered on the east side of the range traveled north to calve in the Tundra Lake area. All the radiocollared cows that wintered in the west traveled east to the Kemuk Mountain area, with the exception of about 2,000 caribou that were observed calving near Heart Lake (on the boundary between GMUs 17B and 18). This was the first documented use of that area for a substantial number of caribou since the mid-1990s.

Similarly, all the radiocollared caribou that calved in the Kemuk Mountain area traveled west to winter in GMU 18, and all the caribou that calved near Tundra Lake wintered on the east side of the herd's range. There has been no evidence of seasonal mixing for the last 2 years.

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).

During the past several years it appears that small groups are again being found in various parts of the Mulchatna herd's range, some remaining distinct from the larger groups with others intermingling during calving.

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:		No open season
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

Season and Bag Limit	Resident Open Season	Nonresident 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
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:		No open season
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:		No open season
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

Season and Bag Limit	Resident Open Season	Nonresident 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:		No open season

Board of Game Actions and Emergency Orders.

During its spring 2009 meeting, the Alaska Board of Game closed nonresident hunting for caribou throughout the range of the Mulchatna herd and changed the Intensive Management population objective to 30,000–80,000 caribou. An emergency order opening for a winter caribou hunt in Unit 9C was issued in RY08.

Hunter Harvest. The reported harvest from the MCH was 510 caribou during the RY08 hunting season and 309 during RY09 (Table 4). These totals and the number of hunters reporting hunting Mulchatna caribou continue to decline from previous years. Sex ratio of the animals reported taken varies considerably from year to year.

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 RY83 to RY89 indicated an estimated annual harvest of 1,318 caribou (P. Coiley, ADF&G-Subsistence, Dillingham, personal communication). 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 RY99, 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 decline in size of the herd, a decline in the number of hunters that traveled out to the Mulchatna herd area was also noted.

Hunter Residency and Success. Local Alaska residents (living within the range of the Mulchatna herd) made up 51% of the reporting hunters during the RY08 season and 71% of the hunters during RY09. Nonlocal Alaska residents accounted for 32% of the reporting hunters during RY08 and 29% during RY09. Nonresidents made up 17% of the reporting hunters during RY08. The area was not open for nonresident hunters in RY09. Of the reporting hunters, 54% successfully harvested at least one caribou in RY08; in RY09, 49% were successful (Table 5).

Harvest Chronology. Prior to RY06 much of the annual reported harvest occurred during August and September. However, the percentage of the annual harvest during those fall months had declined to 26% in RY08 and 18% in RY09. Harvests reported from February and March have been increasing in recent years, accounting for 55% of the reported harvest in RY08 and 42% in RY09. 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 RY08 hunting seasons, 23% of the hunters reported using aircraft, which declined to 15% for the RY09 season. Snowmachines were used by 63% of the hunters reporting in RY08, which increased to 73% by the RY09 season (Table 7). This increasing use of snowmachines is reasonable considering the change in reported harvest chronology to the late winter months.

Other Mortality

The MCH declined 85% between 1996 and 2008. Annual survival of adult cows, 2 years of age or older) averaged 90% during the period, but was less than 80% in 6 of 13 years. Annual population sex/age composition surveys indicate markedly reduced calf survival beginning with the 1999 cohort. A 2011 calf mortality study was conducted in 2 calving areas, the Kemuk Mountain area in subunits 17B and 17C; and the Tundra Lake area in subunits 19A and 19B. Overall survival rate of calves from birth to 4 months of age was 42%, but that is weighted towards the Kemuk Mountain where our sample size was greater (n=77). Nonetheless, calf survival in the Tundra Lake area is suspected to be significantly lower based on the small sample of calves radioed in 2011 (0 of 6 calves survived to 4 months of age) and the low calf:cow ratios observed there during fall in recent years (Table 2).

The specific causes for lower survival rates and the subsequent population decline are poorly understood, but they likely result from a combination of intrinsic (e.g. nutrition, disease, pregnancy rates, survival rates etc.) and extrinsic (e.g. weather, predation, etc) factors. Because other caribou herds in southwest Alaska experienced similar population declines and reduced survival rates during the same period, it is possible that density independent factors (i.e., weather/climate) may have been a contributing factor. Also, the range of the MCH expanded significantly during the mid-1990s. At that time the herd was at peak population levels, and the range expansion may be indicative of habitat limitations in traditional seasonal ranges. During this period density dependent factors are likely to have resulted in deteriorated forage conditions on traditional ranges resulting in decreased nutritional condition of animals. This scenario would make them more susceptible to disease (foot rot, pneumonia, parasites) and predation, and thus contribute to lower survival rates.

There were several observations and reports of wolf and brown bear predation on caribou during this reporting period. Predation rates on MCH are thought to have 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 the winter of 1986–1987, 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 used by the Mulchatna herd when the herd was at its peak population size show 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 they 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 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 would be important to develop. 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 30 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 until 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 1 of 6 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 it moves 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.

9. Assess impact of predation on newborn calves.

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.

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Table 1. Mulchatna caribou herd estimated population size, calendar years 1991–2009.

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

[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, calendar years 1991–2009.

Calendar 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	---	---	---	---	---	---	---	---	---	90,000
1992	---	---	---	---	---	---	---	---	---	115,000
1993	42.1	44.1	23.7%	53.7%	---	---	---	22.6%	5907	150,000
1994	---	---	---	---	---	---	---	---	---	180,000
1995	---	---	---	---	---	---	---	---	---	190,000
1996	42.4	34.4	19.5	56.6	49.8	28.5	21.7	24.0	1727	200,000
1997	---	---	---	---	---	---	---	---	---	--
1998	40.6	33.6	19.3	57.4	27.8	43.7	28.5	23.3	3086	--
1999	30.3	14.1	9.8	69.3	59.9	26.3	13.8	21.0	4731	175,000
2000	37.6	24.3	15.0	61.8	46.6	32.9	20.4	23.2	3894	--
2001	25.2	19.9	13.7	68.9	31.7	50.1	18.3	17.7	5728	--
2002	25.7	28.1	18.3	65.0	57.8	29.7	12.5	16.7	5734	147,000
2003	17.4	25.6	17.9	69.9	36.2	45.3	18.5	12.2	7821	--
2004	21.0	20.0	14.2	71.0	64.2	28.9	6.9	14.9	4608	85,000
2005	13.9	18.1	13.7	75.8	55.3	33.3	11.5	10.6	5211	--
2006	14.9	25.5	18.1	71.3	57.5	33.7	8.9	10.6	2971	45,000
2007	23.0	15.8	11.4	72.1	52.7	36.0	11.3	16.6	3943	--
2008	19.3	23.4	16.4	70.1	46.8	36.1	17.1	13.5	3728	30,000
2009	18.5	31.0	20.7	66.9	39.7	43.9	16.3	12.4	4595	--

[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 conducted in May, calendar years 2000 through 2009.

Calendar Year	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
2009	10	0	6	5	10	9	10	10	36
2010	5	1	13	9	9	5	19	16	46

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

[b] Survey incomplete because of weather.

Table 4. Mulchatna caribou reported harvest, by percent male and female, regulatory years 1991–92 through 2009–10.

Regulatory	Reported Hunter Harvest			
Year	M (%)	F(%)	Unk.	Total[a]
1991–92	86%	13%	1.1%	1573
1992–93	74%	9%	17%	1602
1993–94	80%	20%	0.4%	2804
1994–95	78%	21%	0.7%	3301
1995–96	75%	24%	0.6%	4449
1996–97	78%	21%	1.0%	2366
1997–98	84%	15%	0.6%	2704
1998–99[b]	82%	17%	1.0%	4770
1999–00	76%	23%	1.0%	4467
2000–01	81%	19%	0.8%	4,096
2001–02	72%	27%	0.4%	3830
2002–03	74%	25%	0.5%	2537
2003–04	64%	35%	0.9%	3182
2004–05	55%	44%	0.7%	2236
2005–06	48%	51%	0.6%	2175
2006–07	55%	44%	0.1%	921
2007–08	53%	46%	0.1%	767
2008–09	50%	50%	0.2%	510
2009–10	66%	32%	1.6%	309

[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 1991–92 through 2009–10.

Regulatory Year	Successful				Unsuccessful				Total hunters[b]
	Local resident[a]	Nonlocal resident	Nonresident	Total (%)	Local resident[a]	Nonlocal Resident	Nonresident	Total (%)	
1991–92	89	562	599	85%	9	136	69	15%	1464
1992–93	82	542	651	91%	12	82	26	9%	1391
1993–94	47	718	725	85%	5	171	77	15%	2394
1994–95	61	812	896	83%	11	227	124	17%	2954
1995–96	52	1035	928	87%	15	188	86	13%	3127
1996–97	56	647	824	85%	25	139	101	15%	1822
1997–98	85	564	1277	84%	33	178	152	16%	2301
1998–99	178	1130	1877	78%	142	320	414	22%	4131
1999–00	174	1024	1697	72%	120	453	553	28%	4039
2000–01	188	817	1713	68%	148	427	691	32%	3989
2001–02	270	843	1377	74%	159	351	368	26%	3406
2002–03	169	556	1028	63%	210	383	450	37%	2831
2003–04	312	762	1111	71%	181	352	378	29%	3129
2004–05	256	573	764	62%	133	357	501	38%	2634
2005–06	418	427	485	56%	229	322	497	44%	2405
2006–07	207	208	273	53%	182	207	226	47%	1312
2007–08	334	148	125	58%	184	163	105	42%	1084
2008–09	269	130	61	54%	165	140	85	46%	850
2009–10	181	62	0	49%	171	81	0	51%	496

[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[a], regulatory years 1991–92 through 2009–10.

Regulatory						Harvest Periods					
Year	July	August	September	October	November	December	January	February	March	April	Total[b]
1991–92		29%	43%	6%	0.4%	2%	1%	4%	12%	0%	1573
1992–93		30%	54%	5%	1%	0.3%	0.2%	1%	8%	0%	1602
1993–94		36%	50%	5%	0.4%	1%	1%	1%	5%	2%	2804
1994–95		35%	50%	5%	0.4%	1%	1%	1%	5%	2%	3301
1995–96		33%	50%	6%	1%	2%	1%	1%	5%	2%	4449
1996–97		25%	52%	5%	1%	1%	1%	2%	11%	2%	2366
1997–98		33%	53%	4%	0.3%	0.4%	1%	3%	4%	0.3%	2704
1998–99		25%	55%	6%	0.6%	0.6%	2%	2%	7%	1%	4770
1999–00	0.1%	24%	52%	5%	0.5%	1%	3%	5%	8%	2%	4467
2000–01	0.2%	27%	55%	6%	0.3%	0.3%	2%	3%	4%	1%	4096
2001–02	0.2%	23%	49%	3%	1%	2%	2%	4%	9%	5%	3830
2002–03	0.2%	23%	55%	4%	0.6%	1%	3%	2%	6%	2%	2537
2003–04	0.2%	19%	45%	4%	0.5%	4%	5%	5%	12%	2%	3182
2004–05	0.2%	20%	46%	2%	1%	2%	2%	2%	10%	9%	2236
2005–06	0.2%	15%	32%	2%	4%	2%	3%	6%	25%	7%	2175
2006–07		13%	38%	1%	3%	5%	4%	10%	21%	1%	921
2007–08		3%	26%	2%	2%	6%	7%	28%	26%	1%	767
2008–09		3%	23%	3%	5%	4%	6%	25%	30%		510
2009–10		6%	12%	8%	17%	5%	9%	10%	32%		309

[a] July opening date for Unit 9B established starting 1 Jul 1999. Starting July 1, 2006 opening date Aug 1. Starting July 1, 2008, all closing dates March 15.

[b] Includes unknown harvest date

Table 7. Mulchatna caribou harvest percent by transport method, regulatory years 1991–92 through 2009–10.

Regulatory Year	Percent of reported harvest								Total caribou[a]
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1991–92	81%	0.2%	9%	1%	9%	0.1%	0.2%	2%	1573
1992–93	88%	0.2%	8%	3%	3%	0.1%	0.1%	0%	1602
1993–94	86%	1%	10%	1%	2%	0.3%	1%	0%	2804
1994–95	85%	0.2%	12%	1%	2%	0%	0.2%	0.2%	3301
1995–96	88%	0.2%	9%	1%	2%	0.1%	0.1%	0%	4449
1996–97	82%	0.4%	10%	2%	3%	0.3%	0.7%	1%	2366
1997–98	86%	0.4%	8%	1%	2%	0.1%	0.2%	2%	2704
1998–99	82%	0.1%	10%	2%	3%	0.1%	1%	1%	4770
1999–00	85%	0.3%	6%	2%	5%	0.2%	0.7%	1%	4467
2000–01	87%	0.2%	6%	1%	5%	0.1%	0.1%	0.6%	4096
2001–02	79%	0.1%	7%	2%	11%	0.2%	0.2%	0.8%	3830
2002–03	82%	0.2%	8%	3%	5%	0%	0%	0.2%	2537
2003–04	73%	0%	6%	2%	19%	0.1%	0%	0.7%	3182
2004–05	74%	0%	7%	1%	17%	0%	0%	0.9%	2336
2005–06	55%	0.4%	6%	3%	34%	0.2%	0.3%	1%	2175
2006–07	61%	0.4%	7%	4%	27%	0.2%	0.3%	0.5%	921
2007–08	27%	0.1%	4%	9%	58%	0.5%	1%	0.6%	767
2008–09	23%	0%	3%	10%	63%	0%	0%	1%	510
2009–10	15%	0%	7%	1%	73%	1%	0%	2%	309

[a] Includes harvest by unknown transport method.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010

LOCATION

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 of about 20,000 at the turn of this century and again in the early 1940s. The last population low was during the late 1940s (2,000 caribou). By 1963 the herd had increased to more than 10,000 animals (Skoog 1968). The first radiotelemetry-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 regulatory year (RY) 1993 (RY93 = 1 July 1993 through 30 June 1994), the record harvest of 1,345 caribou and natural mortality estimated at >30% combined to reduce the NAP to 12,500 by 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 continued to decline until 2008 and experienced extremely poor recruitment from 2003 through 2008 as a result of poor calf production and survival. Recruitment improved in 2009, but it is uncertain whether this trend will continue. Predation has become increasingly important in the status of this herd, but indications of nutritional limitations were still evident in 2007.

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 35 bulls:100 cows.

METHODS

Population Size

Postcalving population count surveys were conducted in late June or early July when weather allowed. Caribou groups were located by fixed-winged aircraft equipped with radiotelemetry equipment. Oblique photos of large groups (≥ 20 caribou) were taken to allow accurate enumeration. Survey comprehensiveness was assessed using the proportion of radiocollared caribou encountered relative to total radiocollared caribou. Population estimates were calculated by dividing the minimum caribou count number by the proportion of radiocollared caribou encountered. Calf percentages were calculated from direct enumeration of caribou in close-up photos of larger herds.

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

In late May or 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 (USFWS) to maintain 25–30 functioning radio collars. During each capture we recorded standardized measurements and took blood samples when feasible. We conducted radiotelemetry flights periodically 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 RY99. 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 levels in 1992. Despite a series of hunting restrictions implemented starting in 1994, which significantly reduced harvests, the herd continued to decline through 2008. Current vital rates suggest that herd decline may be slowing.

Population size

The size of the NAP 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 covered 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. In addition, caribou have failed to form large aggregations in recent years, remaining widely scattered across their range. However, based on the number of caribou observed during fall composition surveys the current population size of the NAP was estimated at 2,300 to 2,500 caribou.

Population Composition

During 1970–1980, when the NAP 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). From 2003–2009 fall calf ratios were the lowest ever recorded for this herd, with an average of 9 calves:100 cows (range 7–16, 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 from 2005–2009 (range 19–27, 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 has 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 2000–2001, with the exception of 1 during the winter of 2003–2004. 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 Drainage and Katmai National Park.

MORTALITY

Harvest

Season and Bag Limits. State and federal hunts were closed in RY05 due to concerns for the herd's status and have not been reopened.

Board of Game Actions and Emergency Orders. The Board of Game authorized a wolf program in subunits 9C and 9E to reduce predation on NAP caribou in March 2010.

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 have been issued since RY04. Two ceremonial permits were issued to harvest 1 caribou under each permit (1 permit in January 2007 and 1 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 was historically the most important month for harvest, 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 were more spread out through the hunting season, with early fall and late winter accounting for most of the harvest (Table 4). The subsistence harvest was primarily opportunistic, and chronology of harvests varied among villages depending on caribou availability.

Transportation Methods. Prior to RY99 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 varied 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 harvest a caribou. The general philosophy behind these actions falls into 2 categories. These hunters think that if somebody else has an opportunity to shoot a caribou 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. 2006. 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 radio collared 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 ≥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. This difference was confirmed in a reconnaissance survey comparing lichen abundance in several areas on the traditional range with areas close to the King Salmon–Naknek road that still receive minimal use by caribou (R. Squibb, USFWS, King Salmon, personal communication).

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 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 Hinkes 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. (1996) and Sellers et al. (1998*a*, 1998*b*, 1999 and 2000). Overall, this work demonstrates that the NAP is under moderate nutritional stress. No 2-year-old females produced calves (n = 32), and only 33% of 3-year-olds (n = 18) had been pregnant. Overall pregnancy rates were low but have improved steadily for cows over 2 years of age. Pregnancy rates were 57%, 63%, 74%, 78%, and 84% 2005–2009, 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. Preliminary analysis showed that parasite removal increased pregnancy rates. However, effects of parasite removal on body condition (body weight, muscle mass, and fat deposits) were not significance, and the treated animals did not recruit calves at a higher rate than untreated animals.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

A few encouraging signs of improved nutrition were noted in 2001 and 2002, including renewed fidelity to traditional winter range. In addition, neonate calf weights observed in 2005–2007 were similar to those observed in the late 1990s. However, important population parameters such as calf ratio and herd size have remained below those observed in the late 1990s. While there was noticeable improvement in several key parameters in 2009, calf:cow ratios remain low, making herd recovery unlikely in the next few years.

CONCLUSIONS AND RECOMMENDATIONS

In spite of improvements observed since 2007, NAP 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 manage predators is increasing steadily in local communities. In March 2009 the Board of Game adopted a proposal to develop a predator management plan. During the spring 2010 Board of Game meeting, the Board authorized a wolf management plan for the NAP with the goal of increasing the survival rate of any caribou utilizing state lands.

LITERATURE CITED

Butler, l., B. Dale, J. Gude, K. Beckmen, and R. Squibb. 2006. Production and early calf mortality in the Northern Alaska Peninsula Herd. 2005–2006. Final Report. Cooperative Agreement 06-069.

Hinkes, M. T. and L. J. VanDaele. 1994. Population growth and status of the Nushagak Peninsula caribou herd following reintroduction, southwest Alaska, 1988–93. Submitted. Proceedings of 6th North American Caribou Workshop.

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.

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. Final Report. Cooperative Agreement 98–079.

———, ———, ———, ———, M. ROY. 1998*b*. Fall sex/age composition, body condition, disease screening and collaring of Northern and Southern Alaska Peninsula caribou herds, 1998. Final Report. Cooperative Agreement 99–014.

———, ———, R. SQUIBB, M. ROY, B. DALE. 1999. Survival, natality, and calf weights of caribou on the Alaska Peninsula. 1998–99. Final Report. Cooperative Agreement 99–017.

———, ———, B DALE, R. SQUIBB, M. ROY. 2000. Fall sex/age composition, genetic screening and collaring of Northern and Southern Alaska Peninsula caribou herds. Final Report. Cooperative Agreement 00–020.

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.

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Riley, M. D. 2011. Units 9C & 9E caribou management report. Pages 33–43 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. Alaska Department of Fish and Game. Juneau, Alaska.

Table 1. NAP caribou fall composition counts and estimated population size, calendar years 1984 through 2009.

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]
2009	19	16	12	74	30	35	35	14	2,126	2,300[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 2,300 and 2,500 caribou based on field observations.

Table 2. NAP harvest, regulatory years 2001–02 through 2009–10.

Regulatory Year	Hunter Harvest					Illegal	Estimated Total[a]
	Reported				Estimated Unreported		
	M (%)	F (%)	Unk.	Total			
2001–02	81 (91)	8 (9)	0	89	30	-	120
2002–03	77 (95)	4 (5)	1	82	30	-	110
2003–04	118 (95)	6 (5)	0	124	75	-	200
2004–05	31 (94)	2 (6)	1	34	30	-	60
2005–06[b]	-	-	-	0	-	-	0
2006–07[b]	1	-	-	1	0	15	16
2007–08[b]	1	-	-	1	0	15	16
2008-09[b]	-	-	-	0	0	15	15
2009-10[b]	-	-	-	0	0	15	15

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

Table 3. NAP caribou annual hunter residency and success, regulatory years 2001–02 through 2009–10.

	Successful				Unsuccessful				
Regulatory Year	Local Resident[a]	Nonlocal Resident	Nonresident	Total[b] (%)	Local Resident[a]	Nonlocal Resident	Nonresident	Total[b] (%)	Total Hunters[b]
2001–02	89	0	0	89 (67)	42	1	0	43 (33)	132
2002–03	74	6	0	82 (61)	46	7	0	53 (39)	135
2003–04	111	13	0	124 (72)	39	10	0	49 (28)	173
2004–05	34	0	0	34 (69)	13	2	0	15 (31)	49
2005–06[c]	-	-	-	0	-	-	-	0	0
2006–07[c]	1	-	-	1 (100)	-	-	-	0	1
2007–08[c]	1	-	-	1 (100)	-	-	-	0	1
2008–09[c]	-	-	-	0	-	-	-	0	0
2009–10[c]	-	-	-	0	-	-	-	0	0

[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, regulatory years 2001–02 through 2009–10.

Regulatory Year	Percent of Harvest									
	August	September	October	November	December	January	February	March	April	*n*
2001–02	13	11	0	8	7	6	18	10	26	89
2002–03	19	21	0	5	4	4	5	18	25	80
2003–04	17	18	1	5	24	7	10	6	11	124
2004–05	21	14	0	7	28	7	0	0	24	29
2005–06[a]	-	-	-	-	-	-	-	-	-	0
2006–07[a]	-	-	-	-	-	100	-	-	-	1
2007–08[a]	-	-	-	-	-	100	-	-	-	1
2008–09[a]	-	-	-	-	-	-	-	-	-	0
2009–10[a]	-	-	-	-	-	-	-	-	-	0

[a] No Tier II permits issued.

Table 5. NAP caribou harvest percent by transport method, regulatory years 2001–02 through 2009–10.

Regulatory Year	Percent of Harvest							
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway Vehicle	Other
2001–02	1	-	17	44	24	6	8	-
2002–03	9	-	20	46	5	18	-	2
2003–04	8	-	16	35	23	13	3	2
2004–05	-	-	18	44	26	6	6	-
2005–06[a]	-	-	-	-	-	-	-	-
2006–07[a]	-	-	-	-	-	-	-	100
2007–08[a]	-	-	-	-	-	-	-	100
2008–09[a]	-	-	-	-	-	-	-	-
2009–10[a]	-	-	-	-	-	-	-	-

[a] No Tier II permits issued.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010

LOCATION

GAME MANAGEMENT UNITS: 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 immigration from Unimak in 1976. Nonetheless, caribou on Unimak Island have been determined to be genetically isolated from mainland caribou and with sufficient fidelity to calving areas on the island to be designated a separate herd. Radiotelemetry and genetic studies indicate the SAP is separate from the Northern Alaska Peninsula Caribou Herd as well. 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 2007.

Harvest of the SAP was fairly high from regulatory year (RY) 1980 (RY80 = 1 July 1980 through 30 June 1981) to RY85, probably exceeding 1,000 in several years. Starting in RY86 restrictive regulations reduced harvests as the herd continued to decline. By RY93 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 were 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 RY07 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. Selective wolf removal during calving improved calf survival immediately upon implementation.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

The cooperative, interagency (Alaska Department of Fish and Game [ADF&G] and the U.S. Fish and Wildlife Service [USFWS]) 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

Population Size

Postcalving population count surveys were conducted in late June or early July when weather allowed. Caribou groups were located by fixed-winged aircraft equipped with radiotelemetry equipment. Oblique photos of large groups (≥ 20 caribou) were taken to allow accurate enumeration. Survey comprehensiveness was assessed using the proportion of radiocollared caribou encountered relative to total radiocollared caribou. Population estimates were calculated by dividing the minimum caribou count number by the proportion of radiocollared caribou encountered. Calf percentages were calculated from direct enumeration of caribou in close-up photos of larger herds. Staff of INWR periodically conducted winter aerial counts along systematic transects.

Population Composition

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

Parturition Surveys

Surveys have been conducted since June 1997 when funding was available. In late May or 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

Our goal is to maintain 30 VHF radio collars on adult female caribou to aid in locating the herd during surveys and to obtain basic information about the animal's condition. Caribou were captured and marked with radio collars with the help of funding provided by USFWS, Office of

Subsistence Management. During each capture we recorded standard measurements and took blood samples when feasible. Herd distribution and survival rates are monitored periodically by radiotracking collared animals.

Mortality

The harvest was monitored by use of state harvest tickets and federal subsistence permits until 2008, when all hunting was closed. Caribou calf mortality studies were conducted in 1989–1990 (Pitcher et al. 1990), 1999 (Sellers et al. 1999) and 2008–2010 (Butler, 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. From 2002 to 2007 estimates of calf recruitment were chronically low, and population size declined rapidly. Calf recruitment increased dramatically in 2008, 2009, and 2010 following selective wolf removal on the calving grounds.

Population Size

A partial survey by USFWS in February 2002 counted only 1,700 caribou, but a more complete USFWS survey in November 2002 counted 4,100. USFWS counted 1,800 caribou in December 2004 during 2 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 conducted during 2007 through 2009 estimated the minimum population size to be 600, 700, and 800 caribou, respectively.

Population Composition

Fall composition surveys conducted 2000–2007 identified a declining trend in the calf:cow ratios, reaching a record low of 0.5 calves:100 cows in 2007 (Table 1). During 2008, 2009, and 2010 calf survival was improved by reducing wolf predation in the calving area. The calf ratio increased to 39 calves:100 cows in 2008 and 43 calves:100 cows in 2009.

Bull:cow ratios averaged 45 bulls:100 cows from 1997 to 2001 and decreased to an average of 36 bulls:100 cows during 2002–2005. 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 was a product of the population's age structure becoming increasingly skewed towards older age animals due to the low calf recruitment observed 2002–2007 and the relatively short life-span of bulls compared to cows. However, the bull ratio improved to 21 bulls:100 cows in 2009 in response to improved calf recruitment.

Distribution and Movements

Data from radiotracking surveys indicate that the SAP has 2 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 and in the mountains at the headwaters of the Joshua Green River.

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 RY93–RY98. In RY99 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 RY01 fall seasons were again lengthened for residents (10 August–30 September) and nonresidents (1–30 September during odd-numbered years and 1 September–10 October during even-numbered years). Between RY99 and RY04 the bag limit was 1 caribou for residents and 1 bull for nonresidents. In RY05 the resident bag limit went from 1 caribou to 1 bull in the fall portion of the season or 1 antlerless caribou during the winter. State and federal hunts were closed in RY08 due to concerns for the herd's status and have not been reopened.

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 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 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 close federal subsistence hunting of SAP caribou.

Hunter Harvest. No permits were issued during this reporting period. It's estimated 10 caribou were taken illegally each year (Table 2).

Other Mortality

In 2007 more than 99% of 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 summers of 2008, 2009, and 2010 in conjunction with a caribou calf mortality study. Department staff removed 28 wolves in 2008 from key packs affecting caribou calf survival. An additional 8 wolves were removed in 2009, and 2 more were removed in 2010. Caribou calf survival was significantly improved by the wolf removal. Calf mortality rates from birth to one month of age decreased from >99%, prior to the reduction, to 40%, 29%, and 37% during 2007–2009, respectively. Similarly, fall calf ratios increased from 1 calf:100 cows, to 39 calves:100 cows, to 43 calves:100 cows, to 47 calves:100 cows during 2007–2010, respectively. In 2008, predation accounted for 80% of the calf mortalities investigated (n=20) when calves were <15 days of age. Predation accounted for 87% calf mortalities investigated (n=23) when calves were <15 days of age in 2009, and 80% (n=8) in 2010. During this period wolves continued to be one of the primary predators of caribou calves, despite the removal of wolves and subsequent increase in calf survival.

HABITAT

Assessment

Adult caribou in the SAP appear to be in good overall condition based on evaluation of adult females captured 2006–2010. During 2008 and 2009 neonate calf weights averaged 7.9 kg (n=71) for males and 7.5 kg (n=57) for females at capture. These weights are intermediate compared to other herds in the state.

Pregnancy rates were relatively good in SAP cows >2 years in age. Of those cows observed 2007–2010, 79% (n=235), 86% (n=202), 90% (n=143), and 91% (n=193) were pregnant, respectively.

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. Recent studies offer evidence that predation by wolves is currently the primary limiting factor for the herd. Brown bears, though abundant in the area, preyed on calves to a lesser extent than wolves. 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 is not apparent at this time. Similarly, no weather anomalies or changes in vegetative patterns have been observed in recent years. 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 bull ratio is low, but appears to be improving 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.

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Table 1. Southern Alaska Peninsula caribou composition and survey results, 1986-2009.

Regulatory year	Bulls: 100 cows[a]	Calves: 100 cows[a]	% Calves Summer[b]	% Calves Fall[a]	% Cows[a]	% Bulls[a]	Small bulls (% of bulls)[a]	Medium bulls (% of bulls)[a]	Large bulls (% of bulls)[a]	Composition sample size[a]	Postcalving Count[b]	INWR Count[c]
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	1	1	1	87	12	20	47	33	431	600[b]	
2008	10	39	27	26	67	7	3	30	68	570	700[b]	
2009	21	43		26	61	13	50	16	34	679	800[b]	

[a] Estimates based on October composition surveys.

[b] Estimates based on July post-calving counts and the proportion of radiocollared caribou encountered.

[c] Estimates based on winter (conducted between January and April) counts by Izembek National Wildlife Refuge staff.

Table 2. SAP caribou harvest, 2001–2009.

Regulatory Year	Hunter Harvest						
	Reported				Estimated Unreported	Illegal	Estimated Total[a]
	M (%)	F (%)	Unknown	Total			
2001–2002	52 (93)	4 (7)	0	56	30	-	90
2002–2003	61 (91)	6 (9)	3	70	30	-	100
2003–2004	47 (96)	2 (4)	1	50	30	-	80
2004–2005	68 (89)	8 (11)	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
2008-2009[b]	-	-	-	-	-	10	10
2009-2010[b]	-	-	-	-	-	10	10

[a] Estimated total is rounded off to the nearest 10.
[b] No permits issued.

Table 3. SAP caribou annual hunter residency and success, 2001–2009.

Regulatory Year	Successful				Unsuccessful				
	Local resident[a]	Nonlocal resident	Nonresident	Total[b] (%)	Local resident[a]	Nonlocal resident	Nonresident	Total[b] (%)	Total Hunters
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	61 (64)	20	6	8	34 (36)	95
2006–2007	37	4	17	58 (45)	44	6	19	70 (55)	128
2007–2008[c]	-	-	-	-	-	-	-	-	-
2008-2009[c]	-	-	-	-	-	-	-	-	-
2009-2010[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 2001–2009.

Regulatory Year	Percent of Harvest August	September	October	November	December	January	February	March	n
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	58
2007–2008[a]	-	-	-	-	-	-	-	-	-
2008-2009[a]	-	-	-	-	-	-	-	-	-
2009-2010[a]	-	-	-	-	-	-	-	-	-

[a] No permits issued.

Table 5. SAP caribou harvest percent by transport method, 2001–2009.

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	31	22	0	2	16	0
2007–2008[a]	-	-	-	-	-	-	-
2008-2009[a]	-	-	-	-	-	-	-
2009-2010[a]	-	-	-	-	-	-	-

[a] No permits issued.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010

LOCATION

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

HERD: Unimak

GEOGRAPHIC DESCRIPTION: Unimak Island

BACKGROUND

There have been 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, the Unimak Island Caribou Herd (UCH) was originally considered a segment of the Southern Alaska Peninsula Caribou Herd (SAP). Nonetheless, the UCH has been determined to be genetically isolated from mainland caribou, with sufficient fidelity to calving grounds on the island to be designated a separate herd (Zittlau, 2009). 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 regulatory year (RY) 2000 (RY00 = 1 July 2000 through 30 June 2001), and the state general season reopened in RY01 when the herd was at the maximum population size recommended by ADF&G biologists for Unimak Island. In 2005 calf recruitment for the herd decreased dramatically and has remained low in subsequent years. A similar decrease in bull ratio was observed in 2008 and a count by Izembek National Wildlife Refuge (INWR) staff in 2009 estimated there to be 400 caribou on the island. State and federal hunts were closed in RY09.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

No formal management objectives are in place for the UCH, 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 should be kept below 1,000 animals.

METHODS

Population Size

Staff of INWR periodically conduct winter aerial counts along systematic transects to estimate population size.

Population Composition

Sex and age composition surveys were conducted during the month of October on Unimak Island. Caribou were classified from a helicopter as calves, cows, small bulls, medium bulls, and large bulls.

Parturition Surveys

Parturition surveys were initiated in 2008. In 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).

Radiotelemetry Data

We captured female caribou for radiocollaring in 1997, 1999, 2009, and 2010. During each capture we recorded standardized measurements and took blood samples when feasible. Occasional radiotracking flights are used to monitor herd distribution.

Mortality

The harvest was monitored by use of state harvest tickets and federal subsistence permits until 2009, when all hunting was closed.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Following a peak of more than 5,000 caribou in 1975, the UCH 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 through 2005. The population is currently declining and has experienced very poor calf recruitment in recent years.

Population Size

In January 1997 the INWR 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 subsequent INWR counts suggest there were close to 1,000 caribou on Unimak between 2000 and 2006 (Table 1). In 2009 INWR estimated a population size of 400 caribou based on the results of their winter count.

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. From 2000 to 2005 bull ratios were above management objectives set for most herds in Alaska (between 40 and 54 bulls:100 cows). The bull ratios in 2007, 2008, and 2009 (31 bulls:100 cows, 9 bulls:100 cows, and 5 bulls:100 cows, respectively) 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

The UCH has typically calved on the western portion of Unimak Island in the Urilia Bay and Pogromni River flats areas. Exchange of caribou between Unimak Island and the mainland has not been documented in recent years.

MORTALITY

Harvest

Season and Bag Limits. There were no state or federal hunts on Unimak Island RY93–RY99. In RY00 a federal subsistence hunt (RC101) was resumed. In RY01 a general state hunt was established with a 1 caribou bag limit, with seasons of 1–30 September for nonresidents and 10 August–30 September and 15 November–31 March for residents. State and federal hunts were closed in RY09 due to concerns for the herd's status and have not been reopened.

Board of Game Actions and Emergency Orders. The Board of Game closed the caribou hunting season on Unimak Island during the March 2009 meeting and it was not reopened for the remainder of this report period. In March 2010 the board authorized a wolf management area for Unimak Island.

Federal Subsistence Board Actions. The Federal Subsistence Board decreased the bag limit for the federal subsistence hunt from 4 caribou to 2 caribou in RY07. In RY09 the federal board closed the subsistence caribou hunting season on Unimak Island.

Hunter Harvest. Hunters reported harvesting 9 caribou in RY08 (Table 2). No hunting was authorized in RY09.

Hunter Residency and Success. Nonresident hunters had an average success rate of 88% and accounted for 78% of the reported harvest in RY08 (Table 3). Success rate for nonlocal residents was 67% (n = 3) during the same regulatory year. Participation in the hunt by local residents may have been underreported, both because of noncompliance with state harvest tickets and use of federal permits.

Harvest Chronology. All reported caribou harvest since RY01 occurred in September with the exception of 1 caribou taken in November of 2002 and 1 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

The sample size of active radio collars on caribou in this herd is too small to allow reliable calculation of survival rates.

HABITAT

Assessment

Adult caribou collared on Unimak in 2009 appeared to be in excellent overall condition. The pregnancy rate for cows >2 years in age was also relatively good in 2008 at 85% (n = 113). In 2009 the pregnancy rate decreased to 68% (n = 40), but this low pregnancy rate was attributed to the extremely low bull ratio in 2008 (8 bulls:100 cows) rather than habitat or nutritional limitation.

CONCLUSIONS AND RECOMMENDATIONS

The UCH is managed as a separate and independent caribou herd even though some interchange with the mainland may occur, particularly at high population sizes. Managing this herd to dampen population fluctuations may not be possible given the logistics involved in accessing Unimak Island. The recent population decline, resulting from poor calf recruitment, and possibly a preponderance of senescing individuals, is of concern. Calves have not been surviving to the fall in adequate numbers to replace older individuals dying off since at least 2005. Predation on caribou calves is believed to be the cause of the poor calf survival. Pregnancy rates of adult cows >2 years of age have also declined since 2008 (from 85% pregnant to 68% pregnant). The low bull ratio in 2008 (9 bulls:100 cows) is believed to have reduced the likelihood of cows encountering a bull while in estrus, thus reducing the pregnancy rate. Given the herd's declining population size and poor calf survival, the Alaska Department of Fish and Game recommended implementing a wolf removal program in 2009. Wolves would be removed on the calving grounds in June using the same strategy employed for wolf removal on the SAP's calving grounds (Butler 2009). Because of the UCH's small population size and isolation from mainland herds, it is believed caribou could be extirpated from Unimak Island without such management intervention. The department intends to deploy radio collars on adult cows and calves to assess body condition, health, age, and survival, and to aid biologists in locating caribou during survey flights. Biologists should continue to monitor population size, composition, productivity, and survival of the UCH.

LITERATURE CITED

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.

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

Zittlau, K., R. Farnell, P. Valkenburg, J. Nagy, A. Gunn, and C. Strobeck. 2009. Genetic diversity among woodland and Grant's caribou herds. Part 3:147–164. [In] K. McFarlane, A. Gunn, and C. Strobeck, editors. Proceedings from the caribou genetics and relationships workshops, Edmonton, Alberta, March 8–9, 2003. Department of Natural Resources and Environment, Government of the Northwest Territories, Fort Smith, Northwest Territories.

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Table 1. UCH caribou fall composition counts and estimated population size, calender years 2000 through 2009.

Calendar 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	
2009	5	3	3	92	5	30	30	40	221	400[b]

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

Table 2. Unimak caribou harvest, regulatory years 2002 through 2009.

Regulatory Year	Hunter Harvest						
	Reported				Estimated		Estimated
	M (%)	F (%)	Unknown	Total	Unreported	Illegal	Total
2002	11 (92)	1 (8)	0	12	-	-	12
2003	10 (100)	0	0	10	-	-	10
2004	15 (100)	0	0	15	-	-	15
2005	15 (100)	0	0	15	-	-	15
2006	12 (92)	1 (8)	0	13	-	-	13
2007	13 (100)	0	0	13	-	-	13
2008	9 (100)	0	0	9	-	-	9
2009	-	-	-	-	-	-	-

Table 3. Unimak caribou annual hunter residency and success, regulatory years 2002 through 2009.

Regulatory Year	Successful				Unsuccessful				Total
	Local Resident[a]	Nonlocal Resident	Nonresident	Total[b] (%)	Local Resident[a]	Nonlocal Resident	Nonresident	Total[b] (%)	Hunters[b]
2002	0	5	7	12 (92)	0	1	0	1 (8)	13
2003	0	1	9	10 (77)	0	2	1	3 (23)	13
2004	0	3	12	15 (71)	0	5	1	6 (29)	21
2005	0	4	11	15 (94)	0	0	1	1 (6)	16
2006	0	3	10	13 (87)	0	0	2	2 (13)	15
2007	2	1	10	13 (100)	0	0	0	0 (0)	13
2008	0	2	7	9 (75)	0	1	1	3 (25)	12
2009	-	-	-	-	-	-	-	-	-

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

WILDLIFE

MANAGEMENT REPORT

Alaska Department of Fish and Game
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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[1]

LOCATION

GAME MANAGEMENT UNIT: 12 (3,300 mi^2) and adjacent Yukon, Canada (500–1,000 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 southwestern 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. However, in Canada the Chisana herd has been classified as *Rangifer tarandus caribou,* grouped under the Northern Mountain ecotype of woodland caribou. Behaviorally, the Chisana herd is typical of other mountain herds, particularly with respect to calving, where, rather than aggregating, they disperse up in elevation and away from other calving females (Farnell and Gardner 2002). In Alaska, the Alaska Department of Fish and Game (ADF&G) has classified the Chisana herd as *Rangifer tarandus grantii caribou* along with all other caribou herds in Alaska*.* Genetic analysis conducted by Zittlau et al. (2000) supports the classification of Chisana caribou as woodland caribou and 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. The difference in classification between Canada and the U.S. has not influenced management of the herd.

Little is known about CCH population trends before the 1960s. Skoog (1968) estimated the CCH at 3,000 animals in 1964. By the mid to late 1970s, the herd declined to an estimated 1,000 caribou. Similar declining trends were reported in other Interior caribou herds. During the 1980s, environmental conditions were favorable, and the herd increased to about 1,900 caribou by 1988. The herd then declined to an estimated low of 315 caribou by 2002 (Table 1). Weather and predation were likely the primary causes for the decline (R. Boertje, ADF&G, personal communication). Between 1979 and 1994, the bag limit was 1 bull caribou, and harvest was

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

limited (Table 2). 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 of 30 bulls per 100 cows, and all hunting of Chisana caribou was stopped in Alaska.

Between 2003 and 2006 a captive rearing program was conducted by the Yukon Department of Environment in Yukon. Annually, 20–50 pregnant female caribou were captured in March–April, held in a holding facility in Yukon, and released from the holding facility after calves were 5 weeks old. This program successfully increased the number of calves recruited into the population during 2003–2006. Based on census information and population models from 2004 through 2007, the population appears to have been stable at 694–766 animals (Adams and Roffler 2005 and 2007).

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, and 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. Primarily, 5 guide/outfitters hunted the herd (4 operated in Alaska and 1 in Yukon). Due to limited access, use of the CCH 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 ADF&G and the NPS have different mandates and approaches to meeting management objectives.

To meet the increasing management needs, ADF&G initiated a cooperative study with the NPS and the Yukon Department of Environment (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.

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 2002 through 2007. A process to update the cooperative CCH Management Plan was begun in 2008.

MANAGEMENT DIRECTION

During 1 July 2008–30 June 2010, 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 estimation method was developed by Layne Adams of the U.S. Geological Survey (USGS; Anchorage, Alaska). This technique used observers in helicopters to visually search the herd range while a fixed-wing aircraft with radiotelemetry equipment was used to determine numbers of marked caribou missed by the helicopter crew. In this way, a sightability correction factor was obtained which made it possible to estimate the population size from observed caribou. These methods are summarized in (Adams and Roffler 2005, 2007).

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. Composition counts were conducted in fall 2005–2007 by USGS. In fall 2008 and 2009 similar herd composition counts were conducted cooperatively by ADF&G, NPS, and YDE). In fall 2010 ADF&G, NPS, and YDE used population estimation methods developed by Layne Adams (USGS Anchorage) to conduct a herd composition count and derive a new population estimate. Re-sighting rates of marked caribou were estimated for the Alaska and Yukon portions of the survey area. This rate was applied to the number of groups observed by the helicopter crew to estimate groups missed in each area. Average group size was calculated and multiplied by the number of estimated missed groups to estimate caribou missed in each area. Group size was not significantly correlated with sightability of marked caribou. The actual number of caribou on the study area was calculated as the number of caribou observed plus the estimated number missed. This total was further adjusted for marked animals outside the study area. Standard errors were propagated throughout the calculation using the Delta method in program R. A full description of parameters used in the 2010 estimate was prepared by Troy Hegel (personal communication, YDE, Whitehorse, Yukon, 2011).

Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY08 = 1 Jul 2008 through 30 Jun 2009). Although no permits were issued and no caribou were reported harvested in RY08–RY09, harvest data since 1989 are included in this report (Table 2) to clarify herd population and composition trends.

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 1,900 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, USGS, 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, 2009, and 2010, ADF&G, NPS, and YDE conducted composition surveys on the CCH (Table 1). In 2008 we estimated 44 bulls:100 cows, a substantial increase from the low in 1999 of 17 bulls:100 cows. The 2008 estimate of recruitment was 21 calves:100 cows, which is consistent with most mountain caribou herds in Canada, which average between 20 and 25 calves per 100 cows (Northern Mountain Caribou Management Planning Team 2010). Following winter of 2008–2009, which included prolonged severe cold and ice on top of deep snow (Alaska Snow Survey report, 1 April 2009), the fall 2009 ratio declined to 15 calves:100 cows, while the bull:cow ratio increased to 48:100. However, in 2010 recruitment was back up to 23 calves: 100 cows and the bull/cow ratio remained relatively stable at 42:100.

The 2010 census yielded an estimated 697 caribou (651–743; 90% CI) based on 622 caribou (including 96 with radio collars) observed 11–15 October by one helicopter and one fixed wing aircraft (Figure 1). The 2010 survey used the known herd range during rut and the general location of all radiocollared caribou based on a radiotracking flight a week before the census, and included all the areas surveyed in both 2005 and 2007. In 9 hours of survey time ADF&G and NPS staff searched the herd range within Alaska, including the Beaver creek drainage, Carl Creek, Ophir Creek, and Solo Creek Flats to the White River. The Horsefeld area, Skolai Pass, and Eucre Mountain were also searched but no caribou were found in those areas. An additional 5.5 hours of survey time was spent in the Yukon portion of the herd's range, primarily between the White and Donjek rivers directly east of the Alaska border.

Factors influencing low calf survival are still under investigation. Preliminary analysis of RY04–RY10 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. No Chisana caribou were observed west of the Nabesna River during this report period. Results of this research will be summarized in a final USGS research report in 2011 (L. Adams, USGS, personal communication).

Due to funding limitations no spring parturition surveys were conducted during this report period. Therefore, we are unable to compare spring birth rates to fall calf:cow ratios to further examine herd condition or summer mortality.

MORTALITY

Harvest

There has been no legal harvest of Chisana caribou in Alaska since 1993. All harvest in Yukon stopped after 2001 when Yukon First Nation members voluntarily stopped harvesting Chisana caribou. During RY94–RY09, the Alaska hunting season in the CCH range remained in the regulations but no permits were issued.

Alaska Board of Game Actions and Emergency Orders.

In 2008 the Upper Tanana/Fortymile Advisory Committee proposed reopening a limited hunt on the CCH. At that time the Alaska Board of Game (board) was asked to wait until the new draft cooperative CCH management plan (plan) could be prepared and more data could be collected on the condition of the herd.

During its February–March 2010 meeting the Board passed a follow-up proposal to establish a joint state-federal drawing permit hunt for the Chisana caribou herd starting in the fall of 2011. This hunt would use guidelines set in the plan (Chisana Caribou Herd Working Group 2010), which recommends the herd can support a 2% of population bulls-only harvest split 50:50 between Yukon and Alaska as long as the herd is stable or increasing, calf:cow ratios remain above 15:100 based on a 3-year average, and the bull:cow ratio remains above 35:100. These harvest guidelines were similar to those used for other small caribou herds in Yukon and deemed appropriate for management of the CCH (Northern Mountain Caribou Management Planning Team 2010). As part of the 2010 proposal the board reviewed whether the Chisana herd is associated with significant long-term customary and traditional use and found no requirement for a state subsistence allocation.

In May 2010 the Federal Subsistence Board voted to defer a similar proposal for the joint state-federal hunt based on the recommendations of the draft plan until more information can be gathered and the plan is completed and signed by all participating groups and agencies. Because the Alaska portion of CCH range is entirely within the federal lands of the Wrangell– St. Elias National Preserve, no permits will be issued until the Federal Subsistence Board agrees to open a season for Chisana caribou.

Human-induced Mortality. ADF&G has not issued registration hunt permits for the CCH since RY94 (Table 2). Past reports from local residents and incidences of radiocollared caribou that were shot indicate an illegal harvest in Alaska of 3 or fewer caribou annually during RY08–RY09. 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 stopped harvesting Chisana caribou. Because the herd is inaccessible most of the year in Alaska, illegal or incidental harvest was not a management concern during RY08–RY09.

Other Mortality

ADF&G conducted no activities to evaluate other causes of mortality on the CCH during RY08–RY09. However, as summarized by Gardner (2003), predation by wolves was identified as the primary factor limiting herd growth.

No wolf surveys have been conducted in the area since 2001. At that time it appeared that wolves were not limited by decreases in Chisana caribou, possibly due to the availability of moose and Dall's sheep in the area. The low numbers of wolves taken by trappers and hunters in the CCH range are generally not sufficient to limit wolf density. Gardner (2003) observed 89–97 wolves in 18 packs (2–13 wolves/pack). Ten of these packs (30–36 wolves) were in the Alaska portion of the survey area. The fall 2000 density estimate was 15.8 wolves/1,000 mi^2 (6.1 wolves/1,000 km^2). Similar densities were recorded in the Canadian portion of this area in 1987 (Sumanik 1987) and 1989 (Yukon Department of Environment, unpublished data), which is below the average for most Alaska and Yukon study sites (9 wolves per 1,000 km^2; Gasaway *et al.* 1992).

Although data on moose in the CCH range are limited, reports from area residents suggest numbers are increasing. During the 2010 CCH census, 99 moose were observed in the Alaska portion of the herd range and another 20 were observed in Yukon. Increasing numbers of moose could support larger numbers of wolves, which also prey on Chisana caribou. Moose numbers will continue to be monitored in the area.

The limiting role of disease and parasites on the CCH is poorly understood. Samples taken in the 1990s, suggest that the health of CCH is favorable with respect to viruses and parasites; body condition of adult cows and calf weights were above average for other Alaska caribou herds. Disease has not been considered to be a factor influencing long-term population trends (Farnell and Gardner 2002). Necropsy was performed on 3 Chisana caribou calves found dead in May 2008. All were calves of radiocollared cows. One calf died from suffocation on plant material aspirated into the lungs, one from pneumonia, and one from either wolf or bear predation (K. Beckmen, ADF&G, personal communication, 2008).

HABITAT

Assessment

No habitat assessment activities were conducted during RY07–RY08. 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). The high proportion of moss raises questions about winter forage quality and winter range condition because mosses have extremely low nutritional value and digestibility compared to lichens (Ihl 2010).

Enhancement

No habitat enhancement activities were conducted during RY08–RY09.

NONREGULATORY MANAGEMENT PROBLEM/NEEDS

The process to update the cooperative CCH Management Plan was begun in 2008. Participating members in the planning process include the Yukon Department of Environment, White River First Nation, Kluane First Nation, Canadian Wildlife Service, U.S. National Park Service (Wrangell–St. Elias), U.S. Fish and Wildlife Service (Tetlin Refuge) and ADF&G. The plan coordinates the work of these authorities to guide the management of the CCH with the ultimate goal of supporting a stable or increasing population, while balancing the differing management concerns and goals of the participating agencies. The report summarized the current status of the herd and set guidelines for future management of the herd with objectives, actions, and tasks associated with population monitoring, harvest, habitat, predation, research, and public awareness. A draft for public review was available in May 2010 (Chisana Caribou Herd Working Group 2010) and a public review process was conducted in summer of 2010. Final comments and edits to the plan will be made in spring 2011.

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 the documented mortality among radiocollared cows ≥4 months old (Gardner 2003). Similar levels of predation likely occurred during RY08–RY09 (L. Adams, USGS, personal communication).

Hunting was allowed during the herd's initial decline (1989–1994); however, annual harvest was restricted to bulls and generally below 2% of the estimated 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 ranges, except following severe winters. Based on data from other small caribou herds in Southwest Yukon, for the CCH to remain stable the calf recruitment rate must remain above 15 calves:100 cows while maintaining the cow mortality rate at or below 12–15% and the bull mortality rate at or below 21–25% (Bergerud et al. 2008). For calf recruitment to increase, pregnancy and natality rates must remain high, and mortality caused by predators must decline.

The low recruitment rates experienced by the CCH over the past 18 years are among the lowest documented in any other wild caribou herd (R. Boertje, ADF&G, 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 (Figure 2). Because this is an international herd and extensive efforts have been made to help the herd recover to sustainable levels, care must be taken to include input from all interested parties before resuming harvest. An international management plan has been developed, with input from all interested parties, to help guide harvest as long as the herd remains stable or increases. In Alaska, efforts are being be made to resume a limited harvest for bulls only following recommendations made in the draft plan.

We partially met our management objective during RY08–RY09 to develop and implement management strategies to increase calf recruitment to 25 calves:100 cows. In RY08–RY09 we worked cooperatively with YDE and NPS to monitor the long-term effects of the captive rearing program. This program likely helped raise the calf recruitment in the herd to 21 calves:100 cows during this report period and to 23:100 in 2010. However, the objective of 25 calves:100 cows was not met. This recruitment rate may be unrealistically high based on data from similar small caribou herds in Yukon. The Chisana herd can likely sustain a limited bulls-only harvest with little effect on the overall population. However any harvest of Chisana caribou will require careful monitoring.

ADF&G will continue to work cooperatively with the NPS and YDE, to try to maintain or increase calf survival throughout the next report period. Completion of the cooperative CCH management plan is expected in 2011. ADF&G conducted surveys in RY08, RY09, and RY10. Limited funds will likely continue to be available for RY11–RY12. 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.

For RY11–RY12 the management objective will change to better match minimum requirements for a sustainable harvest set in the cooperative management plan.

- Cooperatively with YDRR and NPS, develop and implement management strategies to maintain a stable or increasing herd with calf recruitment above 15 calves:100 cows on a 3-year average, and a bull to cow ratio above 35 bulls:100 cows.

LITERATURE CITED

ALASKA SNOW SURVEY REPORT. APRIL 1, 2009. Natural Resources Conservation Service. United States Department of Agriculture.

ADAMS, L. G. AND D. H. ROFFLER. 2007. Chisana caribou census: 13-14 October 2007. U.S. Geological Survey, Anchorage, AK.

_____, and _____. 2005. Chisana caribou census: 15-16 October 2005. U.S. Geological Survey, Anchorage, AK.

BERGERUD, A. T., S. N. LUTTICH, AND L. CAMPS. 2008. The return of caribou to Ungava. McGill-Queen's University Press. Montreal, Canada.

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

CHISANA CARIBOU HERD WORKING GROUP. 2010. Management plan for the Chisana caribou herd: 2010–2015. Government of Yukon, Whitehorse, Yukon, Canada. 33pp.

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.

GASAWAY, W. C., R. D. BOERTJE, D. V. GRANGAARD, D. G. KELLEYHOUSE, R. O. STEPHENSON, AND D. G. LARSEN. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. Wildlife Monographs 120.

IHL, C. 2010. Percentage of fecal moss in arctic ungulates as an indicator of wintering area quality. Journal of Wildlife Management 74(4):690–697.

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

NORTHERN MOUNTAIN CARIBOU MANAGEMENT PLANNING TEAM. 2010. Management Plan for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada [Draft]. *Species at Risk Act* Management Plan Series. Ottawa, Ontario, Canada. 88pp.

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.

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

SUMANIK, R. S. 1987. Wolf ecology in the Kluane region Yukon Territory. Thesis, Michigan Technical University. Houghton, Michigan, USA.

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.

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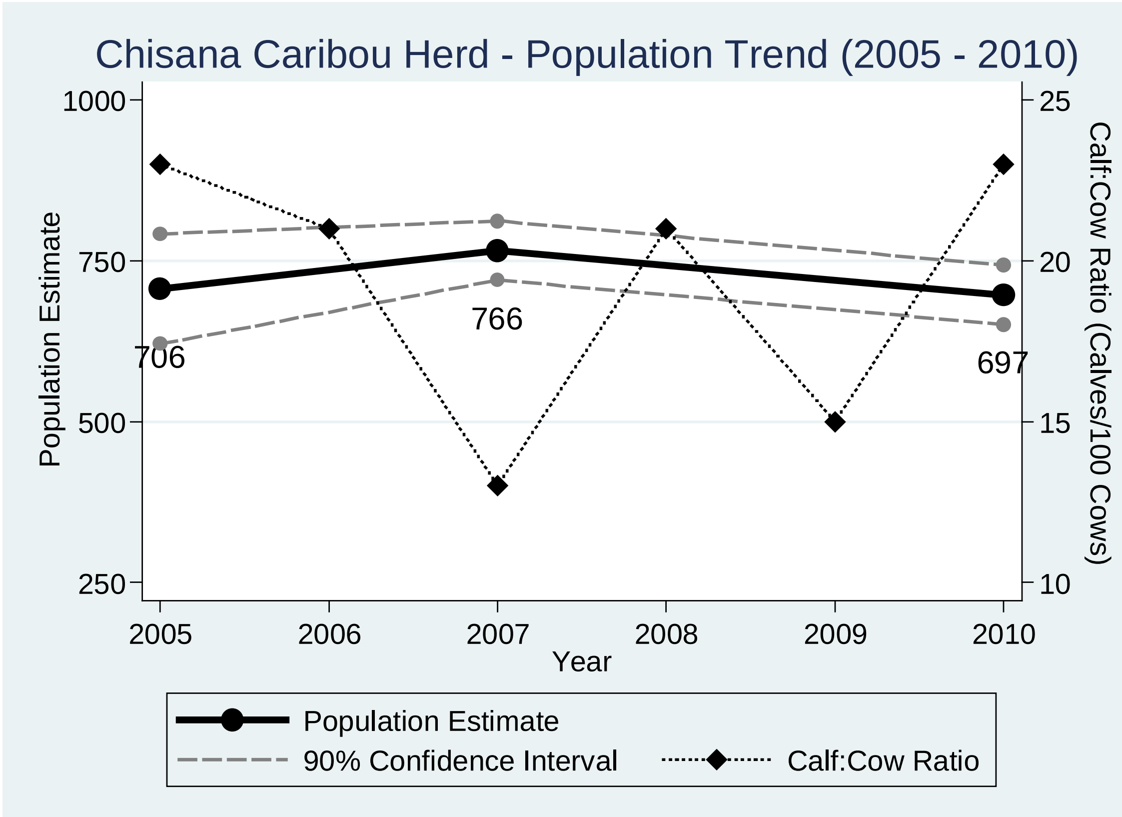

FIGURE 1. Chisana caribou herd population trend based on the 2005, 2007, and 2010 censuses, including 90% confidence intervals and calf: cow ratios, 2005–2010.

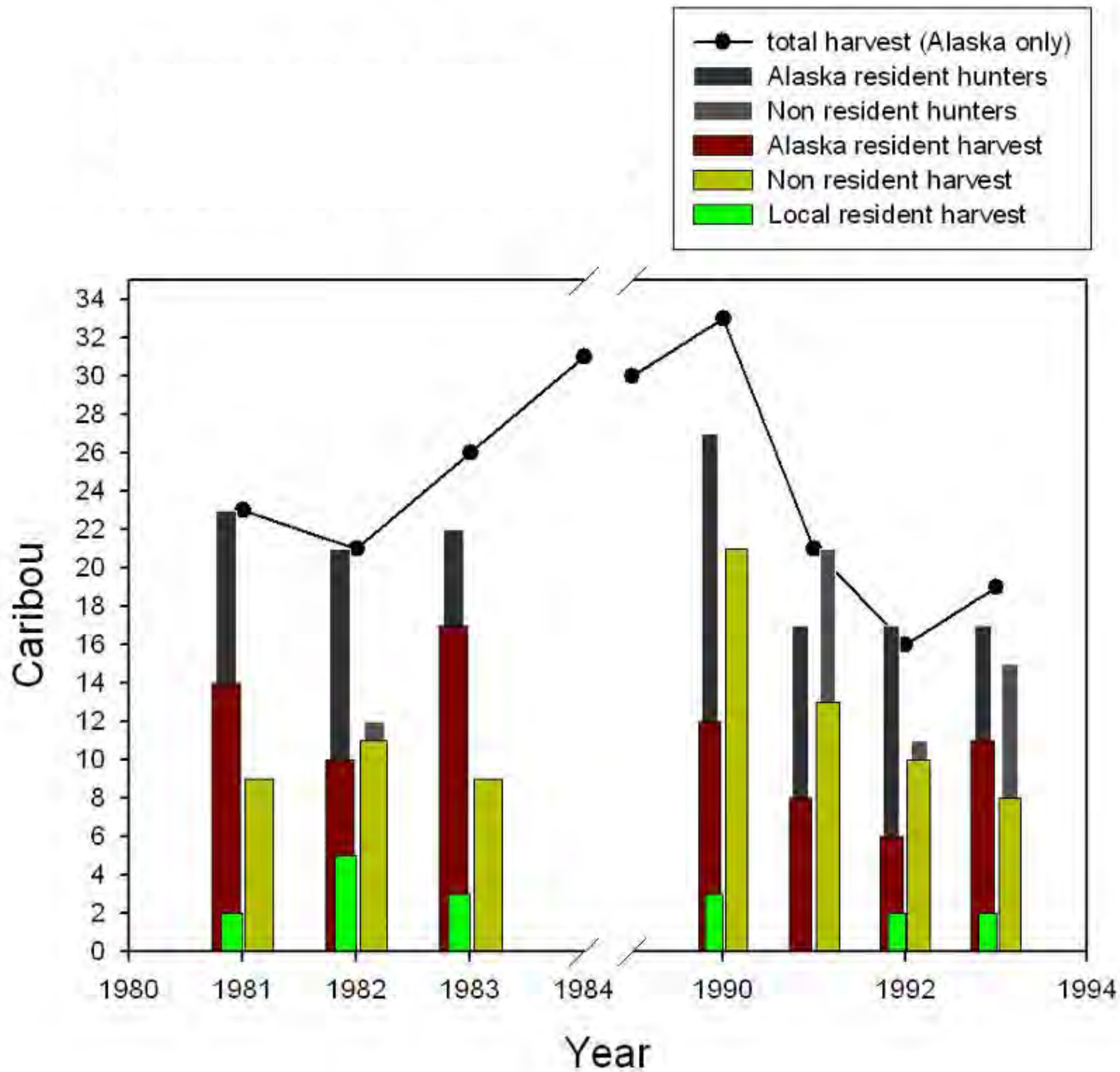

FIGURE 2. Chisana caribou harvest and hunter residency for 1981–1993 in Alaska only (hunter residency data are unavailable for 1984–1989).

TABLE 1. Chisana caribou fall composition counts and estimated population size, 1990–2010.

Date (mm/dd/yy)	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
10/4–5/90	36	11	7	68	37	44	19	25	855	1680
9/29/91	40	1	1	71	45	42	13	28	855	1488
9/27/92	31	0	0[a]	76	34	43	23	24	1142	1270
10/5/93	24	2	2	79	30	45	24	19	732	869
9/29/94	27	11	8	72	20	44	35	20	543	803
9/30/95	21	4	4	80	30	23	47	17	542	679
9/30/96	16	5	4	83	40	18	42	13	377	575
10/1/97	24	14	10	72	3	68	28	18	520	541
9/28/98	19	4	3	81	49	14	37	15	231	493
10/1/99	17	7	6	81	57	16	27	14	318	470
9/30/00	20	6	5	80	52	25	23	15	412	425
10/1/01	23	4	3	79	42	23	34	18	356	375
9/30/02	25	13	10	72	28	23	49	18	258	315
9/30/03[b]	37	25	15	62	n/a	n/a	n/a	23	603	720
9/30/05[b]	46	23	14	59	n/a	n/a	n/a	27	646	706
10/12/06	48	21	13	59	34	33	33	28	628	n/a[c]
10/13–14/07[b]	50	13	8	61	n/a	n/a	n/a	30	719	766
10/9/08	44	21	13	61	n/a	n/a	36	27	532	n/a[c]
10/6–10/09	48	15	9	61	31	32	37	30	505	n/a[c]
10/11–15/10	42	23	14	61	30	16	54	25	622	697

[a] Only 1 calf was seen in this survey.
[b] USGS survey results. Bulls were not classified to size.
[c] No sightability correction factor was determined, herd size could not be estimated.

TABLE 2 Chisana caribou harvest, regulatory years 1990–1991 through 2010–2011.

Regulatory year	Alaska harvest						Yukon harvest		
	Reported				Estimated				
	M	F	Unk	Total	Illegal	Total	Reported	Unreported	Total
1990–1991	34	0	0	34	0	0	11	5–20	50–65
1991–1992	21	0	0	21	0	0	0	5–20	26–41
1992–1993	16	0	0	16	0	0	0	5–20	21–36
1993–1994	19	0	0	19	0	0	0	5–20	24–39
1994–1995[a]	0	0	0	0	0	0	0	5–20	5–20
1995–1996	0	0	0	0	3	7	0	1–3	4–6
1996–1997	0	0	0	0	3	3	0	7	10
1997–1998	0	0	0	0	3	3	0	3–5	6–8
1998–1999	0	0	0	0	3	3	0	20	23
1999–2000	0	0	0	0	3	3	0	3–5	6–8
2000–2001	0	0	0	0	1	1	0	1–3	2–4
2001–2002	0	0	0	0	1	1	0	1–3	2–4
2002–2003	0	0	0	0	0–3	0–3	0	0[b]	0–3
2003–2004	0	0	0	0	0–3	0–3	0	0	0–3
2004–2005	0	0	0	0	0–3	0–3	0	0	0–3
2005–2006	0	0	0	0	0–3	0–3	0	0	0–3
2006–2007	0	0	0	0	0–3	0–3	0	0	0–3
2007–2008	0	0	0	0	0–3	0–3	0	0	0–3
2008–2009	0	0	0	0	0–3	0–3	0	0	0–3
2009–2010	0	0	0	0	0–3	0–3	0	0	0–3
2010–2011	0	0	0	0	0–3	0–3	0	0	0–3

[a] No registration permits were issued for the Alaska hunt during regulatory years 1994-1995 through 2008-2009.
[b] After 2001, Yukon First Nation members voluntarily stopped harvesting Chisana caribou.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[1]

LOCATION

GAME MANAGEMENT UNITS: Portions of Units 12 and 20D (1,900 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 (MACH) 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 MACH, 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 1,357.3).

The MACH numbered about 500 during the early 1970s (Larson 1976). By 1975 the MACH 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 MACH, despite a reduced bag limit and restrictions imposed by conditions of 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.

In 1977, it was necessary to close the 1–15 September hunting 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

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

determination that harvest had to be reduced (Davis 1979). In 1978 the bag limit for the MACH 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 MACH. 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 MACH (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 MACH.

In 1987 the Alaska Board of Game made a customary and traditional (C&T) use determination for the MACH; 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.

In 1988 herd size was estimated to be 800 caribou (DuBois 1989). Historical information from local residents indicated more caribou between the Robertson and Delta rivers than were previously estimated by the Alaska Department of Fish and Game (ADF&G). Because the population was thought to be higher in the past, the Board of Game established a population objective to increase MACH size to 1,000 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 MACH and increase the fall population to 600–800 caribou with a harvest of 30–50 caribou annually by 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 subsistence use 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 radiocollars and to help count total numbers. Caribou were classified according to criteria specified by Eagan (1995).

Fall radiotracking flights were flown in 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 MACH 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 8,000–10,000 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 estimated 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 the MACH population objective during RY08–RY10.

RY08. We were not able to complete a population estimate 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 MACH was not counted (Table 1).

RY09. We achieved a population estimate in association with composition counts on 18 October 2009, by observing 959 caribou (Table 1). Sightability was poor due to incomplete snow cover, making the 959 caribou estimate likely biased low.

Survey costs totaled $2,857.50 and included $1,798 for 3.1 hours of helicopter charter, $920 for 4.6 hours of Super Cub charter, and $139.50 for aviation fuel. In addition, a state fixed-wing aircraft was used during the survey and no cost was charged to the survey for that aircraft.

RY10. We conducted an aerial population estimate on 29 September 2010 that resulted in a population estimate of 1,809 caribou (Table 1). Sightability was fair, as snow cover ranged from no snow over much of the area to incomplete snow cover.

Population Composition

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

RY09. We calculated population composition from a sample of 838 caribou classified from the helicopter. Composition results were 32 bulls:100 cows, 11 large bulls:100 cows, and 26 calves:100 cows (Table 1).

RY10. We calculated population composition from a sample of 1,528 caribou classified from the helicopter. Composition results were 39 bulls:100 cows, 11 large bulls:100 cows and 27 calves:100 cows (Table 1).

Distribution and Movements

The MACH 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 MACH also uses the lowlands of the Tanana River valley as winter range.

RY08. A MACH radiotracking flight was flown on 21 August 2008. Two of 14 (14%) active radio collars were located west of the Gerstle River, 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.

RY09. During the 18 October 2009 population estimate, most caribou (72%) were located on the Macomb caribou herd's primary range between the Johnson and Robertson rivers. Twenty-three percent were located west of the Johnson River, primarily in the McCumber Creek drainage. Two congregations totaling 51 caribou (5%) were located east of the Robertson River.

RY10. During the 29 September 2010 population estimate, most caribou (78%) were located between the Johnson and Robertson Rivers, in the core range of the Macomb caribou herd. West of the Johnson River, a large group of 280 caribou (15%) was located in Boulder Creek west of the Johnson River, an aggregation of 94 caribou (5%) was located in the eastern Granite Mountains, and a few scattered caribou were located in the Granite Mountains.

MORTALITY

Harvest

Season and Bag Limit.

RY08 — Hunting for the MACH was conducted as Tier I registration permit hunt RC835 for resident hunters only during 10–28 August. The hunting season dates were set using ADF&G's discretionary permit authority to shorten the season from the 10 August–30 September framework. The portion of southern Unit 20D west of Jarvis Creek was closed to hunting, also using ADF&G's discretionary permit authority. The harvest quota was 50 bulls, and 3 days of hunter access by motorized vehicles and pack animals were allowed in the western portion of the hunt area during 26–28 August when the Delta Controlled Use Area had no access restrictions.

RY09 and RY10 — Hunting for the MACH was conducted as Tier I registration permit hunt RC835 for resident hunters only during 10–27 August. The hunting season dates were set using ADF&G's discretionary permit authority to shorten the season from the 10 August–30 September framework. The portion of southern Unit 20D west of Jarvis Creek was closed to hunting, also using ADF&G's discretionary permit authority. The harvest quota was 50 bulls, and 2 days of hunter access by motorized vehicles and pack animals were allowed in the western portion of the hunt area during 26–27 August when the Delta Controlled Use Area had no access restrictions.

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 beginning in RY08. No other emergency orders or Board of Game actions pertained to the Macomb herd during RY08–RY09.

Harvest by Hunters. The intensive management harvest quota of 30–50 caribou harvested/year was met in RY08 but was exceeded in RY09 (Table 2). As regulations were liberalized, harvest increased each year from a harvest of 7 during RY04 to 48 in RY08 and 56 in RY09. Harvest continued to increase in RY10, with a harvest of 68 caribou.

Permit Hunts.

RY08 — Registration permits were issued to 267 people (Table 2) and 167 (63%) 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.

RY09 — Registration permits were issued to 242 people (Table 2) and 153 (63%) hunted (Table 3), killing 54 bulls and 2 cows for a 37% success rate (Table 3). This harvest was 6 caribou more than the harvest quota of 50 and therefore did not meet the harvest objective.

RY10 — Registration permits were issued to 326 people (Table 2) and 218 (67%) hunted (Table 3), killing 67 bulls and 1 cow for a 31% success rate (Table 3). This harvest was 18 more caribou than the harvest quota of 50 and therefore did not meet the harvest objective.

The substantial increases during RY08–RY10 compared to RY05–RY07 in number of permits issued ($\bar{x}$ = 278 vs 127; Table 2), people who hunted ($\bar{x}$ = 179 vs 65; Table 3), and harvest ($\bar{x}$

= 57 vs 22; Table 2) were results of adding 26–28 August to the hunting season in RY08 and 26–27 August during RY09–RY10. 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 RY08–RY10 (Table 4).

Hunter Residency and Success.

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

RY09 — Hunters had a 37% success rate (Table 3). Most successful hunters (71%) were not local residents of Unit 20D (Table 3).

RY10 — Hunters had a 31% success rate (Table 3). Most successful hunters (79%) 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 an any-caribou bag limit. Concomitantly, RC835 attracted nonlocal residents who did not qualify for federal subsistence hunts and were looking for a road-accessible caribou hunt.

Harvest Chronology.

RY08 — Harvest was distributed throughout the season with 36% of the harvest in the first 6 days, 19% of the harvest during the second 6 days, and 35% during the final 3 days (26–28 August) when motorized vehicles and pack animals were allowed (Table 5).

RY09 —Harvest chronology had 24% of the harvest in the first 6 days of the season, 11% during the second 6 days, and 56% during 26–27 August when motorized vehicles and pack animals were allowed (Table 5).

RY10 —Harvest chronology had 21% of the harvest in the first 6 days of the season, 20% during the second 6 days, and 40% during 26–27 August when motorized vehicles and pack animals were allowed (Table 5).

During RY08–RY10 57% of the harvest was taken during the last 6 days of the hunting season. During these years 44% of caribou were taken during the final 2–3 days when motorized vehicles and pack animals were allowed in the Delta Controlled Use Area. In contrast, during RY06–RY07, when the entire 10–25 August hunting season had access restrictions within the Delta Controlled Use Area, 30% of caribou were harvested during the last 6 days of the season (Table 5).

Harvest Location.

RY08 — Adding 3 days of motorized access to the hunting season increased harvest in the Jarvis Creek drainage from 33% of the total harvest during RY07 to 44% in RY08. An additional 46% of caribou were harvested east of the Johnson River, with 31% of the total taken on the Macomb Plateau and 15% taken from the Robertson River drainage. Hunters who have Tok Management Area Dall sheep hunting permits for that area often get caribou registration permits (Table 6).

RY09 — Most caribou harvest was reported in the Jarvis Creek drainage (44%). The Macomb Plateau had the second highest harvest (21%), followed by the Granite Mountains (15%; Table 6).

RY10 — Most caribou harvest continued to be reported from the Jarvis Creek drainage (57%) followed by the Macomb Plateau (18%; Table 6).

Transportation Methods.

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

RY09 — Three- or 4-wheeler replaced highway vehicle as the most commonly used mode of transportation for successful hunters (39%). Highway vehicle was the second most commonly used mode of transportation (31%), followed by horse (13%; Table 7).

RY10 — The most commonly used mode of transportation for successful hunters was 3- or 4-wheeler (34%), closely followed by highway vehicle (33%; Table 7).

Other Mortality

No additional mortality sources were identified for the MACH.

HABITAT

Assessment and Enhancement

No habitat assessment work occurred for the MACH during RY08–RY09.

CONCLUSIONS AND RECOMMENDATIONS

The MACH increased substantially during RY08–RY09, exceeding the population objective, meeting the intensive management population objective. The population increase allowed for increased hunting opportunity and harvest. The increased harvest met the intensive management harvest objective in RY08 without having to regulate the hunting season by emergency order as in many previous years. Harvest in RY09 exceeded the management objective, but did not exceed the allowable harvest quota of 50–100 caribou. Further opportunities for increased harvest can likely be implemented and management objectives should be refined to reflect new population data and allowable harvest quota.

At this time we recommend that the current registration permit hunt be continued during August 10–25. However, we recommend eliminating the August 26–27 motorized access portion of the registration hunt and requesting Board of Game authority to replace it with a drawing permit hunt east of Jarvis Creek during August 26–September 20. This action will allow ADF&G to limit the number of hunters when motorized vehicle restrictions are lifted in the Delta Controlled Use Area, while allowing 15 days of opportunity for subsistence users under the Tier I registration hunt.

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.

DuBois, S. D. 1989. Portions of Units 12 and 20D, Macomb Plateau caribou. Pages 60–71 *in* S. O. Morgan, editor. Caribou management report of survey and inventory activities. 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.

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Table 1. Macomb caribou fall composition counts and estimated population size, 1982–2010.

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]
10/18/09	32	26	17	63	34	31	35	20	838	959[b]
9/29/10	39	27	16	60	41	31	28	24	1528	1809

[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 2010–2011.

Hunt	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Harvest: Bulls (%)	Harvest: Cows (%)	Harvest: Unk	Total harvest
530[a]	1985–1986	140	61	22	78	12 (100)	0 (0)	0	12
	1986–1987	100	62	26	74	10 (100)	0 (0)	0	10
570[b]	1986–1987	15	53	14	86	1 (100)	0 (0)	0	1
530[a]	1987–1988	150	53	76	24	53 (100)	0 (0)	0	53[c]
	1988–1989	150	57	55	45	36 (100)	0 (0)	0	36[d]
	1989–1990	150	47	55	45	44 (100)	0 (0)	0	44[d]
535[e]	1990–1991	351	42	21	79	42 (100)	0 (0)	0	42
	1991–1992	317	33	16	50	48 (100)	0 (0)	2	50
	1992–1993 through 1996–1997[f]								
RC835[e]	1997–1998[g]	143	34	23	77	22 (100)	0 (0)	0	22
	1998–1999	168	32	28	72	32 (100)	0 (0)	0	32
	1999–2000[f]	0							0
	2000–2001[g]	274	31	12	88	22 (100)	0 (0)	0	22
	2001–2002[g]	255	32	25	75	43 (100)	0 (0)	0	43
	2002–2003[g]	158	41	28	73	25 (100)	0 (0)	0	25
	2003–2004[g]	161	27	25	75	29 (100)	0 (0)	0	29
	2004–2005	76	58	22	78	7 (100)	0 (0)	0	7
	2005–2006	117	53	33	67	18 (100)	0 (0)	0	18
	2006–2007	103	46	38	63	21 (100)	0 (0)	0	21
	2007–2008	161	47	32	68	27 (100)	0 (0)	0	27
	2008–2009	267	37	29	71	48 (100)	0 (0)	0	48
	2009–2010	242	37	37	63	54 (96)	2 (4)	0	56
	2010–2011	326	33	31	69	67 (99)	1 (1)	0	68

[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 2010–2011.

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	25	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
2009–2010	16	40	0	56 (37)	30	67	0	97 (63)	153
2010–2011	14	54	0	68 (31)	30	120	0	150 (69)	218

[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 2010–2011.

Regulatory year	Harvest: Reported M	F	Unk	Total	Harvest: Estimated Unreported	Illegal	Total	Accidental death	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
2009–2010	54	2	0	56	0	0	0	0	56
2010–2011	67	1	0	68	0	0	0	0	68

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

Table 5. Macomb caribou harvest chronology during permit hunt RC835, regulatory years 1997–1998 through 2010–2011.

Harvest	Regulatory year (RY)[a]													
date	1997	1998	1999[b]	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
August														
10										4	5	2	4	3
11										3	0	3	3	4
12										1	1	6	1	2
13										2	3	2	0	3
14										2	1	4	2	0
15						11	18	4	2	0	1	0	3	2
16						4	9	0	3	0	3	1	0	1
17						5	1	0	2	0	0	2	2	1
18						1	1	0	0	2	3	3	0	0
19						1	0	1	1	1	1	0	0	0
20						3	0	0	5	1	2	0	2	3
21						0	0	0	3	0	0	3	2	8
22						0	0	0	0	0	0	0	1	2
23						0	0	1	0	1	4	2	1	0
24						0	0	0	0	2	0	1	0	5
25						0	0	1	1	1	3	1	3	7
26												12	23	17
27												4	8	10
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		1	1	0
n	22	32		22	43	25	29	7	18	21	27	48	56	68

[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 2010–2011.

	Harvest location/drainage							
Regulatory Year[a]	Jarvis Creek	Little & Big Gerstle River	Granite Mountains	Johnson River	Macomb Plateau	Robertson River	Unit 12	Unknown
1997–1998	8	3	0	0	9	0	0	1
1998–1999	16	2	1	0	9	3	0	1
1999–2000[b]								
2000–2001	18	2	0	0	0	0	0	2
2001–2002	24	0	3	0	13	0	1	2
2002–2003	22	0	0	0	2	0	1	0
2003–2004	22	0	0	0	6	1	0	0
2004–2005	2	0	1	0	2	1	0	1
2005–2006	4	0	0	1	12	1	0	0
2006–2007	2	0	2	1	11	0	0	0
2007–2008	9	0	0	1	14	2	1	0
2008–2009	21	2	2	1	15	5	2	0
2009–2010	30	5	10	1	14	1	7	0
2010–2011	32	5	5	0	10	1	3	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 2010–2011.

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
2009–2010	0	4	0	39	0	13	31	7	6	54
2010–2011	1	12	1[d]	34	0	0	33	9	9	67

[a] Includes permit hunt harvest.
[b] Walking was not listed as a transportation type from 1986–1987 to 1989–1990.
[c] Hunt canceled.
[d] One hunter reported using an airboat

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010

LOCATION

GAME MANAGEMENT UNIT: 13 and 14B (25,525 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 subsequently increased with the intent of reducing the herd size. Since the late 1990s, the NCH population objective has been 35,000–40,000.

The NCH continues to be important to large numbers of hunters because of its accessibility and proximity to Anchorage and Fairbanks. The Board of Game increased bag limits and extended seasons when the NCH began to increase in the late 1950s. Annual harvests from regulatory year (RY) 1955 (RY55 = 1 July 1955 through 30 June 1956) through RY71 ranged from 2,500 to more than 10,000 caribou. After the herd declined, the bag limit was reduced to 1 caribou in RY72, and seasons were dramatically curtailed. In RY76 the season was closed by emergency order after hunters killed 800 caribou in only 5 days. It became apparent that a general open season with unlimited participation was no longer possible for the NCH. Since RY77, Nelchina caribou have been hunted by permit only. Between RY77 and RY90 most permits were issued through a random drawing process. Unit 13 residents took a small number of caribou under a subsistence registration permit hunt. Between RY90 and RY09, Nelchina permits have been issued only for state and federal subsistence hunts, except for a very limited drawing hunt in Unit 14. Regardless of allocation, both the number of permits issued and the allowable harvest fluctuate annually, depending on herd status. During the last 25 years (RY85–RY09) there have been more than 62,000 caribou harvested from the NCH, averaging nearly 2,500 per year.

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 late June or early July in postcalving aggregations. 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 to estimate productivity, and again in early October during the rut to determine the bull:cow ratio and estimate calf survival and recruitment. Fall posthunt population estimates are then calculated from the summer 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

In 1996 and 1997, the size of the NCH was intentionally reduced due to concerns about nutritional stress. In addition to high harvest quotas those years, wounding loss was likely very high given the exceptionally high hunter numbers. The herd declined rapidly. Population estimates averaged just under 33,000 caribou from 1998 to 2003. The herd slowly increased, and population estimates in 2004 and 2005 were within the objective range. Due to weather conditions no count was attained in 2006. Harvest quotas were set based on available estimates of calf production and survival. In 2007, the herd estimate again fell below 33,000. Due to weather conditions no count was attained in 2008.

Since the late 1990s, the department has attempted to consistently manage the NCH at near maximum sustained yield. This management strategy proves difficult when annual composition or count data are inaccurate or unattainable. In these years, the annual harvest quota may be set too high or too low, and corrections must be made in subsequent years.

Despite conservative harvest quotas in RY07 and RY08, the 2009 herd estimate remained low (33,837; Table 1). Even though the 2009 count was conducted over a broad geographic area, encompassing a large portion of the eastern Talkeenta Mountains from Watana Creek south to the Glenn Highway, there were indications caribou were missed. Of the radiocollared cows expected to be in this area, only 60% were located during pre-count flights.

In addition to a low herd estimate, parturition was low and calf mortality increased in 2009. The annual harvest quota was further reduced to encourage herd growth.

Survival during the winter of 2009–2010 was very good, and an exceptionally high number of calves were produced in 2010. The majority of the herd stayed on the calving grounds well into early July, although they were loosely congregated. At the end of the counting window, on 9 July , the herd finally concentrated in the Little Oshetna River, and a photo census was completed. The NCH fall population estimate of 44,985 (Table 1) was the highest estimate since the last peak in 1995.

While the 2010 population estimate exceeded the population objective, the percentage of calves in the population was very high. Although an estimated 11,000 calves were still alive by October, calves have higher mortality rates than older caribou, and only a portion will survive the winter.

Population Composition

For management of the NCH, the most important annual variable is calf production. Variations in calf production occur when caribou exhibit changes in physical condition; poor condition in young caribou can result in a delay in age of first reproduction. Reproductive age cows can also skip a breeding season to regain body condition if they are nutritionally stressed (Whitten 1995). While nutritional stress can occur due to annual weather fluctuations, it can also result due to overgrazing, or a combination of these factors.

The number of calves born and subsequent calf survival are the largest components in estimating the annual increment available for harvest for this herd. Birthrates or parturition of radiocollared cows provide initial spring data on the nutritional status of the herd; this data has been collected from known-age NCH cows since 1997. The typical age range of first reproduction in the NCH is 3 to 4 years old. Parturition of 3-year-old cows appears to be the most sensitive to nutritional fluctuations, and provides a useful index of herd performance. Annual 3-year-old parturition has averaged 39% (1997–2010); overall parturition for cows 3 years old and older has averaged 72% (1997–2010).

With no parturition data prior to 1997, there is no way to know what immediate effects the increased herd size during the mid-1990s had on parturition. Although the size of the herd was intentionally reduced during the late 1990s, nearly half of the 3-year-old radiocollared cows had calves in 1997 and 1998 (average = 47%; n=17). It was during the next several years that parturition declined. All available data indicates there may have been a delayed response, as 3-year-old parturition declined steadily between 1997 and the low observed in 2000 (0%; n=8). While deep snow in Unit 13 likely played a role in low parturition in 2000 and 2001, rates remained relatively low from 2002 to 2005 (average = 46%; n=40).

Although the annual sample of radiocollared 3-year-old cows has been small in recent years, 3-year-old parturition in 2007, 2008, and 2010 was relatively high, averaging 67% (n=18). No 3-year-old parturition data was available for 2009, although overall parturition was below average (65%; n=23), possibly due to poor weather conditions. Parturition was again well above average in 2010. While these parturition rates are clearly influenced by annual conditions, the trend over time has been positive, suggesting the current management strategy for the NCH continues to be successful.

While birthrates help address the nutritional status of the herd, additional information on herd size and composition is necessary to determine the annual allowable harvest. Even though a significant number of calves are lost in the first several weeks of life, summer calf ratios have proven effective in estimating the annual allowable harvest.

Between the late 1970s and 1992, the NCH steadily increased at about 10% per year. Summer calf ratios were high during that period, averaging 55 calves:100 cows (range = 39–65). During the early 1990s the herd started to exhibit signs of nutritional stress as the herd approached 50,000. Calf weights were low and highly variable and summer calf ratios declined (Tobey 2001). Even though the herd was reduced through aggressive harvests in the late 1990s, summer calf ratios remained relatively low through 2003, averaging 43 calves:100 cows (range = 31–55). No summer composition survey was flown in 2004. Summer calf ratios have since increased, averaging 52 calves:100 cows (range = 44–65; 2005–2010).

Summer calf mortality can be variable. Wolves, one of the main predators, steadily increased across Unit 13 through the 1990s. In 2000, the fall estimate of wolves on the NCH calving grounds was 75 (density = 17.4:1,000 km^2). During the late 1990s an average of 14 calves:100 cows were lost between summer and fall composition surveys.

Wolves were subsequently reduced through intensive management (IM), starting in 2001. This IM program was implemented to increase the moose population, but wolf reductions have incidentally improved caribou survival. Between 2001 and 2003, the summer to fall calf loss dropped to 4 calves:100 cows each year. Although wolf numbers continued to decline on the calving grounds, and they have remained at low numbers since 2006 (fall average = 20; density = 4.7:1,000 km^2), calf loss has since increased. In 2005, 2007, and 2009, calf loss increased to 11, 13, and then 15 calves:100 cows, respectively (no summer composition surveys were flown in 2006 or 2008). The calf loss dropped to 10 calves:100 cows in 2010, possibly due to exceptionally high calf production and tight summer congregation.

Although the difference between summer and fall calf ratios has increased in recent years, the wolf reductions appear to have been beneficial for the NCH. The average summer calf loss for the 10 years prior to IM was 28% (range = 13–37%; 1991–2000); the average loss has since declined to 18% (range = 8–34%; 2001–2010). For the same time periods, fall calf ratios averaged 33 calves:100 cows prior to IM (range = 20–45) and 41 calves:100 cows since (range = 29–55; Table 1).

Fall calf and bull ratios are used to refine annual harvestable surplus estimate in those years when hunts run past October. The fall bull ratio averaged 31 bulls:100 cows between 2005 and

2007, but has since increased to 48 bulls:100 cows (2008–2010) following conservative harvest quotas (Table 1).

In addition to sex composition, bulls are also classified by size during the fall. Considering most caribou hunters select for large bulls, hunting can impact this segment of the population in a short period of time (Milner et al. 2007). As permit numbers were increased in the late 1990s, not only did the percentage of bulls decline, but the age structure of the bull population was also likely skewed toward younger animals. Between 1998 and 2001, the percentage of large bulls averaged only 13%. Harvests were curtailed beginning in 2000. The number of large bulls increased, and has averaged 21% 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 subunit 13A. In 2008, the concentration was in the Tangle Lakes area between the Alphabet Hills and the foothills of the Alaska Range in subunit 13B. In 2009 and 2010 rutting was concentrated in the center of the unit covering portions of subunits 13A, 13B, and 13E.

Winter habitat for the NCH extends from Cantwell in subunit 13E, east across subunit 13A and 13B, and northeast into Units 11, 12, and subunit 20E. Through the 1980s and 1990s the size of the NCH increased, and their range expanded. Use of Unit 13 winter range declined in the mid-1990s as caribou began to find higher quality winter range in subunit 20E, presumably due to an abundance of lichen in older burns in the vicinity of the Taylor Highway.

In 2004 much of the preferred NCH winter range in subunit 20E burned such as the Upper West Fork of the Fortymile River and the Upper Dennison. While caribou have been avoiding the recently burned areas, they continue to use adjacent unburned areas. Nelchina caribou that continue to winter in subunit 20E are now concentrated in unburned areas. There has also been documentation of increased movements to previously unused areas such as the Mosquito Fork and Kechumstuk Mountain, northwest of a large burned area. Approximately 60–95% of the NCH continues to winter in subunit 20E.

In addition to winter habitat loss in subunit 20E, continued growth of the Fortymile caribou herd could also impact the NCH. A portion of the Fortymile herd uses this same area year round (Boertje and Gardner 2000) and winter competition has been increasing between these herds in recent years. The Fortymile herd has increased nearly 40% since 2001, and now exceeds 51,000. With the Fortymile Caribou Herd Harvest Management Coalition membership continuing to support further herd growth (Gross pers. comm.), competition will continue to increase and this winter range could become severely overgrazed. With limited lichen availability and increasing winter pressure on the unburned range by both herds, 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 state subsistence caribou hunts in Unit 13 have historically been 10 August–20 September and 21 October–31 March. A subsistence Tier II hunt (TC566) was held annually from RY90 to RY08. In RY09 a subsistence community hunt (CC001) and a limited registration hunt (RC566) were held; the bag limit was 1 bull for both hunts.

Since 1993 a limited state drawing hunt (DC590) for any caribou with season dates of 10 August–20 September also has 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 Units 11, 13, and 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.

Board of Game Actions and Emergency Orders.

In RY08 the Tier II hunt was closed early by emergency order 20 October; no winter season was held.

In March 2009, the Board of Game changed the Amount Reasonably Necessary for Subsistence (ANS) from 'all allowable surplus' to 600–1,000. This change allowed the board to replace the Tier II hunt with alternative subsistence hunting opportunities in RY09 because the allowable surplus exceeded 1,000.

Hunter Harvest. The total reported harvest from all NCH state and federal hunts has been relatively low since RY00 due to lower herd population estimates and lower herd quotas. The average annual take since then has been 1,575 caribou. The total take was 1,372 in RY08 and 796 in RY09 (Table 2).

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. The estimated illegal and unreported take has declined in recent years (Table 3) due to reduced hunting pressure with fewer permits being 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 is shot. 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. Wounding loss increases when large numbers of caribou migrate across the Richardson Highway during late October.

Permit Hunts. Nelchina caribou were harvested by 6 separate permit hunts during this reporting period. Permit and harvest data are presented in Table 2.

The state Tier II subsistence hunt (TC566) was the primary way of allocating harvests from the NCH through RY08, typically accounting for 60–90% of the total herd harvest. In RY08 2,500 Tier II permits were issued.

Unit 13 has long been one of the most popular areas to hunt caribou in the state, although the board heard complaints about the Tier II hunt year after year. In RY09, the subsistence community hunt (CC001) and the registration hunt (RC566) were established to provide alternate subsistence hunting opportunities. The community hunt was administered by Ahtna Inc. for local residents and others with ties to local villages. To participate in RC566, hunters were required to apply early. Permits were limited to one per household. There were 500 permits available in RY09, which were issued randomly.

Both hunts were limited to Alaska residents. Community hunters were limited to hunting caribou in Unit 13 and moose within the community hunt area (Units 11, 13, and a small portion of 12). Registration hunters were limited to hunting moose and caribou in Unit 13. Community hunters were required to salvage all edible meat, as well as the heart, liver, and kidneys. Registration and community hunters were required to cut the skull plate in half, or cut the antlers off at the main beam to destroy the trophy value; caribou antlers also had to be left at the kill site and could not be removed from the field until the season was closed.

The number of participants in Unit 13 federal registration hunts (RC 513/514) has been fairly stable over time. An average of 2,546 permits are issued for these hunts per year (RY99–RY09); no trends are evident. Each person is issued two permits. The harvest from these hunts has been variable in recent years, ranging from 273 to 615 (average = 439; RY05–RY09).

Federal hunting opportunity in Unit 13 is limited to unencumbered federal lands, those not 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. Caribou are also generally available in federal hunt areas during the winter season along the Denali Highway.

The 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 (USFWS) 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. Since it was established in RY90, the average take has been 21 caribou (range = 1–58). The harvest was 20 caribou in RY09.

The state drawing permit hunt (DC590) is for any caribou and is held in Unit 14B; it is not a subsistence hunt. The hunt is open to both residents and nonresidents. Up to 100 permits are issued and the bag limit is either sex, although bulls predominate the harvest. The overall take has been very low, ranging 8–24 animals the last 5 years.

The total reported harvest for the NCH in RY09 for all hunts was 796 (780 bulls, 14 cows, 2 unknown sex) caribou. The estimated illegal, unreported, and accidental take was 400 (Table 3).

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 Unit 14B under the drawing permit hunt. Of the drawing hunters, 98% have been Alaska residents (2005–2010).

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 through RY08. Most Tier II permits were issued to nonlocal Alaska residents (average = 90%; RY05–RY09). Nonlocal success rates averaged 59%, while local success rates averaged 35%.

While local residents harvested only a small proportion of the Tier II caribou taken, they had additional federal hunt opportunities that nonlocal residents did not have. Federal hunts (RC412, RC513, and RC514) are open only to residents of defined rural subsistence zones.

Of the community hunters in RY09, 20% were nonlocal. Of the registration hunters in RY09, 94% were nonlocal. Of all the community hunters, 79% were successful. Of all the registration hunters, 67% were successful. Community hunters were more successful than registration hunters largely due to a liberal designated hunter option where any community hunter could harvest caribou for any other community hunter.

Hunter effort varies somewhat between years, depending on caribou distribution and migration patterns in relation to the road system and hunter access points.

Harvest Chronology. The fall caribou season occurs in August and September and is the most popular time to hunt. 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 also subject to emergency closures in those years when the harvest quota is reached before the season is scheduled to end on 31 March. Harvest chronology by week for the Tier II hunt is listed in Table 5. The harvest in RY09 was relatively low, though the season remained open through the end of March. The harvest chronology was similar to the Tier II hunt in RY05 and RY06, with the majority of harvest occurring late in the fall hunt and early in the winter hunt as caribou crossed the Richardson Highway.

Transport Methods. During the early 1990s, highway vehicles were the most important method of transportation for hunting the NCH, but in RY94 the number of hunters using 4-wheelers began to climb. For successful Tier II subsistence hunters, 4-wheelers were the most popular method of transportation, followed by highway vehicles, snowmachines, and boats (Table 6; RY05–RY09). Aircraft and ORVs weighing over 1,500 pounds were prohibited in the Tier II hunt for the RY07 season. Aircraft is the primary transportation method in the Unit 14B drawing hunt (DC590).

The use of snowmachines has fluctuated widely and depends on both the length of the winter hunt and the availability of caribou. Considering 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 as the most important transportation method (average = 41%; RY05–RY09).

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.

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 since 2006 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 likely benefiting from an intensive wolf management program that has been ongoing in Unit 13 since 2001, originally implemented to improve moose numbers. While calf loss over the summer months has been lower on average since intensive management began, the herd benefits from lower wolf numbers year-round.

One factor that influences winter wolf predation rates 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 subunit 20E until April. Losses to wolf predation in Units 11 and 12 may be substantial, although wolves in subunit 20E have been reduced in recent years through an intensive wolf management program in that area (Gross 2009). The highest winter mortality documented in recent years was in the winter of 2008–2009, when 10 of 58 known radiocollared cows died (17%). Caribou were widely scattered and the snow was relatively deep; both factors tend to increase losses to predation.

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 in Unit 13. 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. While caribou regularly wintered in this area through the early 1970s (Bos 1974), there has been virtually no winter use of this area since then.

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). Beginning in the spring of 1992, short yearling (10-month) female calves have been captured and radiocollared annually in April to assess body condition and future age-specific productivity data. The average spring weight was 113lb (51.2 kg) between 1992 and 1995. The NCH weights were the lightest and most variable weights for the Interior caribou herds. When the two lowest average spring weights of 108lb and 105lb were documented back to back in 1994 and 1995 along with low parturition, it was determined that the range was being overgrazed and the decision was made to reduce the size of the herd. Beginning in 1995, 4-month female calf weights were also collected. From 1995 to 2000, the average NCH 4-month female calf weight was 115lb (52.2 kg) compared to 123 lb (55.9 kg) for the Fortymile herd and 126lb (57.3 kg) for the Delta herd (Patrick Valkenburg, ADF&G files). By comparing the Nelchina herd to adjacent Interior herds, it was clear that this herd had the poorest nutritional status.

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 calf weight was 135 lb (60.9 kg), the highest ever obtained in the NCH, but the fall 2008 average dropped to 115 lb (52.0 kg), one of the lowest. The high weights obtained in 2007 were attributed to a mild winter and a wet cool summer. In contrast, temperatures during the spring and summer of 2008 were the coldest on record, which delayed green-up considerably. Weights averaged 112 lb (50.9 kg) in 2009, but then improved to 129 lb (58.6 kg) in 2010.

While calf weights remain highly variable, the trend since the mid-1990s has been positive. Combined with increasing parturition and summer calf ratios, these changes suggest the herd reduction during the mid-1990s was the right decision. Although it has been nearly 15 years, it is conceivable the high numbers of caribou during that time had lasting impacts on range condition.

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 to historic 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 1990s. Between 1999 and 2009, the herd was maintained at or below the objective range. The most recent estimate of 44,985 in 2010 was above the objective range, however a large proportion of the population was < 1 year of age. With expected calf mortality and increased harvest quotas, the herd should return to the objective range within a year or two, and the lasting impact should be minimal.

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 preferred 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 in this area, 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 hard-rock mine adjacent to the Tangle Lakes in commonly used caribou fall and wintering habitat presents a potential threat to the NCH. In addition to this being an important rutting and migration area, in many years up to 2- or 3-thousand caribou remain in this area throughout the winter. Caribou have utilized this area most recently during the winters of 2005–2006, 2006–2007, and 2009–2010, 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 habitat by the NCH.

Resurrection of the Susitna-Watana Hydroelectric Project has also been discussed in recent years given increased costs of oil and natural gas. During Susitna Hydroelectric Big Game Project studies conducted in the 1980s, caribou were documented using the proposed dam site (Pitcher 1987), although not as consistently as they do now. Large numbers of Nelchina caribou have spent a considerable amount of time between late summer and winter in the Watana Creek area in recent years. As this project moves forward, it will again be necessary to fully evaluate the effects of a large hydroelectric dam on movements and habitat use by the NCH.

Additional management needs include: (1) monitoring range condition by continuing to monitor body condition parameters and productivity, (2) monitoring sources and rates of natural mortality, and (3) minimizing land use activities that adversely affect the range of the NCH.

CONCLUSIONS AND RECOMMENDATIONS

Although harvest quotas have been relatively low since 2000, the herd remained near the low end of the population objective through 2009. While the herd appeared to be increasing in 2004 and 2005, the harvest and natural mortality was ultimately too high, and the herd was unable grow further. With increased productivity, generally mild winters (with the exception of 2008–2009), and a reduction in harvest quotas in recent years the herd has improved.

With a formal estimate of nearly 45,000 caribou following the photo census conducted in 2010 , it appears the 2009 estimate was low and caribou were missed. To improve future counts, additional radio collars will be deployed. With more caribou radiocollared, the risk of missing small scattered groups declines. Harvest quotas will be increased to reduce the herd size to the population objective range over the next couple years.

Maintaining the NCH at or below the current population objective will continue to be the most important management tool to maintain range quality and long-term herd stability. If the herd remains above 40,000, productivity could decline. Likewise, if the Fortymile caribou herd continues to increase, there could be further negative impacts to the winter range in subunit 20E, and both herds could suffer. Overstocking could result in a prolonged period of low herd productivity (Messier et al. 1988, Cameron and Ver Hoef 1994).

Harvest quotas will continue to be adjusted annually to ensure herd growth or reduction so the population objective is maintained over the long term. Annual harvest quotas for cows and bulls should be based on annual recruitment, herd composition, and the population trend. Harvest quotas for the NCH can be successfully attained by adjusting the number of permits issued, as well as closing the season for bulls and cows separately by emergency order when the annual goal for each has been reached.

As the Board of Game continues to search for an acceptable long-term solution to allocation concerns, it will be important that the number of hunters in the field remains at a moderate level. Too many hunters in the field can lead to a large number of caribou taken in a very short period of time. Likewise, if hunting opportunity is restricted, too few hunters could lead to undesirable herd growth.

By managing this herd at near maximum sustained yield, the goal has been to stabilize annual harvest levels over the long term. Historical 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 the herd can be held at 35,000–40,000, given current rates of natural mortality, the projected annual harvests are expected to be about 1,000–2,200 caribou each year, with some years being as high as 3,500 given exceptional productivity and survival. In addition to stable harvestable surpluses for hunters, herd stability should provide a consistent prey supply for wolves, and may help reduce predation pressure on moose.

The NCH may be the only moderately sized caribou herd in the state 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. 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. Up to this point, this management strategy has been highly successful; however, it is critical that management adapt to changing annual conditions and observations. Caribou population dynamics are very difficult to predict, and often change course with little warning.

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.

___________ AND ___________. 2000. The Fortymile caribou herd: novel proposed management and relevant biology, 1992–1997. *Rangifer, Special Issue No.* 12:17-34.

Bos, G. N. 1974. Nelchina and Mentasta caribou reports, 1 January 1972–30 June 1974. Alaska Department of Fish and Game, Federal Aid Project Progress Report. Projects W-17-5 and W-17-6.

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 of Wildlife Management. 67(1):11–19.

Gross, J. A. 2009. Unit 20E wolf. Pages 185–196 *in* P. Harper, editor. Wolf management report of survey and inventory activities 1 July 2005–30 June 2008. Alaska Department of Fish and Game. Project 14.0. 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.

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.

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. 1987. Susitna Hydroelectric Project Final Report, Big Game Studies, Vol. IV Caribou. Alaska Department of Fish and Game. 58pp.

____________ 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.

Tobey, B. 2001. Unit 13 and 14B caribou management report. Pages 90-105 *in* C. Healy, editor. Caribou management report of survey and inventory activities 1 July 1998–30 June 2000. Alaska Department of Fish and Game. Project 3.0. Juneau, Alaska, USA.

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.

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Table 1. Nelchina caribou fall composition counts and estimated herd size, calendar years 2005 through 2010.

Year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Total bulls (%)	Composition Sample Size	Total adults	Fall estimate of herd size	Postcalving[a] count
2005	36	41	23	57	20	3263	28,071	36,428	36,993
2006	23	40	25	61	14	3,380	NA	34,699[b]	NA
2007	34	35	21	59	20	3,027	26,124	32,569	33,744
2008	39	40	22	56	22	3,378	NA	33,288[b]	NA
2009	42	29	17	58	25	3,076	28,198	33,837	33,146
2010	64	55	25	46	29	5,474	33,646	44,985	44,954

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

Table 2. Nelchina caribou harvest data by permit hunt, regulatory years 2005 through 2009.

Hunt No. /Area	Regulatory year	Permits Issued[b]	Percent did not hunt	Percent Successful Permits	Percent Unsuccessful Permits	Bulls	(%)	Cows	(%)	Unk.	Total Harvest
TC566	2005	4001	14%	54%	29%	1614	74%	548	25%	15	2177
	2006	5495	21%	46%	32%	1814	72%	685	27%	4	2503
	2007	3003	30%	32%	36%	693	72%	272	28%	1	966
	2008	2500	20%	42%	36%	787	75%	262	25%	4	1053
RC566	2009	500	15%	55%	27%	274	99%	3	1%	0	277
CC001	2009	477	35%	27%	34%	127	100%	0	0%	0	127
RC 513/514[a]	2005	2570	39%	24%	35%	369	60%	239	39%	7	615
	2006	2641	47%	22%	28%	319	56%	239	42%	14	572
	2007	2409	51%	16%	29%	258	67%	121	31%	6	385
	2008	2536	49%	11%	38%	180	66%	89	33%	4	273
	2009	2576	44%	14%	39%	341	98%	7	2%	0	348
RC412	2005	80	29%	16%	36%	6	46%	7	54%	0	13
	2006	53	32%	6%	53%	0	0%	3	100%	0	3
	2007	88	38%	20%	18%	11	61%	5	28%	2	18
	2008	147	37%	19%	26%	15	54%	13	46%	0	28
	2009	110	43%	18%	25%	18	90%	0	0%	2	20
DC590	2005	100	69%	8%	20%	6	86%	1	13%	1	8
	2006	100	71%	12%	16%	9	75%	3	25%	0	12
	2007	106	64%	22%	14%	19	83%	4	17%	0	23
	2008	100	60%	18%	20%	12	67%	6	33%	0	18
	2009	100	62%	24%	14%	20	83%	4	17%	0	24
Totals for all permit hunts	2005	6751	24%	42%	31%	1995	71%	795	28%	23	2813
	2006	8289	30%	37%	31%	2142	69%	930	30%	18	3090
	2007	5606	40%	25%	32%	981	70%	402	29%	9	1392
	2008	5283	35%	26%	36%	994	72%	370	27%	8	1372
	2009	3763	39%	21%	35%	780	98%	14	2%	2	796

[a] Federal subsistence registration hunts; bag limit was 2 caribou, so percentages are related to permits, not hunters.

[b] Not all permits were returned; percentages are based on all permits issued.

Table 3. Nelchina caribou harvest and accidental death, regulatory years 2005 through 2009.

Regulatory Year	Reported						Estimated			
	M	(%)	F	(%)	Unk.	Total	Unreported	Illegal	Accidental death	Total
2005	1995	72%	795	28%	23	2813	400	200	200	3613
2006	2142	70%	930	30%	18	3090	400	200	200	3890
2007	981	71%	402	29%	9	1392	200	100	200	1891
2008	994	73%	370	27%	8	1372	200	100	200	1872
2009	780	98%	14	2%	2	796	100	100	200	1196

Table 4. Nelchina caribou Tier II hunt (TC566) annual hunter residency and success, regulatory years 2005 through 2008.

	Successful				Unsuccessful				
Regulatory year	Local[a] resident	Nonlocal resident	Total	%	Local[a] resident	Nonlocal resident	Total	%	Total hunters
2005	125	2052	2177	65%	158	1016	1174	35%	3351
2006	130	2373	2503	59%	186	1578	1764	41%	4267
2007	53	913	966	47%	136	933	1069	53%	2035
2008	72	981	1053	54%	192	710	902	46%	1955

[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 2005 through 2008.

	Harvest Periods														
	Weeks (fall)								Months (winter)						
Regulatory year	1	2	3	4	5	6	7	8	Oct	Nov	Dec	Jan	Feb	Mar	n
2005	0	4	7	7	8	12	12	10	16	6	3	3	3	8	2100
2006	0	7	8	5	8	13	15	14	11	8	4	3	4	0	2444
2007	1	11	12	9	13	16	22	17	--	--	--	--	--	--	942
2008	0	9	10	11	15	23	15	16	--	--	--	--	--	--	1022

Table 6. Nelchina caribou hunt TC566 harvest percent by transport method, regulatory years 2005 through 2008.

	Percent of harvest								
Regulatory Year	Airplane	Horse	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Airboat	n
2005	4	0	6	37	12	10	29	1	2149
2006	5	0	8	38	10	9	29	1	2480
2007[a]	0	0	8	62	0	8	19	2	962
2008	3	1	11	51	0	11	22	1	1044

[a] Aircraft and vehicles weighing over 1500 lbs illegal in RY07.

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 2008
To: 30 June 2010[1]

LOCATION

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

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 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 (Perry 2009).

The Andreafsky caribou herd (ACH) existed in Unit 18 north of the Yukon River until the mid 1980s. The origin of this small herd was 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 17B and 19B. 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

[1] This report contains data collected outside the report period at the discretion of the reporting biologist.

KCH. Our current interpretation is that the KCH has been assimilated by the MCH, and caribou hunting regulations in Unit 18 reflect that interpretation.

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. Monitoring will also be used to address questions of herd identity and determine other population parameters of caribou using Unit 18.

METHODS

We continued the ongoing cooperative caribou study with federal agencies and participated in preparation of a manuscript being submitted for publication, though this work was primarily accomplished by other agencies. We also met with other agencies with an interest in MCH caribou to coordinate our resources and efforts more efficiently.

We assisted with fall sex and age composition surveys in the Kilbuck Mountains during October 2008. Two observers and a pilot used an R44 helicopter to sample caribou for composition. A fixed-wing Cessna 206 aircraft equipped with radiotelemetry equipment was used to locate groups of caribou throughout the area. We assisted a similar composition survey during October 2009, using a Maule M-7 airplane to complete radiotracking flights.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The KCH was small but growing and was expanding its range when approximately 35,000 Mulchatna caribou overran it in September–October 1994. Since this event there have been influxes of Mulchatna caribou varying from 10,000 to 40,000 animals annually.

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; in general, the MCH has declined steadily since the mid 1990s.

Population Composition

Results of MCH composition surveys in Unit 18 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

<u>Season and Bag Limit</u>

2008–2009 and 2009–2010 Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
RESIDENT HUNTERS:		
2 caribou; however, no more than 1 bull may be taken, and only 1 caribou may be taken from 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 March 2007 meeting, the Board of Game changed the caribou season throughout Unit 18 so that beginning in 2007–2008, the resident season will be 1 August–15 March with a bag limit of 2 caribou, but no more than 1 bull may be taken and only 1 caribou can be taken from 1 August to 31 January. During the March 2009 Board of Game meeting the nonresident season was eliminated.

Hunter Harvest. In 2008–2009, 235 successful hunters reported killing 252 caribou. These included 148 bulls, 102 cows, and 2 of unrecorded sex. In 2009–2010, 212 successful hunters reported killing 223 caribou, including 159 bulls, 62 cows, and 2 of unrecorded sex. In both years the proportion of bulls harvested was high in fall but nearly equal to the proportion of cows harvested in winter.

In general harvest reporting remains poor, and the value of our reported harvest data for resident hunters is limited. Only hunters using aircraft to access hunting areas have shown a consistent pattern of high reporting rates. Coffing et al. (2000) reported 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 2008–2009 season, 4 nonresident hunters (50%) were successful, while 231 residents (77%) reported taking at least one caribou. In 2009–2010 212 residents (64%) 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 timing and pattern of reported harvest. During 2008–2009, 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 2008–2009. 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 were probably due to better winter travel conditions and caribou movements that placed them within proximity of communities that could take day trips and successfully harvest caribou. In 2009–2010 snow was absent, or nearly so, from late November until late February.

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

Transport Methods. During the open water months, many caribou were reported taken using boats (16 in 2008–2009 and 32 in 2009–2010), and fewer numbers were reported taken using airplanes (12 in 2008–2009 and 12 in 2009–2010). Nonresidents used airplanes almost exclusively.

During the winter months, caribou were typically taken using snowmachines (227 in 2008–2009 and 192 in 2009–2010) 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 Fish and Game Advisory Committees and the Federal Regional Advisory Council. 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 population trend of the MCH. 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.

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.

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

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Table 1. Monthly chronology of reported caribou harvest in Unit 18, 2000–2001 to 2009–2010[a].

	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		
2008		3	15	9	15	36	19	36	114	2		
2009		3	11	10	42	39	16	43	53	4		

[a] Harvest reports without month of take are excluded.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[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 (Murie, 1935). 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, the bulk of this herd retreated to the south (Whitman 1997). The Mulchatna herd declined substantially from over 200,000 animals in the mid 1990s to 45,000 by July 2006 (Woolington 2009).

Several small herds continue to 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. Herds north of the Kuskokwim River include the Beaver Mountains (previously called Kuskokwim Mountains) and Sunshine Mountains herds.

Significant numbers of caribou from the Western Arctic herd have been located in Unit 21E as recently as the early 1990s (Machida, 1995). Also, large numbers of caribou from the Mulchatna

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

and Western Arctic herds have used Unit 21E during the same time (L. Van Daele, ADF&G, unpublished memo, 1998). However, coincident with the return of caribou to the Seward Peninsula during the mid to late 1990s, (Dau, 2001) caribou became rare in Unit 21E. Hunting effort and harvest for the 5 McGrath area caribou herds has been low.

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

We conducted a minimum population count in June 2009 for the Sunshine and Beaver Mountains herds and a partial survey of the Alaska Range herds in conjunction with sheep surveys in June 2010. 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. We enumerated caribou observed from the air and recorded their numbers and locations. Current population size and recent trends in abundance for McGrath area caribou herds are also inferred from incidental observations and hunter information.

Population and harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY08 = 1 July 2008–30 June 2009). These data do not include Unit 19 Mulchatna herd harvest, which is reported elsewhere (Woolington 2011).

The statewide harvest reporting system is used to estimate harvest. In RY98, the department 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.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Beaver Mountains. The Beaver Mountains caribou herd declined from up to 3000 caribou in the 1960s to several hundred in the 1990s. In June 2007, approximately 125 caribou were believed to be present in this herd (Peirce 2009). During a June 2009 survey, 77 caribou were seen in the Beaver Mountains. Including an estimate of caribou missed during the survey, we estimate that the Beaver Mountains herd is stable at 100–150.

Sunshine Mountains. The Sunshine Mountains herd also declined between the 1960s and 1990s (Peirce 2009). In June 2007, approximately 75 caribou were believed to be present in this herd (Peirce 2009). During a June 2009 survey we observed 81 caribou in the range of the Sunshine Mountains herd. Including an estimate of caribou missed during the survey, we estimate that this herd is stable at 100–125.

Rainy Pass, Big River–Farewell, Tonzona. During RY04–RY05, the Rainy Pass caribou herd may have numbered as many as 1,500–2,000 caribou; the Big River–Farewell herd likely included up to as many as 750–1,500; and the Tonzona herd was estimated at 750–1,000 animals. All of these herds had declined to lower levels by RY06–RY07 (Peirce 2009).

We have few data, but observations suggest that RY08–RY09 population levels of the Rainy Pass, Big River–Farewell, and Tonzona herds were lower than in RY04–RY05. During June 2008 we observed 55 caribou and during June 2010 we observed 16 adult caribou during sheep surveys within portions of the ranges of the Tonzona, Rainy Pass, and Big River–Farewell herds. These data are consistent with hunter reports of fewer caribou within these areas. This leads us to believe that these populations were likely much lower during RY08–RY09 than in RY04–RY05.

Population Composition

No composition surveys were conducted during RY08–RY09.

Distribution and Movements

Beaver Mountains. Current distribution of the Beaver Mountains herd is thought to include habitats from Swinging Dome in the south through the Beaver Mountains to the Innoko River in the north. We find caribou here during summer surveys but their range may extend beyond these areas. Few movement data are available but reports by the public indicate that caribou are found west of the Beaver Mountains. This information is corroborated by our observation of caribou tracks during winter surveys for other species.

In the early 1980s, Pegau (1986) radiocollared caribou in the Beaver and Sunshine Mountains. Radiocollared caribou from the Beaver Mountains ranged south almost to Horn Mountain. Calving was in the Beaver Mountains, but postcalving groups occurred throughout the herd's range. Wintering areas included 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 and from the Innoko River 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. 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 regularly observed on the Nixon Flats throughout RY08–RY09.

During a survey of the Beaver Mountain and Sunshine Mountain herd ranges in June 2009, small groups of caribou were found continuously and it was possible that there was mixing of these 2 herds. However, Pegau (1986) did not document range overlap between these herds during his 4-year study.

Tonzona. We do not have current data on range, movement, or distribution of this herd. However, Del Vecchio et. al. (1995) reported that the Tonzona herd was distinct from the Denali herd and that its range was from the Herron River to the lower Tonzona River near Telida and north to Otter Lake; summer concentrations were found in the foothills of the Alaska Range; and winter range consisted of lower elevation areas from Telida up the Swift River and north to the Otter Lake area.

Big River–Farewell. There is little recent data on the range of the Big River–Farewell herd. It is thought to include habitats from the South Fork Kuskokwim River near Farewell southwest to the Swift River. Summering areas are in the foothills of the north side of the Alaska Range. Wintering areas are in the flats north of the summer range.

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.

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 during RY08–RY09.

Herd/Unit/Bag limit	Resident open seasons	Nonresident open seasons
Mulchatna, Beaver Mountains		
RY08		
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

Herd/Unit/Bag limit	Resident open seasons	Nonresident open seasons
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
RY09		
Unit 19A and Unit 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:		No open season
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;	10 Aug–20 Sep	
or 1 caribou;	1 Nov–31 Jan	
or 5 caribou.	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

Herd/Unit/Bag limit	Resident open seasons	Nonresident open seasons
Beaver Mountains, Western Arctic herd 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. Restrictions in seasons and bag limits in Units 19A and 19B were made during RY06–RY07 due to the decline of the Mulchatna caribou herd (Peirce 2009) and continued through RY08. Beginning in RY09, the remainder of caribou hunting seasons in Units 19A and 19B were closed to nonresident hunters.

Harvest by Hunters. Reported harvest remained low for local caribou herds in the McGrath area during RY05–RY09 (Table 1). Hunter effort also remained low, with an average of 101 hunters annually over the same period (Table 2a). In general, harvest and effort fluctuated by herd during RY05–RY09, but remained low (Tables 2b–2g). The average harvest during RY05–RY09 was 22 animals, of which 97% were bulls (Table 1). Most caribou harvested in Units 19A and 19B were from the Mulchatna herd, although changing movement patterns and a recent dramatic decline of Mulchatna caribou (Woolington 2009) have affected harvest of this herd.

Hunter Residency and Success. During RY05–RY09, local hunters, defined as hunters from Units 19C, 19D, 21A and 21E, took 7% of the reported harvest of local caribou herds. Hunters from communities within Unit 19A were not included among local hunters because they reside within the range of the Mulchatna herd. During RY05–RY09, nonlocal residents took 50%, nonresidents took 39%, and hunters with unknown residency took 4% of harvested animals (Table 2a).

Harvest Chronology. Nearly all caribou harvested during RY05–RY09 were taken in August (29%) and September (70%; Table 3).

Transport Methods. Aircraft were the most common means of hunter transportation to access all McGrath area caribou herds. During RY05–RY09, 71% of successful caribou hunters used aircraft. Three- or 4-wheelers (15%) were the next most commonly used method of transportation followed horses (12%). Only 3% of successful caribou hunters used boats (Table 4).

Other Mortality

No specific data were collected concerning natural mortality rates or factors during RY08–RY09.

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 remained low during RY08–RY09 for all McGrath area caribou herds and management objectives were met. The Big River–Farewell herd was managed to provide for a harvest of up to 100 bull caribou and an average of 7 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 11. 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.

During RY08–RY09 the number of caribou hunters in the area declined. This change most likely reflects the small size of the McGrath area caribou herds and may be influenced by the tendency for most caribou harvest to be opportunistic during hunts for other species. No changes are recommended.

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.

DAU, J. 2001. Units 21D, 22A, 22B, 23, 24, and 26A caribou. Pages 181–218 *in* C. Healy, editor. Caribou management report of survey and inventory activities 1 July 1998–30 June 2000. 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.

MACHIDA, S. 1995. Units 21D, 22A, 22B, 23, 24, and 26A caribou. Management report of survey-inventory activities 1 July 1992 through 30 June 1994. Pages 157 – 175 in M. V. Hicks, editor. Alaska Department of Fish and Game. Study 3.0. Juneau, Alaska.

MURIE, O. J. 1935. Alaska–Yukon Caribou. U.S. Department of Agriculture, Bureau of Biological Survey, North American Fauna, No. 54.

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.

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.

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.

WHITMAN, J. S. 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. 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.

WOOLINGTON, J. D. 2011. Mulchatna caribou management report, Units 9B, 17, 18 south, 19A & 19B. Pages 11–32 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. Alaska Department of Fish and Game. Juneau, Alaska.

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TABLE 1 McGrath area[a] caribou harvest by herd, regulatory years 2005–2006 through 2009–2010.

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
2005–2006	1	0	1	3	1	4	6	1	7	0	0	0	2	0	2	1	0	1	13	2	15
2006–2007	0	0	0	13	0	13	8	0	8	0	0	0	1	0	1	2	1	3	24	1	25
2007–2008	0	0	0	9	0	9	12	0	12	0	0	0	1	0	1	1	0	1	23	0	23
2008–2009	1	0	1	5	0	5	11	0	11	0	0	0	1	0	1	3	0	3	21	0	21
2009–2010	0	0	0	9	0	9	11	0	11	0	0	0	2	0	2	3	0	3	25	0	25

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

TABLE 2A McGrath area[a] caribou herds hunter residency and success, regulatory years 2005–2006 through 2009–2010.

	Successful					Unsuccessful					
Regulatory year	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total (%)	Total hunters
2005–2006	2	8	4	1	15 (14)	1	60	27	2	90 (86)	105
2006–2007	2	13	10	0	25 (23)	2	56	25	1	84 (77)	109
2007–2008	3	14	6	0	23 (23)	1	51	26	0	78 (77)	101
2008–2009	0	10	10	1	21 (21)	3	45	27	2	77 (79)	98
2009–2010	1	10	12	2	25 (27)	4	44	15	5	68 (73)	93

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

TABLE 2B Beaver Mountains caribou herd hunter residency and success, regulatory years 2005–2006 through 2009–2010.

	Successful					Unsuccessful					
Regulatory year	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Total hunters
2005–2006	0	1	0	0	1 (14)	0	5	1	0	6 (86)	7
2006–2007	0	0	0	0	0 (0)	1	11	2	0	14 (100)	14
2007–2008	0	0	0	0	0 (0)	0	10	6	0	16 (100)	16
2008–2009	0	0	1	0	1 (11)	0	5	3	0	8 (89)	9
2009–2010	0	0	0	0	0 (0)	2	2	0	0	4 (100)	4

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

TABLE 2C Big River caribou herd hunter residency and success, regulatory years 2005–2006 through 2009–2010.

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2005–2006	2	2	0	0	4 (8)	2	27	14	1	44 (92)	48
2006–2007	2	8	3	0	13 (33)	0	21	5	0	26 (67)	39
2007–2008	3	4	2	0	9 (24)	1	18	10	0	29 (76)	38
2008–2009	0	2	3	0	5 (15)	1	18	10	0	29 (85)	34
2009–2010	1	2	6	0	9 (25)	0	20	6	1	27 (75)	36

TABLE 2D Rainy Pass caribou herd hunter residency and success, regulatory years 2005–2006 through 2009–2010.

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2005–2006	0	4	2	1	7 (21)	0	19	7	1	27 (79)	34
2006–2007	0	5	3	0	8 (20)	1	16	14	1	32 (80)	40
2007–2008	0	8	4	0	12 (32)	0	20	5	0	25 (68)	37
2008–2009	0	7	3	1	11 (31)	0	14	10	1	25 (69)	36
2009–2010	0	6	3	2	11 (38)	0	10	4	4	18 (62)	29

TABLE 2E Sunshine Mountains caribou herd hunter residency and success, regulatory years 2005–2006 through 2009–2010.

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	
2005–2006	0	0	0	0	0 (0)	0	1	1	0	2 (100)	2
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
2008–2009	0	0	0	0	0 (0)	0	1	0	0	1 (100)	1
2009–2010	0	0	0	0	0 (0)	0	0	0	0	0 0	0

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

TABLE 2F Tonzona caribou herd hunter residency and success, regulatory years 2005–2006 through 2009–2010.

	Successful					Unsuccessful					
Regulatory year	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Total hunters
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
2008–2009	0	0	1	0	1 (50)	0	1	0	0	1 (50)	2
2009–2010	0	0	2	0	2 (67)	0	1	0	0	1 (33)	3

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

TABLE 2G Hunter residency and success for caribou where herd identification was not known, regulatory years 2005–2006 through 2009–2010.

	Successful					Unsuccessful					
Regulatory year	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[a]	Nonlocal resident	Nonresident	Unk	Total (%)	Total hunters
2005–2006	0	1	0	0	1 (9)	0	6	4	0	10 (91)	11
2006–2007	0	0	3	0	3 (27)	1	7	0	0	8 (73)	11
2007–2008	0	1	0	0	1 (17)	0	2	3	0	5 (83)	6
2008–2009	0	1	2	0	3 (19)	2	6	4	1	13 (81)	16
2009–2010	0	2	1	0	3 (14)	2	11	5	0	18 (86)	21

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

TABLE 3 McGrath[a] area caribou harvest chronology by month, regulatory years 2005–2006 through 2009–2010.

Regulatory year	Harvest chronology by month: Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Unk	*n*
2005–2006	5	9	0	0	0	0	0	1	0	15
2006–2007	5	20	0	0	0	0	0	0	0	25
2007–2008	8	15	0	0	0	0	0	0	0	23
2008–2009	7	14	0	0	0	0	0	0	0	21
2009–2010	7	18	0	0	0	0	0	0	0	25

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

TABLE 4 McGrath[a] area transportation method of successful caribou hunters, regulatory years 2005–2006 through 2009–2010.

Regulatory year	Harvest by transport method: Airplane (%)	Horse (%)	Boat (%)	3- or 4-Wheeler (%)	Snowmachine (%)	ORV (%)	Highway vehicle (%)	Unk (%)	*n*
2005–2006	9 (60)	1 (7)	1 (7)	4 (27)	0 (0)	0 (0)	0 (0)	0 (0)	15
2006–2007	19 (76)	2 (8)	1 (4)	3 (12)	0 (0)	0 (0)	0 (0)	0 (0)	25
2007–2008	12 (52)	5 (22)	1 (4)	5 (22)	0 (0)	0 (0)	0 (0)	0 (0)	23
2008–2009	17 (81)	2 (10)	0 (0)	2 (10)	0 (0)	0 (0)	0 (0)	0 (0)	21
2009–2010	20 (80)	3 (12)	0 (0)	2 (8)	0 (0)	0 (0)	0 (0)	0 (0)	25

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

CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[1]

LOCATION

GAME MANAGEMENT UNIT: 20A (6,796 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, north and south 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 1,500–2,500 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 4,000. Valkenburg et al. (1996) present a detailed analysis of the decline. The herd continued a slow decline and dropped to less than 3,000 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 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 the public reduced wolf

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

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. Research on and enhancement of Delta caribou were regional priorities for the Alaska Department of Fish and Game (ADF&G, department) 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 5,000–7,000 caribou.
- Sustain an annual harvest of 300–700 caribou.

METHODS

Population Status and Trend Population Census

In 2008 we conducted a census of the Delta caribou herd on 5 July, using the radio-search technique (Valkenburg et al. 1985). The herd was surveyed using 4 fixed-wing aircraft with pilot–observer teams. Two of the aircraft also used radiotracking equipment to locate caribou. Searching began at approximately 10:20 AM. Temperature at 5000 feet elevation was 50°F and skies were clear. 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 Unit 20A boundary to the south.

Photos were taken from a DeHavilland Beaver with the large format camera and from one of the radiotracking planes with a handheld digital camera. Caribou in large-format photographs were counted using an 8-power loupe. Caribou in the digital images were magnified on computers screens and counted.

In 2009 we conducted a census of the Delta caribou herd on 6 July using the radio-search technique (Valkenburg et al. 1985). The herd was surveyed using 5 fixed-wing aircraft with pilot–observer teams. Three of the aircraft also used radiotracking equipment to locate caribou. Biologists in one of the aircraft (a DeHavilland Beaver fitted with an externally-mounted high quality digital camera) conducted all photography.

Searching began at approximately 7:30 AM. Temperatures were 60–70°F, skies were clear, and winds were light. Light smoke was present in the survey area. 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 Unit 20A border to the south. On the day following the survey, a radiotracking plane located all radio collars that were south of the Unit 20A boundary, and thoroughly radiotracked the entire search area to account for any radio collars missing the previous day.

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 fixed-wing 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 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

During the 2008 photo census we counted 2,078 caribou (Table 1) in 26 groups ranging in size from 1 to 1,189 caribou. We accounted for 31 of 48 potentially active radio collars within the search area. Factors that may have led to few radio collars being detected include: 1 of the 2 aircraft with radiotracking equipment had technical difficulties with that equipment, several radio collars were located within large groups of Nelchina caribou in Unit 13, and failure rate of radio collars was very high at that time because a large portion of radio collars had been deployed 5 or more years earlier.

During the 2009 photo census we counted 1,764 caribou (Table 1) in 43 groups ranging in size from 1 to 783 caribou. We photographed 5 large groups (>50 caribou). Caribou in the digital images were magnified on computer screens and counted. We accounted for all of 30 active radio collars, inside and outside the search area. Nine of the 30 radio collars were in the Deadman Creek drainage of Unit 13, 30 miles south of Unit 20A (5–20 miles south of the Denali Highway), with an estimated 10,900 caribou. If we optimistically assume that the Delta herd caribou in Unit 13 will ultimately return to Unit 20A and if each Delta herd radio collar found in Unit 13 represented the same number of caribou as in Unit 20A (84), we can estimate the Delta herd population at 2,520 caribou.

The Delta herd declined from more than 10,000 in 1989 to less than 4,000 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 4,646 caribou in 1995 to 2,211 caribou in 2004 (Table 1). Weather precluded completion of a census in 2005 and 2006. By 2007 the herd increased to approximately 2,985 caribou, an increase of 774 caribou (35%) from the 2004 census. This estimate and much improved fall calf:cow ratios during 2004–2007 are the first indications that the herd may have been increasing. In 2008 and 2009, the minimum herd counts appeared to decline. However, both of these estimates were rife with difficulties, including radio collars failing on a monthly basis due to old age; as much as half the herd spent time mixed with the Nelchina herd outside of Unit 20A; and several photocensus aircraft were used without radiotracking gear. In future years, the failure rate of radio collars will be stabilized, movements of the Delta herd into Unit 13 will be better understood, and more aircraft will be equipped with radiotracking equipment.

Population Composition

In fall 2008 we did not complete a composition survey because of poor weather when helicopters were available for charter.

In fall 2009 we classified 642 caribou: 50 large bulls, 67 medium bulls, 82 small bulls, 382 cows, and 61 calves (Table 1). The largest number of caribou classified from a single group was 80, the smallest was a group of 2, and mean group size was 16. The 2009 calf:cow ratio was 16:100.

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 1993, and since 1994 was highest in 2009 (13 large bulls:100 cows). 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 these low calf:cow ratios were primarily the result of 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 during 2004–2007 were 4 of the 5 highest since the population declined during the 1990s. In 2009, calf recruitment was again low at 16 calves:100 cows, similar to the low levels observed in RY97–RY01.

Radio collars are maintained in the herd every year to aid in population and composition surveys. The goal is to keep 30–40 active radio collars in the herd. When female calf caribou are captured at 10 months of age in April, they are weighed (Table 2) and these weights are compared to previous weights for the Delta Herd (Valkenburg et al. 2002) to help us track nutritional status of the herd. No caribou were captured in 2008 or 2009 because the number of radio collars in the herd had been adequate. Long-term research directed at the Delta caribou herd through 2001 included assessing natality, data for which wa also collected in some subsequent years (Table 3).

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 river 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 near Donnelly Dome and Donnelly Flats. During RY06–RY09, radiocollared caribou from the Delta herd were often found south of the Alaska Range in the Susitna River 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 the Delta caribou 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 River 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 (RY08 and RY09).

	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 improved 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 were taken or emergency orders issued for the Delta herd during RY08–RY09.

Permit Hunts. We issued 75 permits annually in RY96 and RY97, 100 permits annually during RY98–RY03, and 150 permits annually during RY04–RY09. 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 4). Permittees who did not hunt decreased to 33% in RY09. Success rates of those who hunted have ranged between 35% (RY00) and 71% (RY97). Success rates in RY08–RY09 averaged 47%, similar to the average during RY00–RY07 (48%). 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 Alaska resident and nonresident hunters (22 caribou) surpassed that of local residents (15 caribou) for the first time since the hunt began in RY96 (Table 5). During RY03–RY07 the comparison between the two groups stabilized with an average of 20 caribou taken by nonlocal resident and nonresident hunters and an average of 20 taken by local resident hunters. In RY08–RY09 nonlocal residents harvested more caribou ($\bar{x}$ = 27) than locals ($\bar{x}$ = 19). Success rates of nonresident hunters (76%) continued to be higher in RY08–RY09 than that of local and nonlocal resident hunters (44%). 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 RY08–RY09, 24% (4/17) of nonresident hunters reported using a guide compared to 0% (0/179) of resident hunters.

Harvest Chronology. No clear trends were apparent in harvest chronology for RY96–RY09 (Table 6). 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–RY09) was 3- or 4-wheeler followed by aircraft, other off-road vehicle (ORVs), horse, highway vehicle, and boat (Table 7).

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 would have 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 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/1,000 km^2 or 38–41 wolves/1,000 mi^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 5,000–7,000, and to sustain an annual harvest of 300–700 caribou. Research on the Delta herd, including analysis of fecal samples and condition of caribou, would 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 to 200 drawing permits for hunt DC827 because harvest of bulls had been below the recommended allowable harvest of 2–3% annually. In RY08 and RY09 we achieved a harvest rate of 2.4% and 2.8%, respectively, of the caribou surveyed in Unit 20A. 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.

The mixing of Delta herd caribou and Nelchina caribou poses a significant management challenge. If Delta herd caribou are susceptible to hunting seasons intended for the Nelchina herd, then they are functionally, for management purposes, Nelchina herd animals. Several radiocollared Delta herd animals spend most of the year with the Nelchina herd, and some have been moving back and forth on a regular basis. At this time there appears to be no pattern to their movements or mixing. Since we cannot tell what proportion of a group of caribou in Unit 13 is Nelchina caribou and what proportion is Delta caribou, we have begun to use hunt boundaries, rather than calving distribution, to nominally define herd membership. We chose to draw the line at the subunit boundary, so that the population estimate area matches the areas designated in the hunting seasons.

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.

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TABLE 1 Delta caribou fall composition counts and estimated population size, 1983–2009.

Composition 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	17	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
2008	–[e]	–[e]	–[e]	–[e]	–[e]	–[e]	–[e]	–[e]	–[e]	–[e]	2078[f]	–[e]
10/12/09	52	13	16	10	60	41	34	25	31	642	1764[f]	36

[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] Survey was not conducted due to weather conditions.
[f] Includes only caribou within 20A.

TABLE 2 Mean weight of samples of 4- and 10-month-old female calves from the Delta caribou herd, 1979–2011.

Year[a]	10-month-olds				4-month-olds			
	$\bar{x}$ (lb)	$\bar{x}$ (kg)	$s_{\bar{x}}$ (lb)	n	$\bar{x}$ (lb)	$\bar{x}$ (kg)	$s_{\bar{x}}$ (lb)	n
1979	132.3	60.1	2.4	11				
1981	137.0	62.1	7.4	5				
1982	135.1	61.3	3.9	11				
1983	137.2	62.2	3.3	13				
1984	126.9	57.5	1.3	14				
1987	120.8	54.8	2.8	9				
1988	131.3	59.6	2.9	12				
1989	133.6	60.6	2.7	9				
1990	119.9	54.4	3.3	9				
1991	113.1	51.3	2.3	9	127.6	57.9	2.6	14
1992	119.1	54.0	2.6	17	119.1	54.0	2.6	17
1993	122.3	55.5	2.9	12	122.9	55.8	3.0	11
1994[b]					131.4	59.6	3.0	15
1995	123.1	55.8	2.7	15	131.1	59.5	2.7	15
1996	120.8	54.8	3.3	15	123.0	55.8	3.0	14
1997	118.3	53.7	2.5	14	128.3	58.2	2.2	20
1998	123.7	56.1	3.0	12	124.4	56.4	2.6	16
1999	116.7	52.9	2.6	13	126.0	57.1	2.9	14
2000	114.9	52.1	2.6	12	124.7	56.6	4.0	14
2001	122.2	55.4	3.2	11	126.0	57.1	2.4	14
2002	130.0	59.1		15	119.7	54.4		15
2003	117.5	53.4		15	126.3	57.4		16
2004	129.4	58.8		14	132.4	60.2		15
2005	127.2	57.8		14				
2007	121.9	55.4		11				
2008								
2009								
2010	123.8	56.2	1.7	7				
2011	123.0	55.9	2.5	15				

[a] Years 1979–2001 come from Valkenburg et al 2002. [b] There were too few calves to obtain a sample of 10-mo-olds in April 1994.

TABLE 3 Natality rates of radiocollared known-aged Delta Herd caribou[a] females observed in late May 1980–2007.

Year	Proportion parturient (%) in late May						
	Yearlings	2-year-olds	3-year-olds	4-year-olds	5-year-olds	≥6-year-olds	All cows 3 years and older
1980		7/11 (64)					
1981	0/7 (0)	1/1 (100)	10/13 (77)				10/13 (77)
1982	0/10 (0)	0/7 (0)	2/2 (100)	5/8 (63)			7/10 (70)
1983	0/12 (0)	1/8 (13)	7/7 (100)		6/8 (75)		13/15 (87)
1984	0/12 (0)	0/11 (0)	8/9 (89)	6/6 (100)	1/1 (100)	6/7 (86)	21/23 (91)
1985		1/9 (11)	9/10 (90)	6/7 (86)	6/6 (100)	7/8 (88)	28/31 (90)
1986			8/9 (89)	9/9 (100)	3/4 (75)	8/9 (89)	28/31 (90)
1987	0/6 (0)	0/2 (0)		8/8 (100)	8/9 (89)	9/11 (82)	25/28 (89)
1988	0/11 (0)	0/5 (0)	1/1 (100)		8/8 (100)	15/16 (94)	24/25 (96)
1989	0/10 (0)	0/11 (0)	3/5 (60)	2/2 (100)		21/23 (91)	26/30 (87)
1990		0/4 (0)	6/10 (60)	5/6 (83)	0/1 (0)	17/17 (100)	28/34 (82)
1991	0/4 (0)		2/7 (29)	8/10 (80)	3/3 (100)	11/14 (79)	24/34 (71)
1992	0/16 (0)	0/5 (0)	0/1 (0)	6/7 (86)	8/8 (100)	12/12 (100)	26/28 (93)
1993	0/11 (0)	0/10 (0)	0/5 (0)	0/1 (0)	1/3 (33)	6/15 (40)	7/24 (29)
1994	0/10 (0)	0/12 (0)	2/9 (22)	4/5 (80)	1/1 (100)	13/15 (87)	20/30 (67)
1995	0/13 (0)	0/7 (0)	7/11 (64)	8/8 (100)	4/5 (80)	13/13 (100)	32/37 (86)
1996	0/16 (0)	1/11 (9)	5/5 (100)	9/10 (90)	6/6 (100)	15/16 (94)	35/37 (95)
1997	0/12 (0)	0/11 (0)	5/10 (50)	3/4 (75)	8/9 (89)	16/17 (94)	32/40 (80)
1998	0/17 (0)	1/8 (13)	9/10 (90)	7/7 (100)	3/3 (100)	18/22 (82)	37/42 (88)
1999	0/10 (0)	1/13 (8)	6/7 (86)	5/7 (71)	7/7 (100)	16/17 (94)	34/38 (89)
2000	0/9 (0)	0/10 (0)	8/12 (66)	5/5 (100)	6/6 (100)	14/18 (78)	33/41 (80)
2001	0/15 (0)	1/7 (14)	2/8 (25)	8/10 (80)	4/6 (67)	15/17 (88)	29/41 (71)
2002	0/9 (0)	2/11 (18)	3/6 (50)	8/9 (89)	11/11 (100)	11/13 (85)	33/39 (85)
2003		1/8	5/8	4/6	8/9	17/20	34/43 (79)
2004		1/12	5/6	4/4	4/5	19/20	32/35 (91)
2005		0/4	11/13	6/8	7/7	19/21	43/49 (88)
2006		1/4	3/4	5/7	5/5	19/20	32/36 (89)
2007			3/6	3/3	4/6	19/23	29/38 (76)

TABLE 4 Delta caribou harvest data by permit hunt, regulatory years 1996–1997 through 2009–2010.

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 (97)	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
	2008–2009	150	54 (36)	53 (55)	43 (45)	43 (100)	0 (0)	0 (0)	43
	2009–2010	150	50 (33)	51 (51)	49 (49)	49 (100)	0 (0)	0 (0)	49

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

TABLE 5 Delta caribou annual hunter residency and success, permit hunt DC827, regulatory years 1996–1997 through 2009–2010.

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
2008–2009	21	17	5	43 (45)	20	30	3	53 (55)	96
2009–2010	17	24	8	49 (49)	26	24	1	51 (51)	100

[a] Residents of Unit 20.

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

TABLE 6 Delta caribou annual harvest chronology percent by harvest periods, permit hunt DC827, regulatory years 1996–1997 through 2009–2010.

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
2008–2009	19	31	17	33	1	43
2009–2010	29	10	33	29	0	49

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

TABLE 7 Delta caribou harvest percent by transport method, permit hunt DC827, regulatory years 1996–1997 through 2009–2010.

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
2008–2009	44	0	5	40	7	5	0	43
2009–2010	31	2	4	49	2	10	2	49

[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
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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[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, and was estimated to be at its lowest population level since the 1920s (5,740–8,610 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 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.

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

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. During 1990–1995, the herd remained relatively stable at about 22,000 caribou when population growth stabilized due to high adult mortality, unusually low pregnancy rate in 1993, and low to moderate calf survival (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 objectives of 50,000–100,000 caribou and harvest of 1,000–15,000 caribou 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 the 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 and 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 comprised 13 members of the public representing 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* in October 1995 (Fortymile Caribou Herd Management Planning Team 1995). This plan included recommendations for herd size, harvest, and habitat management and 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 and 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, 2000, Tok). The 2001–2006 harvest plan was developed to guide harvest management of the Fortymile caribou herd in Alaska during 2001–2006 and retained the same primary goals of the 1995 *Fortymile Caribou Herd Management Plan* to provide conditions for continued growth of the Fortymile caribou herd to allow it to expand to its former range in Alaska and Yukon. However, the 2001–2006 harvest plan provided for resumption of traditional hunting opportunity that was severely reduced during 1995–2000. The 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 (RY = 1 July through 30 June; e.g., RY02 = 1 July 2002 through 30 June 2003) through RY05.

In 2005, the 5 Alaska Fish and Game 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). The 2006–2012 harvest plan retained the same primary goals as the 1995 management plan and 2001–2006 harvest plan and was endorsed by the Alaska Board of Game in March 2006. The 2006–2012 harvest plan has guided 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–RY09, 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 FCH. 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 reduction in herd growth or potential population declines or to separation of state and federal hunt management systems. The following management goals and objectives were developed to meet the goals of the 2006–2012 harvest plan and the intensive management regulations.

MANAGEMENT GOAL

- Restore the FCH to its traditional range in Alaska and Yukon (As described in the 2006–2012 Fortymile herd harvest plan).

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 RY08–RY09 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 radiocollared caribou. 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 were too large for observers to count accurately from aircraft (i.e., >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 and the 3 counts were averaged. 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 (Boertje and Gardner 2000*b*).

Productivity

Parturition rates were determined by observing known-age radiocollared females from a Piper PA-18 during calving season. Caribou observed with calves, hard antlers, or distended udders were classified as parturient (Whitten 1995). During 2008 and 2009, radiocollared females ≥3 years old were radiotracked 3 to 4 times (at approximately 4–5 day intervals) during 11–26 May.

Population Composition, Captures, and Body Condition

We conducted aerial surveys and captures during late September–mid October to estimate herd sex and age composition, deploy radio collars to maintain a sample of known-age females, and assess body condition of 5-month-old females.

During composition surveys, we located all functioning radio collars in the herd using a fixed-wing aircraft (Piper PA-18 or Bellanca Scout) and used an observer in a Robinson R-44 helicopter to visually classify 10–15% of the herd. We tallied the composition of each group on a 5-position counter and recorded the tallies on a data sheet. 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).

Composition data for each group of caribou were weighted by the proportion of radiocollared Fortymile caribou in that group. We attempted to spread survey effort evenly throughout the herd by classifying an equal number of caribou in the vicinity of each radio collar. To adjust for variable group size and number of radiocollared caribou per group, we multiplied the number of cows and bulls in each group by the proportion of radiocollared caribou that were in the group to derive weighted totals and ratios for each group. Weighted totals and ratios of all groups were added to derive herd composition.

Captures were conducted annually in the last week of September or first week of October. Sixteen to 18 female calves of the year (4–5 months old) were fitted with VHF radio collars to maintain a sample size of 60–80 radiocollared females in the herd. During captures, we weighed each animal, and recorded sex, age, and handling time. We also drew blood for serology, genetics and trace mineral analysis.

Distribution and Movements

We obtained seasonal herd distribution, movements, and estimates of annual mortality by radiotracking 60–90 radiocollared cows throughout the year. On an annual basis, a portion of the radiocollared caribou were located approximately weekly during hunting seasons in August, September, and December, 3–4 times during calving in May, 8–10 times leading up to the annual photocensus attempt during June and early July, and approximately once a month during the remainder of the year.

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 RY08–RY09 the harvest quota was set at 850 caribou, with no more than 25% cows. The 2006–2012 harvest plan guidelines were used to further allocate the annual quota between seasons and hunt areas. 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). The fall quota was subdivided between 3 hunt areas: the Steese Highway and Chena Hot Springs Road area (zone 1), the Taylor Highway area (zone 3), and the roadless area between these 2 areas (zone 2). The winter hunt quota was divided between the Taylor Highway area (zone 3) and both the Steese Highway and Chena Hot Springs Road areas combined (zones 1 and 2). 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. Zone 2 was included with the road-accessible zone that was allocated 60% of the harvest and was closed in conjunction with that road-accessible zone.

We issued emergency orders to close hunting seasons when the harvest quotas were met. Further information regarding Fortymile caribou harvest management is in the 2001–2006 harvest plan (ADF&G, unpublished document, 2000, Tok) and the 2006–2012 harvest plan (ADF&G 2006).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

During 1990–1995, herd size remained relatively stable at around 22,000 caribou (Table 1). Between 1995 and 2003, the herd size doubled (annual growth rates of 4–14%) to 43,375 caribou counted during the summer 2003 photo census. Annual increases in herd size resulted from increased adult and calf survival rates and increased adult pregnancy rates (Table 1; Boertje and Gardner 1998*b*, 1999, 2000*a*).

Photo censuses were attempted annually during summers 2004–2008, but were successful only in 2007 (38,364 caribou counted). The herd size was likely underestimated in 2007 due to poor sightability and difficulty of identifying the large number of caribou in timbered habitat. Therefore, the 2007 results were not used to estimate population size. While herd size probably fluctuated during 2004–2008, it likely remained at about 40,000–44,000 caribou (Gross 2007; Boertje, unpublished data, ADF&G Fairbanks).

<u>RY08</u>. Good calf recruitment to autumn (33 calves:100 cows in early Oct 2008) allowed the population to increase an estimated 4 % during RY08 despite deep snow. The late June 2009 population was estimated at 46,510 caribou in June 2009 (Table 1).

<u>RY09</u>. Good calf recruitment to autumn (34 calves:100 cows in early Oct 2009), mild winter conditions and good winter survival, allowed the population to increase an estimated 10% during RY09. The estimated late June 2010 population size was 51,675 caribou (Table 1).

Successful photo censuses were completed in July 2009 and June 2010, with 46,510 and 51,675 caribou counted, respectively.

Productivity

Parturition rates of radiocollared females ≥3 years old in 2009 and 2010 were 68% (n = 57) and 72% (n = 60), respectively. Parturition rates averaged 85% during 1993–2008. Since 1993, parturition rates as low as those observed in 2009 and 2010 were observed only in 1993 and 2003 (Table 2). In addition, 2009 and 2010 are the only years since 1993 that parturition rates ≤72% occurred in 2 consecutive years. Although additional years of data are needed to detect a trend, these 2 consecutive years of low parturition rates could indicate that the herd was nutritionally stressed during 2009–2010.

Natality rate can also be a useful index to assess herd nutrition (Valkenburg et al. 2000). Parturition rates of 3-year-old cows during different phases of herd growth (increasing population phase, stable/high population phase, and decreasing population phase) were a more sensitive indicator of herd nutrition than parturition rate of other age classes in the George River herd in northeastern Quebec and northern Labrador (Bergerud et al. 2008), as well as the Delta and Nelchina herds in Alaska (Valkenburg et al. 2003). Preliminary analysis of parturition rates of known-age cows in Alaska caribou herds indicates that 3-year-old parturition rates of <55% for multiple years could indicate nutritional stress (Boertje, unpublished data, ADF&G, Fairbanks). Parturition rates of 3-year-old cows in the Fortymile herd were below 55% during 2009 (30%) and 2010 (29%) (Table 2), indicating the herd could be experiencing nutritional stress.

Population Composition

RY08. We conducted the autumn 2008 composition survey in early October. A total of 4,119 caribou were classified in the vicinity of 65 radiocollared animals, resulting in an estimated 33 calves and 37 bulls:100 cows (Table 1).

RY09. We conducted he autumn 2009 composition survey in early October. A total of 4,503 caribou were classified in the vicinity of 39 radiocollared animals, resulting in an estimated 34 calves and 59 bulls:100 cows (Table 1).

The increase in the bull:cow ratio from 37 bulls:100 cows (RY08) to 59:100 (RY09) is likely due to uneven distribution of bulls in the herd during the RY09 composition survey rather than a sudden increase in the proportion of bulls in the herd. It will take several more years of data to determine if there is an increasing trend in the bull:cow ratio. Harvest quotas will remain conservative (~2% of the herd annually) 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.

Captures and Body Condition

During the first week of October 2008 and 2009, we captured 15 and 18 five-month-old female calves, and deployed 15 and 18 VHF radio collars, respectively. Average calf weight was 104.6 lbs in 2008 and 107.5 lbs in 2009 (Table 3). These were the 2 lowest average weights since we began collecting autumn weights on the FCH in 1990.

Distribution and Movements

Calving and post-calving. In May 2009, the FCH primarily calved along the eastern edge of the Yukon–Charley Rivers National Preserve in the upper Charley River and Seventymile River drainages and the drainages of the upper Middle Fork Fortymile and upper North Fork Fortymile rivers. 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 2010, the FCH primarily calved along the eastern and southern edges of the Yukon–Charley Rivers National Preserve south to the headwaters of the Healy River and Sand Creek drainages near Mount Harper. 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.

Pre-rut and rut. In both RY08 and RY09, during mid September–October, the FCH was concentrated from the area around Jack Wade Junction (~milepost 100 on the Taylor Highway) southeasterly through Boundary and into the Sixtymile River and North Fork of the Ladue River drainages.

Winter. During November–March RY08 and RY09, 5,000–15,000 caribou were located along the Top of the World Highway from Boundary, Alaska east into Yukon, Canada and just to the south. 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 RY08–RY09, with various unit-specific bag limits and season dates for state and federal hunts (Table 4). Gardner (2003) summarized the regulatory history of the FCH during 1987–2002.

Alaska Board of Game Actions and Emergency Orders. We issued several emergency orders to delay, close, and reopen hunting seasons in order to meet harvest quotas (Table 5).

The 2006–2012 harvest plan was adopted by the Board of Game in March 2006. The board affirmed the harvest plan recommendation for an annual harvest quota of 850 caribou in 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. Herd size was less than 50,000 caribou prior to the RY08 hunting seasons, so the quota was held at 850 caribou during RY08–RY09.

Also at the spring 2006 meeting, 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 increase 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 RY08–RY09.

Harvest by Hunters. We issued 3,582 and 2,765 registration permits in RY08 and RY09, respectively. In RY08, 2,471 hunters reported taking 913 caribou. In RY09, 2,018 hunters reported taking 1,083 caribou (Table 6). 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 917 in RY08 and 1,104 in RY09 (Table 7). To assist herd growth during RY08–RY09, 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 8% of hunters during RY08–RY09 and accounted for 11% of the total harvest (Table 8). The success rate for residents (local and nonlocal combined) was 42% during RY08–RY09, whereas success for nonresidents was 59% (Table 8).

Harvest Chronology.

RY08 — During the fall RY08 hunt (RC860), the Taylor Highway (zone 3) harvest quota was 290 caribou, the Steese Highway–Chena Hot Springs Road (zone 1) harvest quota was 190 caribou, and the roadless area (zone 2) harvest quota was 160 caribou. Most (73%) fall harvest (RC860) occurred during the first week of the season (Table 9). For the fourth 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 zone 3 on 16 August when the harvest quota was met (Table 5). Unlike the previous 2 years, large numbers of caribou were also available to hunters along the Steese Highway and Chena Hot Springs Road during first week of the fall season, which resulted in heavy harvest and early season closure of zone 1 on 14 August (Table 5). Caribou were available throughout the fall season in the roadless area, and steady harvest during the first 6 weeks resulted in an early closure of zone 2 on 22 September.

During the RY08 winter hunting season (RC867) the harvest quota was 85 caribou for the zones 1 and 2 combined, and 56 for zone 3. At the beginning of the winter hunt a portion of the herd was available to hunters in zone 1 and hunter success was high. The quota of 85 caribou for zones 1 and 2 was reached on 4 December (Table 10) and the state seasons in these zones were closed (Table 5). A limited number of caribou were available from the Taylor Highway throughout the winter season, and the season in zone 3 remained open to the published ending date (28 February).

RY09 — During the fall RY09 hunt (RC860), the harvest quotas were: 190 caribou in zone 1, 160 in zone 2, and 290 in zone 3. Most (83%) of the total fall harvest (RC860) occurred during the first week of the fall season, when not only the fall quota, but the entire annual quota was harvested (Table 9). For the second year in a row, large numbers of caribou were also available to hunters along the Steese Highway and Chena Hot Springs Road at the beginning of the fall season, resulting in heavy harvest and an early closure of the state season in zone 1 on 12 August when the quota of 190 caribou was exceeded (Table 5). In addition, for the fifth 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 in zone 3 on 12 August when the harvest quota of 290 caribou was exceeded (Table 5). Caribou were available throughout the fall season in the roadless area where steady harvest during the first 6–weeks resulted in an early closure of zone 2 on 18 September.

In RY09 the winter (RC867) state hunt was cancelled because the entire annual quota was harvested during the fall season (RC860).

<u>Transport Methods</u>.

RC860 fall hunts — During the RC860 fall hunts in RY08–RY09, the types of transportation used by successful hunters varied by hunt zone, and depended primarily on the number of ATV trails available and whether air taxi companies worked in the area. All successful hunters in the central portion of the FCH range (primarily zone 2) used boats and airplanes. This remote hunt area has no trails and cannot be reached by ground transportation.

Successful hunters in the Steese Highway–Chena Hot Springs area in northeastern Unit 20B and southeastern Unit 25C (zone 1) primarily used ATVs, followed by highway vehicles. Hunters who used ATVs had high harvest success during the fall seasons.

Successful hunters in Unit 20E (zone 3 and part of zone 2) primarily used ATVs, followed by highway vehicles. The Chicken Ridge trail, along with its spur trails, was the primary access used by hunters with ATVs to hunt 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). 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.

RC867 winter hunts — A variety of transportation types were used by successful hunters (Table 11). During the RC867 winter hunting seasons in RY08, successful hunters primarily accessed the FCH using snowmachines and highway vehicles along the Steese and Taylor highways (zones 1 and 3). Hunters on snowmachines had excellent success along the trail system off the Steese Highway during early December in RY08. The Taylor Highway had limited numbers of caribou available to hunters who used highway vehicles and snowmachines in RY08. The winter hunt was closed in RY09. Accessibility to caribou 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 RY09. ADF&G research staff continues to monitor the effects of the 1996–2000 management actions.

HABITAT

Assessment

In 1998, for the first time in 3 decades, the FCH exceeded 1.3 caribou/mi^2 (0.5 caribou/km^2). Beginning in 2001 the herd expanded its range use, possibly as a result of increased herd size. The herd moved farther west near the Steese Highway in fall 2001 and used winter range in Yukon, Canada during winters 2000–2001 through 2009–2010. Even so, more than 75% of the historic Fortymile range has not been used since the 1960s and the far eastern portion of the range has not been used since at least the 1940s.

Fecal samples from overgrazed winter ranges contain a relatively high proportion of mosses or vegetation other than lichens (Boertje 1984). 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. Preliminary data collected during 2000–2004 indicate a high proportion of lichens in fecal samples (William Collins, ADF&G, personal communication, 2009) suggesting that Fortymile winter range continued 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. 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.

Some Nelchina herd caribou have wintered in portions of the Fortymile winter range since 1999. Nelchina calves that wintered in the Fortymile range were significantly heavier than calves that wintered in Units 11 and 13 (B. Dale, ADF&G, personal communication, 2009). Also, Nelchina calves on Fortymile range gained weight over winter, except in years when snow depth was above average.

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 RY08–RY09. 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 calving and postcalving areas. The FCH 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 1999–2010 to plan their activities away from the herd and have minimized their impacts during calving and postcalving.

The *Upper Yukon Area Plan* (Alaska Department of Natural Resources 2003) guided management of state lands within the FCH range during RY04–RY09. The plan gives adequate protection to the Fortymile herd throughout its range and strong protection for the calving and postcalving ranges.

NONREGULATORY MANAGEMENT PROBLEMS AND NEEDS

Herd Plans

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 has been 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 by ADF&G during RY02, RY03, RY06, and RY08 and distributed to about 4,500 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–RY07, the FCH population estimate ranged 40,000–44,000 caribou, below the intensive management objective of 50,000–100,000 caribou. Based on the sex and age structure, 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.

With an average annual increase of 7% during RY08–RY09, We met our objective to provide conditions for the Fortymile herd to grow at a moderate annual rate of 5–10%. With an estimated population of 51,675 caribou, we met the herd size objective of 50,000–100,000 caribou.

With record low fall calf weights in 2008 (avg. 104.6 lb) and 2009 (avg. 107.5 lb) and parturition rates of 3-year-old cows below 55% during 2009 (30%) and 2010 (29%), we will continue to closely monitor indicators of nutritional condition during the next report period. In addition, we will continue to refine Fortymile herd nutritional indices and develop recommendations for when to stabilize the herd based on these indices.

Harvest was managed using the guidelines in the 2006–2012 harvest plan. During RY08–RY09, the annual harvest quota was 850 caribou (including up to 25% cows). 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. According to the plan, 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 estimate exceeded 50,000 caribou June 2010, with a late June estimate of 51,675. However, because we were unable to finish counting the photos from the June 2010 photo census until mid November 2010, the quota was not increased during RY09. The RY10 quota will be increased to 1,000 caribou following the recommendations of the 2006–2012 harvest plan.

We did not meet the intensive management harvest objective of 1,000–15,000 caribou in RY08, but this objective was met in RY09. During RY08 and RY09, 2,471 and 2,018 hunters took 913 and 1,083 caribou, respectively. Harvest was maintained at a level that did not affect 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 have 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 RY10–RY11. 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 RY08–RY09.

For the next report period, the management goals, objectives, and activities will be revised to address uncertainty about historic range size and sustainability of estimated historic population levels, and more clearly define the FCH management program.

MANAGEMENT GOAL

- Restore the FCH to as much of its traditional range in Alaska and Yukon as possible, within sustainable levels, and without significantly compromising herd health and habitat condition.

MANAGEMENT OBJECTIVES

Objective 1: Provide conditions for the Fortymile herd to grow at an annual rate of 5–10%, until population indices indicate the herd is becoming nutritionally stressed, to provide increased caribou hunting and viewing.

Objective 2: Manage for a herd size of 50,000–100,000, unless nutrition indices indicate a lower sustainable limit.

Objective 3: Manage the herd to sustain an annual harvest of 1,000–15,000 caribou.

Objective 4: Maintain an October bull:cow ratio of at least 35:100.

MANAGEMENT ACTIVITIES

- Work with land agencies, landowners, and developers to minimize the impact of human activities on caribou habitat (Objective 1).
- Work with land agencies, landowners, and developers to mitigate developments detrimental to Fortymile caribou (Objective 1).
- Maintain regulatory flexibility to stabilize the FCH population, if nutrition indices indicate herd health is becoming significantly compromised (Objectives 2 and 3).
- Work with land agencies and landowners to maintain a near-natural fire regime (Objective 1).
- Attempt annual photo censuses (Objectives 1 and 2).
- Conduct annual fall composition surveys (Objectives 1 and 4).
- Capture 35 female calves of the year annually to collect biological information and deploy radio collars to maintain the minimum sample size of 75 radiocollared females in the herd (Objectives 1–4).
- Maintain a minimum sample size of at least 75 radiocollared females, including a minimum of 15 satellite and 60 VHF collars (Objectives 1–4).
- Radiotrack throughout the year to determine seasonal distribution, mortality rates and proximity to highways during hunting seasons (Objectives 1–3).
- Monitor changes in seasonal range distribution (Objectives 1–3).
- Conduct annual parturition surveys in May to determine parturition rates of radiocollared females ≥3 years of age (Objectives 1 and 2)
- Regulate hunting to maintain an annual harvest of 2% (±0.3%) of the preseason population estimate, with no more than 25% of the harvest consisting of cows (Objectives 1–4).
- Monitor harvest through hunt reports (Objective 3).

- ➢ Regulate caribou hunting along the Steese Highway, Chena Hot Springs Road, Taylor Highway, and Boundary Cutoff to avoid heavy roadside harvest to the extent possible, without jeopardizing higher priority objectives (Objectives 1 and 3).

- ➢ Provide for increased caribou hunting, viewing, and other wildlife-related recreation (Objectives 1–4).

For the next report period I also recommend:

- Continued work with research staff to refine nutrition indices to determine when the herd is becoming nutritionally stressed.

- Consultation with research staff to explore future research needs for the Fortymile herd, including:

    - Monitor early-calf survival in years when wolf control objectives of the Upper Yukon Tanana Predator Control Program are met.

    - Improve understanding of how habitat in areas historically used for calving and insect relief influences calf survival and weight gain.

    - Monitor baseline condition of the FCH calving–summer range to help assess herd health.

    - Explore use of cow antler data to assess summer nutrition. Hunter reports could be used to collect main beam length and/or number of antler points for use in this analysis.

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.

BERGERUD, A. T., S. N. LUTTICH, AND L. CAMPS. 2008. The return of caribou to Ungava. McGill-Queen's University Press. Montreal, Canada.

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.

———, 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.

FORTYMILE CARIBOU HERD MANAGEMENT PLANNING TEAM. 1995. Fortymile caribou herd management plan. Alaska Department of Fish and Game. Tok, Alaska.

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.

———, 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.

———, R. W. TOBEY, B. W. DALE, B. D. SCOTTON, AND J. M. VER HOEF. 2003. Body size of female calves and natality rates of know-age females in two adjacent Alaskan caribou herds, and implications for management. Rangifer Special Issue 14:203–209.

WHITTEN, K. R. 1995. Antler loss and udder distension in relation to parturition in caribou. Journal of Wildlife Management. 59:273-277.

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TABLE 1 Fortymile caribou fall composition counts and population size, regulatory years 1985–1986 through 2009–2010.

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	22,104
1994–1995	9/30/94	44	27	19	57	45	33	22	24	2990	22,558	22,558
1995–1996	10/3/95	43	32	18	57	43	31	27	25	3303	23,458	23,458
1996–1997	9/30/96	41	36	20	57	46	31	23	23	4582	25,910	25,910
1997–1998	9/30/97	46	41	22	53	48	28	24	25	6196	31,029	31,029
1998–1999	9/29/98	40	38	21	56	49	27	24	23	4322	33,110	33,110
1999–2000	9/29/99	48	37	20	54	55	29	16	26	4336	34,640	34,640
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	43,375
2003–2004	9/27/03	50	17	10	60	51	29	21	30	6296		40,000–44,000[d]
2004–2005	9/28/04	45	28	16	59	31	37	32	25	4157		40,000–44,000[d]
2005–2006	10/5/05	51	18	10	59	25	23	52	30	2350		40,000–44,000[d]
2006–2007	10/5/06	43	34	19	57	27	29	44	24	4995		43,837[e]
2007–2008	10/4/07	36	37	22	58	34	34	33	21	5228		44,673[e]
2008–2009	10/7–8/08	37	33	19	59	30	43	27	22	4119	46,510	46,510
2009–2010	10/7/09	59	34	17	52	26	33	42	30	4503	51,675	51,675

[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, 2004–2006 and 2008 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] Based on 2009 and 2010 photo census results, the 2004–2006 population estimates were revised. While the herd likely experienced some level of fluctuation during this period, it likely remained relatively stable ranging between 40,000–44,000 during 2004–2006, based on below average fall calf:cow ratios (17:100 in 2003 and 18:100 in 2005), spring parturition rates (68% in 2003, 77% in 2005 and 80% in 2006) and over winter calf survival (56% (n=16) during winter 2004–2005.
[e] Average interpolations of herd size, because herd size was not estimated.

TABLE 2 Fortymile caribou parturition rates of known-age radiocollared females, 1993–2010.

Year	Survey Date	3-year-olds[a] (%)		4-year-olds[a] (%)		≥5-years-old[a] (%)		All cows ≥3-years-old[a] (%)	
1993	11 May–3 Jun[b]	4/9	(44)	1/1	(100)	27/37	(73)	32/47	(68)
1994	11 May–7 Jun[b]	5/6	(83)	4/6	(67)	28/33	(85)	37/45	(82)
1995	11–19 May[b]	5/7	(71)	2/3	(67)	28/31	(90)	35/41	(85)
1996	12–21 May[b]	9/9	(100)	5/5	(100)	24/25	(96)	38/39	(97)
1997	10–20 May[b]	6/6	(100)	7/8	(88)	26/32	(81)	39/46	(85)
1998	10–19 May[b]	9/9	(100)	6/6	(100)	32/33	(97)	47/48	(98)
1999	11–19 May[b]	10/12	(83)	9/9	(100)	40/47	(85)	59/68	(87)
2000	12–20 May[b]	8/9	(89)	11/13	(85)	37/40	(93)	55/61	(90)
2001	13–21 May[b]	7/10	(70)	6/7	(86)	37/40	(93)	50/57	(88)
2002	11–19 May[b]	6/7	(86)	10/10	(100)	34/36	(94)	50/53	(94)
2003	12–23 May[c]	9/11	(82)	1/7	(14)	26/35	(74)	36/53	(68)
2004	14–27 May[c]	4/7	(57)	9/9	(100)	28/31	(90)	41/47	(87)
2005	12–22 May[c]	2/6	(33)	7/7	(100)	21/26	(81)	30/39	(77)
2006	14–22 May[c]	9/11	(82)	6/6	(100)	34/44	(77)	49/61	(80)
2007	11–27 May[c]	5/6	(83)	10/10	(100)	40/45	(89)	55/61	(90)
2008	11–26 May[c]	7/8	(88)	3/5	(60)	43/46	(93)	53/59	(90)
2009	12–24 May[c]	3/10	(30)	5/7	(71)	31/40	(78)	39/57	(68)
2010	11–28 May[c]	2/7	(29)	8/10	(80)	33/43	(77)	43/60	(72)

[a]Number of collared cows with calf + collared cows with no calf, but with hard antler or udder divided by number of radiocollared cows observed.
[b]During this year, near daily flights were flown during this period in conjunction with a calf mortality research project.
[c]During this year, 3–4 flights were conducted during this period.

TABLE 3 Fortymile caribou fall 4-month-old female calf weights, 1990–2009.

Year	Capture Dates	Average weight in kg (lbs)[a]	*n*
1990	25–27 Sep	52.8 (116.3)	14
1991	21–22 Oct	53.9 (118.9)	14
1992	29-30 Sep	55.1 (121.5)	14
1993	4 Oct	56.1 (123.8)	15
1994	1 Oct	54.5 (120.0)	14
1995	29 Sep	56.7 (125.0)	15
1996	29 Sep–1 Oct	54.7 (120.7)	14
1997	29-30 Sept	59.3 (130.7)	15
1998	26 Sept	53.0 (116.9)	17
1999	30 Sept	54.7 (120.5)	15
2000	2 Oct	56.7 (125.0)	15
2001	26 Sept	54.1 (119.3)	17
2002	29 Sept	52.0 (114.7)	15
2003	26-27 Sept	51.1 (112.6)	18
2004	28-29 Sept	53.7 (118.3)	16
2005	24-25 Sept	51.4 (113.4)	16
2006	1-3 Oct	54.4 (119.8)	14
2007	27 Sep	53.9 (118.8)	15
2008	6–7 Oct	47.4 (104.6)	15
2009	8–9 Oct	48.8 (107.5)	18

[a] Weight without radio collar.

TABLE 4 Fortymile caribou seasons and bag limits managed as joint state–federal registration permit hunts, regulatory years 2004–2005 and 2009–2010.

	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 2009–2010								
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 5 Emergency orders issued during regulatory years 2004–2005 through 2009–2010.

Regulatory year	Effective date	Emergency order number	Permit hunt and area affected	Action taken/reason
2008–2009	14 Aug 2008	03-05-08	The part of RC860 in areas accessible from the Steese Highway and Chena Hot Springs Road in Units 20B and 25C.	Closed part of hunt early. Quota met.
2008–2009	16 Aug 2008	03-06-08	The part of RC860 in areas accessible from the Taylor Highway in Unit 20E.	Closed part of hunt early. Quota met.
2008–2009	22 Sep 2008	03-07-08	The part of RC860 in the roadless portions of Units 20B, 20D, 20E and 25C.	Close remaining part of hunt early. Quota met.
2008–2009	30 Nov 2008	03-12-08	The part of RC867 in areas accessible from the Taylor Highway in Unit 20E.	Closed part of hunt early. Prevent Nelchina caribou harvest and quota met.
2008–2009	4 Dec 2008	03-13-08	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.	Close remaining part of hunt early. Quota met.
2009–2010	12 Aug 2009	03-04-09	The part of RC860 in areas accessible from the Steese Highway and Chena Hot Springs Road in Units 20B and 25C and from the Taylor Highway in Unit 20E.	Close remaining part of hunt early. Quota met.
2009–2010	20 Aug 2009	03-06-09	The RC867 in entire hunt area.	Hunt cancelled. Annual quota taken during fall hunt.
2009–2010	18 Sep 2009	03-07-09	The part of RC860 in the roadless portions of Units 20B, 20D, 20E and 25C.	Close remaining part of hunt early. Quota met.

TABLE 6 Reported Fortymile caribou harvest by joint state–federal registration permit, regulatory years 2002–2003 through 2009–2010[a].

Regulatory Year	Permits issued	Did not hunt (%)	Did not report (%)	Total hunted	Successful hunters (%)	Unsuccessful hunters (%)	Harvest			Total reported harvest	Harvest quota	
							Bulls	Cows	Unk		cows	total
2002–2003[b]	4155	1397 (34)	138 (3)	2620 (63)	860[c] (33)	1760 (67)	663	185	12	860	235	950
2003–2004[b]	5718	2135 (37)	143 (3)	3440 (60)	799[d] (23)	2641 (77)	612	181	6	799	210	850
2004–2005[e]	4217	1540 (37)	180 (4)	2497 (59)	846[f] (34)	1651 (66)	592	243	11	846	210	850
2005–2006[e]	4438	1786 (40)	169 (4)	2483 (56)	741[g] (30)	1742 (70)	557	182	2	741	210	850
2006–2007[e]	3975	1295 (33)	75 (2)	2605 (66)	852[h] (33)	1753 (67)	601	247	4	852	210	850
2007–2008[e]	4576	1361 (30)	33 (1)	3182 (70)	1012[i] (32)	2170 (68)	746	262	4	1012	210	850
2008–2009[e]	3582[j]	1078 (30)	9 (1)	2471 (69)	913[k] (37)	1558 (63)	681	217	15	913	210	850
2009–2010[e]	2765[j]	736 (27)	7 (1)	2018 (73)	1083[l] (54)	935 (46)	881	192	10	1083	210	850

[a]Data from RC860, RC863, RC865, RC866 and RC867 harvest reports.
[b]Includes RC863, RC865, RC866 and RC867.
[c]An additional 16 hunters reported harvesting Fortymile caribou on general harvest reports.
[d]An additional 15 hunters reported harvesting Fortymile caribou on general harvest reports.
[e]Includes RC860 and RC867.
[f]An additional 12 hunters reported harvesting Fortymile caribou on general harvest reports.
[g]An additional 4 hunters reported harvesting Fortymile caribou on general harvest reports.
[h]An additional 12 hunters reported harvesting Fortymile caribou on general harvest reports.
[i]An additional 20 hunters reported harvesting Fortymile caribou on general harvest reports.
[j]Differences in permits issued and the sum of did not hunt + FTR + total hunted is due to individual hunters obtaining multiple permits during the same season.
[k]An additional 9 hunters reported harvesting Fortymile caribou on general harvest reports.
[l]An additional 11 hunters reported harvesting Fortymile caribou on general harvest reports.

TABLE 7 Fortymile caribou harvest, regulatory years 2002–2003 through 2009–2010.

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	746	262	4	1,012	20	5	5	10	0	1,042
2008–2009	681	217	0	898	9	5	5	10	0	917
2009–2010	881	192	10	1,083	11	5	5	10	0	1,104

[a] Data from RC863, RC865, RC866 and RC867 harvest reports in RY02–RY03.
[b] Data from RC860 and RC867 harvest reports in RY04–RY09.

TABLE 8 Fortymile caribou hunter residency and success of hunters who reported residency, regulatory years 2002–2003 through 2009–2010[a].

Regulatory year	Successful: Local[b] resident	Successful: Nonlocal resident	Successful: Nonresident	Successful: Unknown residency	Successful: Total (%)	Unsuccessful: Local[b] resident	Unsuccessful: Nonlocal resident	Unsuccessful: Nonresident	Unsuccessful: Unknown residency	Unsuccessful: Total (%)	Unknown success	Total hunters
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	119	779	114	0	1012 (32)	269	1791	110	0	2170 (68)	0	3182
2008–2009	87	713	122	0	922 (36)	215	1329	70	0	1614 (64)	0	2536
2009–2010	111	881	103	1	1096 (53)	153	751	84	0	988 (47)	4	2088

[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 in Unit 25C.

TABLE 9 Fortymile caribou autumn harvest by month/day, regulatory years 2002–2003 through 2009–2010[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	444 (74)	24 (4)	18 (3)	44 (7)	38 (6)	18 (3)	3 (1)	10 (2)	599
2008–2009	519 (72)	25 (4)	36 (5)	49 (8)	44 (6)	33 (5)	1 (1)	0 (0)	707
2009–2010	888 (84)	19 (2)	30 (3)	36 (3)	42 (4)	38 (4)	0 (0)	0 (0)	1053

[a] Data from RC860, RC863, RC865 and RC866 harvest reports for the Fortymile caribou herd that indicated a harvest date.

TABLE 10 Fortymile caribou winter harvest by month/day, regulatory years 2002–2003 through 2009–2010[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[b]	4 (2)	7 (3)	183 (91)	1 (1)	1 (1)	5 (2)	0 (0)	0 (0)	201
2003–2004[b]	30 (12)	6 (2)	199 (82)	7 (3)	0 (0)	0 (0)	0 (0)	0 (0)	242
2004–2005[b]	23 (7)	21 (7)	224 (72)	24 (8)	4 (1)	1 (<1)	0 (0)	12 (4)	309
2005–2006[b]	68 (26)	5 (2)	42 (16)	42 (16)	33 (13)	19 (7)	17 (6)	38 (14)	264
2006–2007[b]	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
2008–2009[b]	23 (12)	16 (8)	156 (79)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	196
2009–2010[b]	10 (38)	14 (54)	1 (4)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	26

[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.

TABLE 11 Fortymile caribou harvest by transport method, regulatory years 2002–2003 through 2009–2010[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	102 (10)	3 (<1)	39 (4)	376 (37)	288 (28)	37 (4)	148 (15)	7 (1)	12 (1)	1012
2008–2009	135 (15)	0 (0)	55 (6)	409 (45)	137 (15)	29 (3)	114 (12)	18 (2)	16 (2)	913
2009–2010	106 (10)	8 (<1)	50 (5)	670 (62)	5 (<1)	69 (6)	145 (13)	17 (2)	13 (1)	1083

[a] Data from RC860, RC863, RC865, RC866, and RC867 harvest reports for the Fortymile caribou herd.

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 2008
To: 30 June 2010[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 1,850 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). 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. Similarly, fall aerial surveys of the Ray Mountains and Hodzana Hills herds are difficult due to frequent fog, clouds, and high winds.

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

The origin of these herds is unknown. Some residents speculated 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 alleles 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 beginning 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.
- Harvest up to 10 cows and up to 25 bulls from the Hodzana Hills herd.

METHODS

Caribou from these herds are monitored through cooperative radiotelemetry studies by ADF&G, U.S. Fish and Wildlife Service, and BLM. Radio collars 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 RY08–RY09 there were 5 active radio 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). During RY08–RY09 helicopters were used in surveys for the Hodzana and Ray Mountains herds. Surveys of the Galena and Wolf Mountain herds were conducted using fixed-wing aircraft. Surveys conducted using helicopters allowed for accurate composition data to be collected. Fixed-wing aircraft were typically used during RY98–RY09 to survey the Galena Mountain and Wolf

Mountain herds; therefore, only numerical counts were completed during those surveys. However, in the Wolf Mountain herd we have had some success in estimating composition from fixed-wing aircraft by taking high-quality digital photographs of congregated groups and classifying each caribou from the photos. This type of photo census has been conducted in the Ray Mountain herd in the past and generally allows for a total count.

We monitored hunting mortality using 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. Harvest data were summarized by regulatory year.

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 probably declined from 250–500 prior to RY02 to less than 125 caribou by RY05. The highest number of caribou seen during RY08–RY09 was 89 animals in March 2009 (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 found that radiocollaring more caribou did not increase the number of caribou found during fall surveys, 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 Mountian herd was in October 1995, when 346 caribou were counted. In June 2008 we counted 244 caribou and in July 2009 we counted 434 caribou (Table 2). Based on these counts, the Wolf Mountain herd likely numbered 350–450 caribou during RY08–RY09. This estimate assumes that some of the 434 caribou counted in July 2009 were Galena Mountain herd caribou. Since the Wolf Mountain herd is widely dispersed most of the year, surveys 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 in which 400 caribou were counted. Surveys have been regularly conducted during the 1990's and 2000's (Table 3). In September 2008, 1400 caribou were counted and composition data was obtained from 780 caribou. In September 2009, 953 caribou were counted and classified.

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 since 2002 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 September of 2008 and 2009, composition counts yielded 880 and 775 caribou respectively (Table 4). We will continue surveys to improve our understanding of movements and calving locations.

Population Composition

During RY08–RY09, composition data were available for all 4 herds (Tables 2–5). Surveys of the Wolf Mountain herd yielded composition data, while calving surveys of the Galena Mountains herd allowed for a rough estimate of composition (Table 2 and 5).

The fall 2009 calf:cow ratios of 39:100 and 18:100 for the Ray Mountains (Table 3) and Hodzana Hills (Table 4) herds, respectively, were similar to other Interior herds with stable populations. 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 the relatively stable period 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 RY08–RY09 were likely consistent with movement information from earlier investigations of those herds. Galena Mountain caribou usually migrate toward alpine areas east of Galena Mountain in April and calve on the alpine slopes of the southern Kokrines Hills in Unit 21C. 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 these 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). The possibility of mixing between the Wolf Mountain and Galena Mountain caribou herds must be considered in years when an unusually high number of caribou are observed during a survey or composition count.

Wolf Mountain Herd. Based on composition surveys and radiotracking flights by the U.S. Fish and Wildlife Service the seasonal movements of the Wolf Mountain herd during RY08–RY09 appeared 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 (Stout 2003). 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. Based on composition surveys and observations during other field projects (i.e., moose surveys) the seasonal movements of the Ray Mountains herd in RY08–RY09 appeared 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 caribou 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. In March 1992 groups of 10–20 bulls were regularly seen near Sithylemenkat Lake and 200 caribou were seen in the Kanuti Lake area in Unit 24B. We do not know if these caribou were from the Ray Mountains herd or the Western Arctic caribou herd.

Since radiocollaring began in October 1994, caribou have been 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 in 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, caribou that reside in the Hodzana Hills typically have 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. In the past, caribou seen along the Dalton Highway near Finger Mountain were thought to be Ray Mountains caribou. Today, we consider these animals to be Hodzana Hills caribou.

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 Western Arctic and Central Arctic herds. Seasons and bag limits in those areas reflect harvest recommendations for those herds.

Season and Bag Limit during RY08–RY09

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

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
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.	10 Aug–30 Sep	10 Aug–30 Sep
1 caribou.		
Galena Mountain Herd:		
Unit 21D, that portion north of the Yukon River and east of the Koyukuk River.	Winter season to be announced	No open season
2 caribou.		
Western Arctic Herd:		
Remainder of Unit 21D.		
RESIDENT HUNTERS:	1 Jul–30 Jun	
5 caribou per day; however, cow caribou may not be taken 16 May–30 Jun.		
NONRESIDENT HUNTERS:		1 Jul–30 Jun
5 caribou per day; however, cow caribou may not be taken 16 May–30 Jun.		
Ray Mountains Herd:		
Unit 24A, that portion south of the south bank of the Kanuti River.	10 Aug—Mar 31	Aug—Sept 30
1 caribou		
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.	10 Aug–31 Mar	10 Aug–30 Sep
1 caribou.		

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Ray Mountains and Hodzana Hills Herds:		
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. No Board of Game actions were taken during RY08–RY09 and no emergency orders were issued.

Harvest by Hunters. During RY08–RY09, only 3 caribou (3 bulls) were reported taken from the 4 herds. All were harvested from the Ray Mountains herd and none were reported harvested from the Galena, Wolf Mountain, or Hodzana Hills 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 primarily by aircraft, with occasional access 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. During RY08–RY09, the 3 caribou harvested in the Ray Mountains herd were taken by one local resident, one nonlocal resident, and one nonresident (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 between Rampart and Tanana (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

Assuming parturition rates are high in all four herds, fall calf percentages (Tables 2, 3, 4, and 5) indicate that natural mortality of caribou calves continued to be high in the Ray Mountains, Wolf Mountain, Galena Mountain, and Hodzana Hills herds during RY08–RY09. 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, most likely 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 overlap. Because the herds overlap only occasionally during calving season and only a portion of the Galena mountain herd mixes 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 in the Ray Mountains and Galena Mountain herds previously indicated good nutrition (Osborne 1995), although in 2005 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 because there was no open season. In addition, the management objective for this herd was not achieved because no harvest opportunity was available. All other management objectives were met, as harvest opportunity was available but did not exceed the objectives. Harvest of bulls and cows did not exceed desired levels for any of the herds. For the next report period, one of the management goals is going to be modified to state the following:

- Provide opportunity for people to participate in caribou hunting.

To allow harvest of Western Arctic herd caribou 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 Western Arctic herd is not present. Maintaining radio collars in the Galena and Wolf Mountain herds will help us to distinguish these caribou from the Western Arctic herd. 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.

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TABLE 1 Galena Mountain caribou composition counts, 1991–2009

Month/ Year	Cows	Calves	(%)	Bulls	Total caribou observed
12/91[a]					260
10/92	123	9	(5)	49	181
10/93	165	41	(16)	53	259
10/94	115	46	(25)	25	186
10/95	211	40	(13)	59	310
10/96	151	19	(8)	56	232[b]
12/98[a]					313
12/99[a]					89
01/01[a]					65
06/01[a]					105
07/02[a]					102
09/04	64	7	(8)	13	84
12/04[a]					95
04/05[a]					78
11/05	58	9	(12)	6	73
01/06[a]					95
06/07[a]					61
05/08	22	12	(34)	1	35
03/09[a]		12	(13)		89

[a] Fixed-wing survey, no composition classifications.
[b] Six caribou were unclassified.

TABLE 2 Wolf Mountain caribou composition counts, 1991–2009

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
06/08[a]		45 (18)		244
07/09[d]	312	95 (22)	27	434

[a] Fixed-wing survey, no composition classifications.
[b] Photocensus (fixed-wing).
[c] No significant caribou groups found.
[d] Composition counts obtained from photos taken during a fixed-wing survey

TABLE 3 Ray Mountains caribou composition counts and estimated population size, 1991–2009

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	
09/09	36	29	18	61				22	953	

[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 composition counts , 2003–2009

Month/Year	Cows	Calves (%)	Bulls	Total caribou observed
10/03	173	43 (14)	90	306
06/04[a]				242
10/04[a]				136
06/05[a]				318
10/05	661	111 (10)	343	1115
04/06[a]				320
10/06	247	20 (5)	122	389
09/07	201	38 (11)	122	361
09/08	232	64 (16)	99	395
09/08[a]				880
09/09	527	93 (12)	155	775

[a] No composition data available.

TABLE 5 Galena Mountain caribou summer calving surveys, 1991–2009

Month/Year	Cows	Calves (%)	Bulls	Total caribou observed
06/91	97	11 (8)	27	135
06/92	191	13 (5)	37	241
05/93	65	12 (13)	16	93
06/93	130	24 (13)	40	194
05/94	56	13 (12)	40	109
06/94	104	34 (18)	53	191
1995–2006[a]				
06/07[b]				61
05/08	22	12 (33)	2	36
06/09	35	9 (18)	5	49

[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 2000–2001 through 2009–2010

Regulatory year	Ray Mountains		Galena Mountain		Wolf Mountain		Hodzana Hills[a]	
	Bulls	Cows	Bulls	Cows	Bulls	Cows	Bulls	Cows
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
2008–2009	2	0	0	0	0	0	0	0
2009–2010	1	0	0	0	0[b]	0	0	0

[a] Hodzana Hills caribou were considered part of the Ray mountain harvest prior to regulatory year 2005–2006.

[b] 5 caribou were reported. However, the game management unit was likely reported incorrectly and these caribou were taken in 22B instead of 21B because the 5 caribou were taken by 3 hunters after the Wolf Mountain hunting season closed.

TABLE 7 Galena Mountain, Wolf Mountain, Ray Mountains, and Hodzana Hills caribou hunter residency and success, regulatory years 2000–2001 through 2009–2010

	Successful				Unsuccessful				
Regulatory year	Local resident[a]	Nonlocal resident	Nonresident	Total	Local resident[a]	Nonlocal resident	Nonresident	Total	Total hunters
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
2008–2009	1	0	1	2	8	9	1	18	20
2009–2010	0	1	0	1	12	6	0	18	19

[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 115526** **JUNEAU, AK 99811-5526**

CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[a]

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 157,000 mi^2 (363,000 km^2) of northwestern Alaska (Figures 1 and 2). During spring, most mature cows travel north toward the calving grounds in the Utukok Hills (Figure 3); bulls and nonmaternal cows lag behind parturient cows and generally move toward summer range in the Wulik Peaks and Lisburne Hills. Following the calving period, cows and neonates initially travel southwest toward the Lisburne Hills where they mix with bulls and nonmaternal cows from the remainder of the herd. Summer range consists of the Brooks Range and its northern foothills west of the trans-Alaska pipeline (Figures 1 and 2). During summer WAH caribou move eastward through the Brooks Range (Figure 4); this is the most rapid and predictable seasonal movement of the year. Caribou from this herd are more dispersed during fall than at any other time of year as they move southwest toward wintering grounds (Figure 5); rut occurs en route during the fall migration. 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 (Figure 6). Since 1996 very few WAH caribou have wintered in the southern portion of the Nulato Hills.

In 1970 the WAH numbered approximately 242,000 caribou and was thought to be declining (P. Valkenburg, ADF&G, personal communication). By 1976 it had declined to about 75,000 animals (Figure 7). From 1976 to 1990 the WAH grew 13% annually, and from 1990 to 2003 it grew 1–3% annually. In 2003 the WAH numbered ≥490,000 caribou but by 2011 it had declined to 325,000 caribou.

At its peak in 2003, density of the WAH over its total range was 3.12 caribou/mi^2 (1.2 caribou/km^2). Density estimates for caribou are misleading, though, because they exhibit a

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[a] This report also contains information collected outside the reporting period at the discretion of the reporting biologist.

"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 weeks of July 2007, for a density of 11.2 caribou/mi^2, caribou actually occupied <25% of this total area, making effective local densities much higher. Additionally, WAH range overlaps with that of two other northern Alaska caribou herds as well as Seward Peninsula reindeer. Density estimates should include these other *Rangifer* populations as well.

The Western Arctic Caribou Herd Working Group (WG) became established as an interim group in 1997 and adopted its current structure in 2000. The purpose of the group is to help manage and conserve this herd. A working group technical committee consisting of agency staff that conduct or supervise field studies of the herd was subsequently established in 2004. These groups now meet once each year to discuss the status of the herd, share information and discuss issues that affect caribou and the people who rely on or value them (see also Nonregulatory Management Problems/Needs section).

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 caribou herd; MCH for Mulchatna caribou herd; NAP for Northern Alaska Peninsula caribou 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 31 July–20 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 that provides 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 are 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 ≥1 hard antler during June.

“NPS” is the National Park Service.

“NPS-GAA” is the Gates of the Arctic National Park and Preserve.

“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.

“Rivest population estimate” refers to an estimate of population size based on Rivest et al. (1998).

“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 29 April–6 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.

“WG” refers to the Western Arctic Caribou Herd Working Group.

“Winter” is 21 November–28 April.

Population Status and Trend. Our understanding of WAH population status and trend is based on conventional, satellite, and GPS telemetry information; opportunistic observations by department staff located in Nome, Barrow, Kotzebue and Fairbanks; and reports from the public. Implementation and early objectives of the conventional telemetry program in the WAH were previously reported (Dau 2005). In 1987 the department began deploying 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 would be 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 and distribution. Although we rely heavily on telemetry information to monitor the WAH, we have never collared more than 0.03% of the herd. We have typically conducted at least_15–20 VHF relocation flights annually since the late 1980s in part to monitor characteristics of caribou, e.g. body condition and sex-age distribution, and partly to assess environmental conditions, e.g. snow conditions and the prevalence of predators. In 1995, 2000 and 2012 VHF telemetry flights enabled us to identify localized mortality events.

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).

Beginning in 2009, agencies began deploying GPS collars in the WAH. The NPS deployed 39 GPS collars programmed to record 1 location every 8 hours and 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. Unfortunately, the VHF transmitters in 13 of these collars were in the federal frequency band. It is difficult to monitor VHF transmitters in 2 separate bands during telemetry flights. Therefore, little observational data has been collected for NPS collars with VHF frequencies in the federal band. This will become a bigger problem, compromising our ability to find collared individuals in both frequency bands, as the proportion of collars in the federal band increases.

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 do not deploy collars on bulls less than 3 years old 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 2008–2009 collar year with 114 potentially active collars on living caribou (96 cows and 18 bulls). Of these, 34 collars on cows and 15 on bulls were equipped with a functional PTT. We began the 2009–2010 collar year with 132 potentially active collars on living caribou (112 cows and 20 bulls). Twenty four cows had an active PTT and 39 had an active GPS collar; 18 bulls had an active PTT and 1 bull had an active GPS collar. Initial sample sizes of collared caribou are inconsistent between consecutive WAH management reports because collars are retroactively censored from the initial sample after we decide that 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 people who reside within the range of this herd. Even so, we limit the duration of the collaring project at Onion Portage to 1 week to minimize our impact on local hunters and visiting nonconsumptive users. Additionally, we limit the number of agency staff on the project to only those required to meet our objectives.

In 2008 we deployed 20 PTTs (11 BLM collars and 9 department collars) and 6 VHF collars (all department collars) on WAH caribou. In 2009 we deployed 39 GPS collars for NPS as well as 2 GPS collars and 8 PTT collars for the department. To maintain a minimum 36-month VHF transmitter life expectancy in PTT and GPS collars, we specified a 12-hr ON/12-hr OFF duty cycle in conventional transmitters contained in department satellite collars (ON 8:00 a.m–8:00 p.m. daily). Increasing involvement by federal agencies in the department's telemetry program has resulted in a variety of duty cycles for PTTs deployed on WAH caribou. We standardized all PTT location data to a 1-day-on/5-days-off duty cycle for the entire year when conducting location density analyses for depicting seasonal ranges and movement corridors. During this reporting period all collars purchased by the NPS were fitted with a Cr-2a breakaway device programmed to release in 5 years. Each of the federal agencies stipulated that their collars be deployed on female caribou. All PTT or GPS collars deployed on bulls have been purchased by the department. After 2006 the department stopped putting VHF collars on bulls, because it is often impossible to determine their fate.

Population Size and Composition. Since 1986 we have determined population size using the aerial photo-direct count extrapolation (photo census) technique (Davis et al. 1979). This herd was photographed on 3 and 10 July 2009, overlap lines were placed on the photos by department staff from Region V in December 2009, and all photographs were counted by 15 March 2010. All collared caribou that were not in the groups photographed on 3 or 10 July were subsequently located on mortality mode immediately following the census photography. These caribou had died before the census. Three collared caribou were in groups located on the Seward Peninsula that totaled 3,943 caribou. Additionally, 1,133 caribou were photographed on the Baldwin Peninsula. These groups on the Seward and Baldwin peninsulas likely contained some feral reindeer; however, based on the size of fawns and calves (i.e., individuals that were less than 12 months old), it appeared that most of the animals were caribou. Therefore, we included them in the census. The department contracted Don Williams (Ambler) to count all of the 2009 census photos.

On 7 and 9 July, 2011 (after this reporting period), we again photographed the WAH. During November-December 2011 Jim Dau and Charlotte Westing placed overlap lines on the photos. Don Williams was contracted to count all of the photos and completed this by 31 March 2012. Dau recounted 53 randomly selected photos to evaluate the potential for counting errors. The estimate was finalized in May 2012.

This report presents both minimum population counts of census photographs as well as population estimates based on radio collared caribou following Rivest et al. (1998). The main benefits of the Rivest approach are that it provides confidence intervals around population estimates, and it allows us to statistically incorporate radiocollared caribou that were not located during the census photography into the final estimate. When using census data to calculate density estimates, I use either the Rivest point estimate or the minimum count, whichever is highest. This change in handling census data results in many other changes in this report relative to previous reports. For example, density estimates among portions of winter range reported herein differ for most years. Even so, the magnitude of these differences is generally small given the small difference between the minimum counts and Rivest estimates of WAH herd size.

Population composition for the WAH was estimated from annual calving surveys during June, fall composition counts during October–November 2008 and 2010, 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 during the previous fall (Cameron and Ver Hoef 1994).

In 1987 and 1990 calving probably peaked early, at least in relation to the timing of calving surveys but probably relative to other years as well, based on the absence of hard antlers on maternal cows as well as their westerly distribution and the mobility of calves observed during the surveys. Therefore, these years were excluded from kernel analyses to delineate the calving grounds. Based on direction and rate of travel for satellite-collared caribou, the WAH calving period is 7–13 June. Since the mid 1990s we have attempted to conduct calving surveys during 3–10 June to minimize the likelihood that parturient cows will have shed both antlers. Cows that have dropped both antlers that do not have a calf are classified as nonmaternal. Undoubtedly, some of these cows gave birth but lost their calf soon thereafter. Using the presence of hard antlers to determine parturition status minimizes this error. In 2009 and 2010 we attempted to record udder status of collared cows but, as in the past, found it too difficult to consistently do so in very large groups. In some years poor weather has extended calving surveys into and slightly past mid June, which probably caused us to slightly underestimate parturition. In 2009, calving surveys were conducted in a PA-18 airplane during 5–6 and 8 June. During 2010, calving surveys were conducted using a PA-18 airplane during 5–10 June. Calving survey techniques and criteria to determine maternal status and geographic coverage were previously described (Dau 1997). In this report I arbitrarily used the 95% isopleth to show extent of calving and a Bayesian model (Wilson et al. 2009) to select the core area isopleths during 1988–1989 and 1992–2012 (all years combined). Thus, the calving area in this report differs somewhat from previous reports that employed the Spatial Analyst kernel density estimator to delineate the calving grounds.

In 2010 we began relocating collared cows multiple times during calving surveys to better determine their maternal status and improve the accuracy of parturition sites. We tried to locate cows until they were observed with a calf at heel or began to sprout velvet antlers. However, the parturition site for some cows having at least 1 hard antler when we terminated calving flights was still uncertain. For these individuals we assigned the parturition site as their last location. No collared cows were observed >3 times.

Caribou collared at Onion Portage tend to move *en masse* through their first fall and winter so are not randomly mixed throughout the herd until the following June. Therefore, we exclude location data for these individuals from the time of collar deployment through May 31 to determine the distribution of this herd.

Fall composition surveys were conducted on 23–26 October 2008 and 18-19 October 2010 using techniques previously described (Dau 1997). In both years survey dates were determined by the availability of an R-44 helicopter and weather.

Spring composition (short yearling or recruitment) surveys were conducted on 4, 15, 16, and 30 April; and on 1, 5, 6, and 14 May 2009. During 2010 they were conducted on 26 March; 5–7, 9, 19 and 27 April; and 5 May. In both 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 directly correspond with the period over which we estimate adult mortality (October through the following September). As a result, recruitment is graphed differently in Figures 9 and 12. In Figure 9 recruitment is plotted on the year it was estimated (i.e., the year following the birth year) to best correspond with estimates of adult mortality. The purpose of Figure 12 is to show the ratio of calves to cows through their first year of life; therefore, the spring recruitment estimate for any specific year is shifted 1 year earlier to track its year of birth. For example, we observed 86 neonate calves:100 cows during June 1992, 52 calves:100 cows during October 1992, and 28 calves:100 cows during April 1993. The 28 calves:100 cows is attributed to 1993 in Figure 9, and 1992 in Figure 12.

<u>Distribution and Movements</u>. Distribution and movements of the herd were monitored through range wide conventional telemetry surveys, and through PTT locations. Range wide surveys were conducted during spring (January–May), summer (June) and fall (August–December), often in conjunction with composition surveys. Flights were based out of Barrow, Kotzebue, Nome, and Fairbanks using survey techniques previously described (Dau 1997).

<u>Mortality</u>. Mortality rates for adult WAH caribou were estimated from cows with conventional, PTT or GPS collars on a collar-year basis. Estimated mortality includes all causes of death including hunting. Portions of 3 collar years (2007–2008, 2008–2009 and 2009–2010) span this reporting period. Mortality rates are estimated separately for cows and bulls because we do not collar bulls less than 3 years old, and sample sizes of collared bulls have historically been small. We began using expandable collar sections on bulls in 2001 which seems to have reduced the number of collars that are lost by slipping over their head.

Mortality rates reported in consecutive management reports are inconsistent because sample sizes are continually adjusted as we determine the fate of collared individuals. For example, radiocollared caribou 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 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 for the years 1983–84 and all years after 1985–86. However, I was only able to use the years 1992–93 through 2009–10 for bulls, and the multiplier used for individual years ranged 4–11. Therefore, 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.

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); and 3) community-based harvest assessments for 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. 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. The single exception to this approach was the community of Nome where we administered the harvest report system through the registration permit hunt RC900. Harvests of WAH caribou in Units 21 and 24 were not incorporated into the model because they were considered inconsequential. Human populations of communities were based on estimates for the year 2007 (Alaska Department of Fish and Game 2000).

In previous management reports (e.g., Dau 2007) we initially estimated total community caribou harvest as described above for Anaktuvuk Pass and communities in Unit 26A where the CAH, TCH, and WAH caribou mingle. We then estimated the percentage of total harvest composed of WAH caribou based on our understanding of caribou distribution and movements for each herd. Although we recognized that 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 we used kernel analyses of PTT- and GPS-collared WAH and TCH caribou in relation to the spatial distribution of subsistence hunting effort around Barrow to estimate the proportion of WAH animals in its total harvest. In 2010 we used the same approach for Nuiqsut and Atqasuk. The proportion of WAH animals in the total caribou harvest taken by each of the Unit 26A communities for 2008–2009 and 2009–2010 used for this report were as follows: Barrow—0.03; Point Lay—0.40; Atqasuk—0.02; Nuiqsut—0.01; Wainwright—0.15; 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 33 bulls and 41 cows in 2008, 31 bulls and 53 cows in 2009, and 16 bulls and 46 cows in 2010. 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 2009, we tested for a number of other pathogens, including *Chlamydia* and Q fever.

In September 2010 (after this reporting period), we 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 second comprehensive health assessment conducted on WAH caribou since the late 1980s.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The WAH is clearly in a period of population decline that began around 2003 (Table 1, Figure 7). Rivest estimates of population size agree closely with the minimum counts previously reported (Dau 2009). For example, in 1996 the minimum count and Rivest estimate were virtually identical; in 3 years (1988, 1990 and 2003) the minimum count exceeded the Rivest estimate; and in one year (1990) the minimum count exceeded the Rivest upper 95% confidence limit. For censuses conducted after 1987, the minimum count captured an average 99% (SD=4) of the Rivest estimate. We interpret this not as evidence of minimum counts over counting this herd during some years, but rather as an indication that WAH minimum count censuses have historically been thorough and accurate.

The original minimum count by Don Williams for the 2009 WAH census was 401,000 caribou (Dau 2009). During the winter of 2010–2011, Region III staff discovered a counting problem with the 2010 PCH census that Williams had also counted. For all WAH censuses prior to 2009 I recounted a random sample of photos to identify potential counting problems. In all years my counts and Williams' counts had been very close. Unfortunately, given my high workload, the consistent agreement between my and Williams' counts and the fact that Williams had counted orders of magnitude more photos and caribou than I had in recent years, I did not recount any photos during the 2009 census. After learning of Williams' error with the 2010 PCH counts, I recounted 30 randomly selected photos from the 2009 WAH census and found that his counts were 12% higher than mine. I then randomly selected 6 additional photos from the subset that contained >4,000 caribou per photo. Williams' counts were again 12% higher than mine. The same 36 photos were recounted by a second department biologist (C. Westing): her counts were similar to mine. The disparity between Williams' and my counts was substantial (roughly 50,000 caribou) so we adjusted his original count.

For each of the 36 prints that I recounted we calculated a ratio of my count to Williams' count. For each of the 283 photos counted in the census, we randomly selected one of the 36 ratios, applied it to Williams' count and then summed all 283 corrected counts to produce an adjusted total minimum count. We replicated this procedure 1000 times. The median of these replications was 348,000 caribou with a 95% confidence interval of 342,361–354,228 caribou. This is the correct minimum count (348,000 caribou) for the 2009 WAH census.

The significance of this correction to the 2009 census estimate is that it suggests the WAH was not stable from 2007 to 2009 as originally reported (Dau 2009); instead, it declined approximately 3% each year (Table 1, Figure 7). We reported this correction in a press release (11-20) 24 March 2011.

The 2011 census estimate of 325,000 caribou constitutes a 4% average annual rate of decline from 2009. Ninety six of 97 collared caribou were found during the 2011 census photography; most caribou were not rapidly moving while being photographed; and caribou were optimally aggregated for photography and counting. Light conditions were excellent for photography and the quality of the 2011 prints was high. For the 53 photos that both Williams and I counted, there was no statistical difference between our respective counts.

Considering that the WAH has numbered more than 300,000 caribou since about 1988, a slow decline is probably preferable to continued growth that could lead to an eventual abrupt decline as occurred during the early 1970s. No restrictions on caribou harvests are being considered at this time because the herd is still very large, there is no biological problem with the bull:cow ratio, the rate of decline is modest, and the health and body condition of WAH caribou are still good. However, department staff have begun to warn the public and the WG that if this decline persists, harvest restrictions may become necessary in the future.

My observations of snow conditions, caribou carcasses and the body condition of live caribou during spring suggest that fall and winter icing events have probably contributed to this population decline. Additionally, although we have little quantitative information regarding densities of brown bears or wolves throughout the range of this herd, opportunistic observations by department staff, and many reports from residents of this area as well as long-term guides and transporters all indicate that predator numbers are high compared to previous years. I have seen substantially more wolf-killed caribou during the last 3–5 winters than prior to that time. Although BLM (Joly et al. 2007) has documented a decline in lichen cover with a concomitant increase in shrub and grass cover on portions of WAH winter range, the generally good body condition of WAH caribou suggests that habitat degradation is probably not the primary factor behind this population decline (although it could be contributing to it).

The department has supplemented bi- and triennial census counts with annual estimates of adult cow mortality (Table 2; Figures 8 and 9) and recruitment (Figure 9) to fill gaps between years when censuses were conducted, and to help understand factors that could be driving population size and trend. 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. Cow recruitment should consider only female calves, as now shown in Figure 9. This change in calculation does not alter the overall trend previously identified, and both approaches indicate that adult cow mortality has slowly increased while recruitment has declined since the early 1980s. Converging trends in adult female caribou mortality and recruitment are consistent with the decline in population size shown by census data.

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. Additionally, WAH caribou are never distributed evenly over their entire range. Thus, the functional density of caribou on seasonal ranges, especially summer range, was much higher than calculated density.

Population Composition

Calf production and survival. Rate and direction of travel of PTT-collared cows suggest that calving occurs during 7–13 June (Dau and Sutherland, unpublished data). Calving probably peaked early, at least in relation to the timing of calving surveys, during 1987 and 1990 based on the westerly geographic distribution of collared cows, their westerly direction and high rate of movement, and their lack of hard antlers. The earliest reported peak calving date for the WAH is 26 May 1960 (Lent 1966). During 1987–2010 there has been no correlation between median date of observation and the June calf:cow ratio (Pearson rank correlation = -0.22, P = 0.30, n = 25). Our estimates of parturition are probably 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 79 calves:100 cows in 2009, 73 calves:100 cows in 2010, and 77 calves:100 cows in 2011 (Table 3, Figure 10). Historical estimates of calf production suggest parturition rates were more variable 1960–1970 than in recent years (Figure 10). 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.

In 2010, we observed 29 collared cows multiple times. Of these, 23 had $\geq$1 hard antler and were north of 68.65 degrees latitude the first time they were observed so their maternal status could not change with additional locations (i.e., no 'maternal' designations are reversed by multiple sightings). Six cows had no antlers and no calf the first time they were observed, of which 2 were subsequently observed with a neonate. This increased our estimate of parturition from 70 to 73 calves:100 cows. Although multiple observations of collared cows had little effect on the estimated parturition rate, multiple locations probably improved the accuracy of recorded parturition sites. Seventeen of the 23 cows that initially had hard antlers, but no calf, were eventually seen with a calf. These cows moved an average of 8.8 mi (14.1 km) from where they were first seen to where they were observed with a neonate.

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 = –0.71, P < 0.0001, n = 24 years). The median proportion of cows with velvet antlers during years when the calf:cow ratio was $\geq$70:100 (7.6%, n = 12) was significantly lower than the median for years when this ratio was <70:100 (14.4%, n = 12; Kruskal-Wallis test statistic 6.60, P = 0.01). This suggests low WAH parturition rates are real and not artifacts of sampling error. Since 1993 the parturition rate has generally increased (Table 3, Figure 10).

The fall calf:cow ratio generally increased during 1976–1982, a period of rapid population growth. In contrast, this ratio declined 1992–2010, a period of slow growth or decline (Table 4, Figure 11). Spatial and temporal segregation of bulls and cows likely confounds fall calf:cow estimates because we do not sample the entire WAH and the degree of sexual segregation varies among years.

We observed fourteen 10-month-old calves:100 adults in spring 2009 and 15:100 in spring 2010 (Table 5, Figure 9). Recruitment, as reflected in April–May surveys, has slowly declined since the early 1980s (Table 5, Figures 9 and 12). This trend would not be evident without a long-term data set.

Unweighted least squares linear regression indicates that there has been no trend in the June calf:cow ratio during 1982–2011 ($T = -0.38$, $P = 0.71$). The fall calf:cow ratio declined linearly during 1982–2010 (correlation coefficient = -0.59, $P = 0.04$, $n = 14$) as did the spring calf:cow ratio (correlation coefficient = -0.73, $P < 0.001$, $n = 29$; Figure 12).

Calf:cow ratios were estimated during June, the following fall, and the following spring in 14 years between 1992 and 2010 (Figure 12). There has been no correlation between the June calf:cow ratio and subsequent fall ratio (Spearman rank correlation = 0.10, $P = 0.74$), or with the following spring ratio (Spearman rank correlation = -0.11, $P = 0.72$). In contrast, the fall and subsequent spring ratios were correlated (Spearman rank correlation = 0.63, $P = 0.02$). In summary, calf production has likely had little influence on the population trajectory of the WAH; however, calf survival has probably contributed to its recent decline.

<u>Bull:cow ratios</u>. Since 1992 telemetry-based fall composition surveys indicate the bull:cow ratio has ranged 38–64:100 and trended downward, with a median of 50 bulls:100 cows (Table 4, Figure 13). The fall bull:cow ratio generally increased during 1976-1980, a period of rapid population growth, and declined during 1992–2010 when this population was growing slowly or declining (Figure 13).

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. The low value of 38 bulls:100 cows in 2001 was almost certainly caused by incomplete sampling of the entire herd rather than an actual drop in the proportion of bulls.

Distribution and Movements

<u>Historical Summary</u>. Our historical understanding of WAH distribution has been previously described (Dau 2001). We have conducted spring and fall range wide telemetry surveys since spring 1995 and consistently found ~75% of the collared caribou through VHF telemetry flights. Often, collars missed during one seasonal survey are located during the subsequent survey mixed with caribou that had been previously found. Also, we have repeatedly flown very near satellite- and GPS-collared caribou without hearing their VHF transmitter. 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 survey coverage of the herds' range. Deployment of PTT or GPS collars with VHF transmitters in the federal frequency band will almost certainly increase the number of caribou missed during relocation flights.

<u>General Movement Pattern</u>: The general movement pattern of this herd was previously reported (Dau 2009).

<u>Calving grounds.</u> The WAH has exhibited strong fidelity to its calving grounds in the Utukok hills for decades. For example, the areas identified by Lent (1966) as calving areas in 1960 and

1961 are within the 95% kernel delineated from 1988–2012 calving data (Figure 14). Combining data for all years to delineate the calving grounds as in Figure 14 ignores annual variability in the distribution of maternal cows. Substantial deviations from typical calving distributions occurred in 2000 and 2001 when spring breakup was late.

In 2009 we located 70 collared cows during calving surveys and observed 79 calves:100 cows (Table 3). One collared cow with a neonate along with 2 other caribou cow-calf pairs were located about 5 miles south of Cape Espenberg. This was the first time we documented a collared WAH cow with a neonate on the Seward Peninsula. This collared cow spent the summer of 2009 in the vicinity of Serpentine Hot Springs: she was photographed near Harris Dome during the 2009 photo census. This cow wintered in the Nulato Hills and then died in the Baird Mountains while migrating north toward the calving grounds during spring 2010.

In 2010 we observed 80 collared cows with 73 calves:100 cows. All but 6 collared cows, all nonmaternal, were observed within the 95% calving kernel (Figure 14): 4 of these 6 individuals were barely south of the calving grounds. The other 2 collared cows were observed moving north through the middle Noatak drainage.

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 department staff have observed and received reports of up to several thousand WAH caribou, primarily bulls and immature cows, near Serpentine Hot Springs, Cape Espenberg, and the Bendeleben Mountains on the Seward Peninsula during summer. In contrast, during some years very few caribou have summered in this area. Some residents of Seward Peninsula communities believe a new resident caribou herd has become established there because caribou can be seen almost year-round. However, based on telemetry data, it appears that although a small percentage of WAH caribou may frequently summer there, there is no indication that the same individual cows calve there to comprise a distinct herd.

Fall movements. The fall movement pattern has been previously described (Dau 2007; Figure 5). During autumn of 2009 and 2010, WAH movements through Unit 23 were generally limited to a narrow east-west corridor down the Anisak River, through Ivishak Pass, and into the Purcell Mountains. From there caribou moved west into the northern Nulato Hills or onto the Seward Peninsula where they wintered. As a result, in both years most communities within Unit 23 had difficulty getting caribou during autumn. Noatak and Kivalina hunters harvested almost no caribou during the fall of 2010, and Kotzebue hunters took very few.

Besides the limited spatial distribution of caribou during fall of 2009 and 2010, they were also late emigrating off the North Slope during the fall migration. For example, in 2010 roughly half of the WAH migrated through the vicinity of Dahl Creek, Shungnak, and Kobuk during the second and third weeks of October. The relatively late timing of the fall migration further reduced the availability of caribou to subsistence hunters. Many village hunters took few bulls because, by the time caribou became accessible to them, caribou were in rut and bulls were unpalatable. Many subsistence hunters traveled far by boat or snowmachine to access caribou during this reporting period. We received many reports of families pooling their money to purchase gas for extended caribou hunting trips only to return without meat.

Visiting hunters and commercial operators were also affected by the limited availability of caribou during this reporting period. Their use of airplanes to access hunting areas reduced the effects of limited spatial distribution on hunter success once caribou began moving through Unit 23. But these users were strongly affected by the late onset of the fall migrations. During September of 2009 and 2010 the Anisak River drainage was heavily used by visiting hunters. Although virtually all access points in this drainage were occupied by drop-off camps during each year, many caribou continued to migrate down heavy, fresh trails and past this gauntlet of visiting hunters.

As in previous reports, 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 traditional subsistence hunting areas. This has been a major, recurrent issue brought up during every Unit 23 User Conflict meeting. I combined caribou satellite collar movement data for 1988–2010 with fall camp location data for 2006–2010 to evaluate the potential for hunting camps and associated activity to deflect caribou from established movement corridors. Unfortunately, on an annual basis there are too few GPS- and PTT-collared caribou and too few recorded camp locations to establish cause and effect (or lack thereof). Not surprisingly, fall camp location and caribou migration data suggest that commercial operators and visiting hunters target high use caribou movement areas. The exception to this is the Squirrel River drainage that is heavily used by commercial operators and visiting hunters despite relatively low use by caribou during the fall migration. Hunters in the Squirrel River drainage also pursue moose and brown bears.

In an effort to get more complete information about the distribution of hunter camps and commercial activities, the department requested guide and transporter contract data for fall 2009 and 2010 from the Department of Commerce and Community Economic Development (DCCED). Commercial operators are not required to provide latitude and longitude for camp sites or drop- off/pick-up locations. However, in 2009 the Big Game Commercial Services Board requested that commercial operators in Unit 23 voluntarily provide this information to DCCED. In 2009, 7 transporters submitted 125 contracts to DCCED; of these, 86 (69%) contracts reported latitude and longitude of camps. In 2010, 4 transporters submitted 35 contracts of which 21 (60%) reported latitude and longitude. The low number of records for 2010 relative to 2009 may have been due to DCCED not having entered all contracts into their system. Comparing the DCCED data with observations of camps recorded by agency staff suggests that both sources of information are incomplete. The lack of camp location information seriously compromises our ability to evaluate whether airplane activity and nonlocal hunters deflect caribou from migration corridors and traditional subsistence hunting areas.

Linear relationships and correlations between air temperature, wind chill and snow depth with latitudinal movements of WAH caribou during fall have been previously reported (Dau 2007). Over an annual basis, air temperature and wind chill 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. 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; during winter WAH caribou may occur throughout their total annual range albeit at very low densities in some areas (Figure 6; Tables 6 and 7). Although 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.

The Seward Peninsula (subarea 7, Figure 15; and Tables 6 and 7) was the primary wintering area during the winter of 2008–2009 (Tables 6 and 7). The herd was more dispersed during the winter of 2009–2010 with roughly equal proportions of the herd in Kotzebue Sound (subarea 4) and the Nulato Hills (subarea 8). Substantial numbers of WAH caribou wintered in the Koyukuk drainage south of the Brooks Range and on the Seward Peninsula during 2009–2010 as well.

The estimates of caribou density on winter ranges reported in Table 7 represent minimum densities because they do not include reindeer or caribou from the TCH or CAH that also use WAH winter range. 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 near Red Dog and in the lower Noatak drainage (subarea 9, Figure 15).

Densities reported in Table 7 are inconsistent with previous reports because I modified some historical estimates of population size using Rivest estimates. When the minimum count of a census exceeded the Rivest point estimate, I used the minimum count to estimate density. Otherwise, I used the Rivest estimate.

Satellite and GPS Collars. The objectives and limitations of the WAH satellite collar program were previously described (Dau 2007). In December 2010 the department shared all PTT data collected during or after 2000 with NPS, FWS, and BLM.

We deployed 39 GPS collars for the NPS and 2 GPS collars for the department in September 2009. In 2010 we deployed an additional 15 GPS collars for NPS on WAH caribou. The NPS has shared this data with BLM, FWS, and the department.

Genetics. In a previous study we found no genetic difference between WAH and TCH caribou (Dau 2009). In 2009 we provided blood samples from WAH caribou to a researcher, Dr. S. Cote, at the University of Laval, Sainte-Fog, Quebec, Canada to assess genetic relatedness of caribou herds throughout Canada and Alaska. Results from that study are pending.

During this reporting period we provided blood samples and telemetry location data to Ms. K. Mager, University of Alaska, to assess the genetic relatedness of WAH, TCH, CAH, and PCH caribou as well as Seward Peninsula reindeer. Of the 4 caribou herds, only the WAH and PCH were significantly different; reindeer were significantly different from all 4 caribou herds (Mager, University of Alaska, Fairbanks, personal communication). Given the decades of co-mingling of reindeer and caribou, especially WAH caribou, this suggests that there are biological barriers to gene flow between these subspecies. Potential barriers include a 1 month difference in the seasonal cycles of reindeer and caribou (reindeer are 1 month advanced relative to caribou) and increased vulnerability of reindeer to predation (reindeer are slower with less endurance). Additionally, there is a strong preference by subsistence hunters to take reindeer when they are mixed with caribou as reindeer meat is considered superior to caribou. Reindeer herders eliminate caribou and hybrids when these individuals are mixed in reindeer herds.

MORTALITY AND RECRUITMENT

I estimate adult caribou mortality separately for bulls and cows based on radiocollared individuals. Mortality estimates for cows are conservative because they exclude emaciated, injured, or clinically diseased cows even though these individuals compose part of the population. Additionally, we collar few yearling cows. Mortality estimates for bulls are probably biased high because we do not collar bulls younger than 3 years old. During the 1970s through 1990s, when the WAH telemetry program was based almost solely on VHF observations, we sometimes could not determine time of death to year much less season. This introduces uncertainty into estimates of adult caribou mortality.

There is also error associated with our estimates of recruitment. We probably misclassify some 10- and 22-month-old caribou during spring composition surveys because we conduct them from a Piper PA-18 airplane which provides a brief view of the animals compared to observations made from a helicopter.

Pritchard et al. (2012) found that randomly collaring only 2-year-old and older cows each year causes the age structure of the collared sample to be older than the population (as noted previously, this bias is more pronounced for the sample of collared bulls as we collar only 3+ year-old individuals). As a result, based on our collared sample we underestimate adult cow survival about 3.4% and overestimate recruitment about 3.3%. Before 2009 this bias in estimated cow mortality is probably inconsequential given the uncertainty in determining time of death. Since then the increasing proportion of PTT and GPS collars in the sample of collared caribou has reduced – but not eliminated – uncertainty in determining time of death. Bias in adult mortality and recruitment is significant when cardinal estimates of each parameter are used to model population size. When these parameters are used as indices of trends in adult mortality and recruitment, these biases are less important.

Mortality rates for the 2008–2009 and 2009–2010 collar years were relatively high (23% and 27%, respectively; Table 2, Figure 8). Possible effects of winter thaws and rain-on-snow events on caribou mortality have been previously reported (Dau 2009). Additionally, our opportunistic observations and many reports from the public indicate that wolf numbers have been high and increasing during recent years. My opportunistic observations during winter suggest that wolf predation on caribou has been higher since about 2008 than in previous years. Not surprisingly, given the large size of this herd since the mid 1980s, BLM has documented substantial declines in percent lichen cover with concomitant increases in grasses and shrubs on some WAH winter range (Joly et al. 2007). Despite these changes in winter range, body condition of caribou has remained good based on the 2007 and 2010 health assessments, and on our subjective index of condition for caribou handled during the September collaring project. This suggests that range limitation is not yet a primary driver of high mortality or the current population decline.

Adult cow mortality has exceeded 20 deaths per 100 collared cows during 5 of the last 6 years (Table 2, Figures 8 and 9). Prior to 2004–2005 this value was equaled or exceeded only twice (in

1992–1993 and 1999–2000). Median mortality during 1984–1985 through 2003–2004 (15 deaths:100 collared cows) was significantly lower than during 2004–2005 through 2009–2010 (26 deaths:100 collared cows; Kruskal-Wallis statistic = 10.53, P = 0.001). There has been a significant linear increase in adult cow mortality during 1984–1985 through 2009–2010 (slope = 0.55, F = 23.55, P = 0.0001, R^2 = 0.50).

Adult mortality has slowly increased while recruitment has slowly decreased since the mid 1980s (Figure 9). These trends are consistent with census results (Figure 7). As noted above, age related bias in our sample of collared cows probably causes us to overestimate mortality and recruitment. However, the opposing trends in these relationships are more important than their annual values. There has been a significant negative correlation between recruitment and adult cow mortality during 1984–2010 (Spearman rank correlation = -0.66, P = 0.0003).

Survival rates in relation to collar type and sex have been previously reported (Dau 2009). Survival data collected since the last reporting period did not change the shape of survival curves for bulls or cows (Figure 16).

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. Based on collared individuals, seasonal differences in mortality rates were less pronounced for cows than bulls (Figures 17 and 18). Cows died from natural causes at similar rates throughout the year. Little harvest of cows or bulls occurred during summer. In contrast, natural and harvest mortality of bulls both spiked during fall. Conclusions regarding seasonal mortality patterns of bulls should be viewed with caution given small sample sizes of radiocollared individuals and the fact that we avoid collaring young bulls.

Harvest

<u>Season and Bag Limit</u>. On state-managed lands the following seasons and bag limits were in effect throughout the reporting period.

2008–2009 and 2009–2010 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	 Nonresident Open Season
Units 21D, 22A, and 22B remainder		
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

2008–2009 and 2009–2010 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	No closed season	
Cows	1 July–15 May	
Nonresident Hunters: 5 caribou per year		
Bulls		No closed season
Cows		1 July–15 May

2008–2009 and 2009–2010 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	No closed season	
Cows	1 July–15 May	
Nonresident Hunters: 5 caribou per year		
Bulls		No closed season
Cows		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	No closed season	
Cows	1 July–15 May	
Nonresident Hunters: 1 caribou total per year		
Bulls		No closed season
Cows		1 July–15 May

2008–2009 and 2009–2010 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Units 24A excluding that portion south of the south bank of the Kanuti River (24 remainder), 24B excluding that portion south of the south bank of the Kanuti River upstream from and including the Kanuti-Kilolitna River drainage (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

Federal hunting seasons were identical to state seasons during this reporting period. However, the bag limits under federal subsistence regulations were 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.

The board increased the nonresident caribou bag limit in Unit 23 during the 2009 fall BOG meeting in Nome to 2 caribou per year. At this meeting the board also extended the dates of the Noatak Controlled Use Area to be in effect August 15–September 30. The latter action was based on the unpredictability of fall caribou movements in recent years. These changes went into effect 1 July 2010.

Human-Induced Harvest. The total harvest of WAH caribou was approximately 15,000 caribou in 2008–2009 and 12,000 caribou in 2009–2010 (Table 8). These levels are within the range of harvest levels for previous years (Dau 2007, 2009). Total annual harvest was 3-4% of the population each year using the 2007 and 2009 population estimates (Table 1). We assumed that 95% of all caribou harvested by visiting hunters in Unit 26A were from the WAH and the remainder from the TCH (Table 8). Our harvest data does not include wounding losses or caribou killed but not salvaged.

Permit Hunts. All caribou hunting by residents that live north of the Yukon River and within the range of the WAH is administered through a 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) even though vendors were paid twice the normal amount to issue caribou registration permits, and department and Department of Public Safety staff invested substantial time educating hunters in some communities about the need for data produced through this system. The exception to this is the community of Nome where compliance with reporting requirements is believed to be much better (T. Gorn, ADF&G, personal communication). The department has not requested harvest information from registration permit holders outside of Unit 22 since the year 2000 because it is so incomplete.

Nonresidents and residents that live outside the range of the WAH must carry a statewide caribou harvest ticket when hunting. Department of Public Safety (DPS) Wildlife Enforcement officers indicate that compliance with this requirement is almost 100% (C. Bedingfield, J. Rodgers, and D. Hildebrand, DPS Alaska Wildlife Troopers, personal communication). We think this system is reasonably accurate for monitoring caribou harvested by nonlocal hunters.

Hunter Residency and Success. Hunters living within the range of this herd took roughly 14,000 WAH caribou in 2008–2009 and 11,500 caribou in 2009–2010 (Table 8). As in past years most of the subsistence harvest of WAH caribou came from Unit 23 (96% in 2008–2009 and 96% in 2009–2010. Availability of caribou to individual communities, human population sizes, and estimated harvests are reported in Tables 9 and 10.

There has been no clear trend in numbers of nonlocal WAH caribou hunters since 1998–1999 (Table 11). This is surprising because many nonlocal hunters who have come to Unit 23 in recent years have indicated that declines in the MCH and accompanying regulatory restrictions had caused them to shift their effort to the WAH. Other factors, such as the stagnant national economy, may offset this effect by discouraging hunting in northwest Alaska by nonresident hunters. As in the past, most WAH caribou taken by nonlocal hunters were harvested in Unit 23 (80% in 2008–2009 and 77% in 2009–2010). The mean annual success rate for nonlocal hunters during 1998–1999 through 2009–2010 was 65%.

The nonresident caribou bag limit in Unit 23 was increased from 1 caribou per year to 2 caribou per year beginning 1 July 2010. This may have contributed to the increase in nonresident hunters in this unit (235 nonresidents in 2009 versus 272 nonresident hunters in 2010) and the number of caribou harvested by them (140 versus 160 caribou).

Harvest Chronology. Seasonal subsistence harvest patterns have been previously described (Dau 2009). Subsistence hunters throughout WAH range take caribou whenever they are available. Seasonal movements of caribou drive seasonal harvest patterns among communities within the range of this herd.

Despite no closed season on bulls, 85–90% of all caribou taken by nonlocal hunters are harvested between August 25 and October 7. This temporal concentration of nonlocal hunters in Unit 23 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 12). During this reporting period, most nonlocal hunters accessed hunting areas by airplane (75% in 2008–2009 and 65% in 2009–2010). Boats were the next most commonly used transport method used by nonlocal hunters.

Other Mortality

Disease. Since 1992 we have collected blood annually from caribou during the Onion Portage project to screen for exposure to selected pathogens and measure haptoglobin levels. During 2009, 7% of caribou tested had an elevated haptoglobin level and in 2010 this value was 13% (Table 13). These levels are within the range seen in previous years. There has been no temporal trend in the percentage of caribou with an elevated haptoglobin level (Table 13).

Levels of exposure to brucellosis continued to be low during 2009 (Table 13). Brucellosis results for 2010 were not available when this was written. 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 currently affecting the population dynamics of this herd.

The department collected 10 caribou, including males and females of various ages, during the Onion Portage project in September 2010 to assess their health. Gross characteristics during necropsies indicated the collected individuals were healthy. Histopathology results have revealed no disease problems at the cellular level that likely go beyond the individual caribou sampled.

Results of 2007 and 2010 health assessments, serological surveys conducted since 1992, opportunistic observations by staff, and hundreds of caribou body condition reports from hunters suggest that neither disease nor a chronic decline in body condition are likely causing the current population decline.

Unsalvaged caribou. During July 2008, the DPS Wildlife Enforcement Division investigated reports that Point Hope hunters had shot numerous caribou and failed to completely salvage many of them. Reports in the press initially indicated that about 120 caribou had been harvested and up to 60 had been at least partially wasted. The investigation eventually charged 8 individuals with failing to salvage 9 caribou. Three individuals were convicted. The defendants argued that the 9 caribou not fully salvaged were either sick or had been shot so many times with a small caliber rifle that the meat was inedible. This case highlighted deeply rooted differences between state regulations and traditional hunting practices regarding salvage of meat from harvested wildlife that are sick or injured.

The issue of ‘waste’ should be addressed soon by the department, fish and game advisory committees, the Department of Public Safety, and Department of Law. Everyone agrees that waste is wrong. But while salvage regulations provide guidance regarding what must be salvaged from harvested wildlife that exhibit signs of trauma or disease, it is by no means definitive and of little value to hunters who cannot understand it. Additionally, there are strongly held differences among subsistence users, agency staff, and recreational hunters regarding what is fit for human consumption and, hence, what constitutes ‘waste.’ Allegation of waste was a major issue during the last decline of this herd during the 1970s. If the WAH again declines to a level where it becomes necessary to restrict hunting, it will be critical for agencies and users to agree on a mutually acceptable definition of waste. Managers, enforcement staff, and users should try to address this issue now, while the WAH population is still high, and before the controversy and allocation battles that will likely accompany a significant decline. The WG could be a good venue for this discussion.

HABITAT

Assessment

The department did not monitor WAH range condition during this reporting period. We did consult with staff from the Selawik Refuge to initiate a program to monitor snow conditions on WAH winter range. Snow surveys were conducted during the winter of 2010–2011 to begin developing a sampling protocol. Permanent snow transect sites were established during July 2011 (after this reporting period).

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 as an entity separate from state and federal management agencies in 1997. The purposes of the WG are 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 WG consists of 20 ‘voting chairs’ and ‘alternates’ representing multiple stakeholders. It is a nonregulatory body that emphasizes shared decision-making. BLM, FWS, NPS, and ADF&G support the WG.

During this reporting period, the WG and technical committee met once each year in Anchorage. The ADF&G regional (Region V) education specialist developed an issue of *Western Arctic Caribou Trails* newsletter during each year of this reporting period. The WG launched a website at www.westernarcticcaribou.org to improve communication about issues affecting the WAH. The 2003 Cooperative Management Plan was revised by WG members with assistance from agency staff during a two year period between annual its meetings in 2009 and 2011. Printing and distribution of the revised plan is expected to be completed prior to the WG 2012 meeting.

The history and timeline of WG includes the following key events:

1995 Harvest Symposium and initial discussion of WG. The idea to form a citizen stakeholder group to help manage the WAH stemmed from a discussion between ADF&G Regional Supervisor, John Coady, and Maniilaq Association Subsistence Coordinator, Arthur Ivanoff, during a harvest assessment workshop focused on rural Alaska in April 1995. Ivanoff, and many other rural representatives at the workshop, were interested in having tribes share legal authority, along with state and federal agencies, in management of wildlife resources. This initial discussion prompted the department to lead a multiyear effort that eventually culminated in the formation of the "Western Arctic Caribou Herd Working Group".

1995–1996 Scoping meetings by ADF&G in Huslia, Barrow, Kotzebue, Nome, Fairbanks and Anchorage to assess public interest in a group of stakeholders to help manage the WAH.

1996 Co-Management Agreement to share authority among the tribes, federal agencies, and State of Alaska for management of the WAH drafted by Maniilaq Association (A. Ivanoff) and Kotzebue Sound Advisory Committee (Pete Schaeffer, Chair).

1997 Interim WG formed to assess: 1) legal limits on state and federal authority to share management of public resources (e.g., caribou) with tribes; 2) interest among agencies and users in developing a co-management approach for WAH; 3) the structure of a stakeholder group; and 4) funding to support the group. The Interim WG drafted a mission statement and resolutions supporting the establishment of the WG were endorsed by the Board of Game and ADF&G Commissioner.

1997–1998 Two Interim WG meetings were held each year to discuss the Maniilaq Co-Management Agreement.

1998 The purpose, goals, and objectives of the Interim WG were drafted.

1999 The Interim WG discontinued work on the Maniilaq Co-Management Agreement as there was no legal basis for state or federal agencies to share legal authority for managing caribou with tribes. The Interim WG agreed to continue and decided to: 1) expand representation to include communities within the range of the herd as well as other users (stakeholders), and 2) hold at least 1 meeting per year in a subsistence community within the range of the WAH.

2000 The Interim WG established a structure of 20 'voting chairs' for representation among communities and user groups. Small communities within the range of the herd were grouped with a single representative, similar to the model of the state fish and game advisory committees, and the regional hubs of Kotzebue, Nome, and Barrow were each assigned separate voting seats. Nonlocal hunters were represented by voting seats assigned to Anchorage and Fairbanks. Guides, transporters, reindeer herders, and conservation organizations were each assigned one voting seat. The supporting resource management agencies (ADF&G, BLM, FWS and NPS) were represented by one nonvoting Agency Representative to the

WG (John Trent initially filled this position; Peter Bente later replaced him). The resource development industry (e.g., oil, gas, mining) would be invited to participate in meetings but not given a voting seat. Initially, advisory committees were asked to select community representatives; however, as vacancies occurred, communities and user groups at large selected their representatives and alternates. Also, in the initial formation of the group, Barrow opted not to participate as a voting member.

As the group formation solidified, there was agreement to: 1) create and distribute 2 newsletters each year that focused on issues affecting the herd and the people who rely on or value the herd, and 2) establish a committee to review and update the 1984 ADF&G WAH Strategic Management Plan.

At the end of the year, the full WG was formed and 10 'voting chairs' were seated. The WG elected its first chair (Joe Ballott) and agreed that 'alternates' be selected for each 'voting chair'. The remaining seats for voting chairs were filled over the next 2 years. Although individual representatives have changed since 2000, the structure of the WG has remained stable.

2001–2002 Two meetings per year were held by the WG. Meeting locations included: Nome, Kotzebue, Anaktuvuk Pass, and Point Hope

2003 The WG finalized and approved the WACH Cooperative Management Plan.

2004 A technical committee consisting of agency staff conducting or supervising field work on the herd was formed and met in Anchorage along with several interested WG members. The technical committee was tasked by the WG to report the status of the herd.

2009–2011 Review of the 2003 Cooperative Management Plan was completed by WG members and agency staff. A revised plan that includes updated biological information, population management strategies, and important issues affecting the herd was approved by the WG.

Resource development

The WAH has one of the most pristine, intact ranges of any caribou herd in North America. The Red Dog mine, road and port site comprise the only large development complex within the range of this herd. These facilities are located wholly within the northwestern portion of WAH range and appear to have had only local effects on movements and distribution of WAH caribou. This is partly because Teck Alaska, Inc. policies have attempted to minimize their impacts on subsistence users and wildlife, including caribou. It is also partly because locally-hired truck drivers and other employees have voluntarily acted to minimize impacts of industrial activities on wildlife.

A number of potential developments within the range of the WAH have recently been considered. These are:

1. Oil and gas development in NPR-A. The NPR-A South Planning Area contains roughly 80% of the WAH calving grounds. This area also holds important insect relief habitat during summer. Caribou from this herd use the Northwest Planning Area during summer as well but to a much lesser degree than the South Planning Area. Over the past 10–15 years the likelihood of oil or gas development in NPR-A has changed abruptly and significantly with changing federal administrations. A primary objective of the state 'Roads to Resources' program is to facilitate development of oil, gas and mineral resources in the NPR-A South Planning Area. Oil and gas exploration activities near Umiat increased during the summers of 2010 and 2011.

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. A project funded by the Arctic Slope Regional Corporation to assess the feasibility of mining North Slope coal that was located at Deadfall (roughly 30 miles southwest of Point Lay) was at least temporarily halted and the camp was largely removed during this reporting period. Opposition to coal mining by residents of Point Lay and Point Hope, based on concerns about displacing caribou from traditional hunting areas, influenced this decision.

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 contemplating transport of waste water and lead-zinc product from the mine through pipelines to their port site (W. Hall, Red Dog mine environmental coordinator, 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 existing road bed. This could reduce fugitive dust (Ford and Hasselback 2001) and traffic levels on the road, both of which would benefit wildlife. Development of the Aqqaluk deposit is merely an extension of the existing pit so will have very little to no additional effect on 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. If built, this road could affect access to caribou by residents of Noatak through improved access for 4-wheelers and potential deflection of caribou. No work was conducted on this project during the reporting period.

   b. Construct 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. No work was conducted on this project during the reporting period.

   c. Establish a road or railroad from the Dalton Highway to the Ambler-Bornite area. Eventually, two additional roads would then connect to the Red Dog road and Nome-Council road system. The state Department of Transportation has actively pursued this project and has been in frequent communication with NPS-GAA about establishing a road through NPS lands.

d. Build a road from the Dalton Highway or Meltwater Oil Field road to Umiat to facilitate development of natural gas deposits. The state Department of Transportation and Public Facilities has actively pursued this project during this reporting period. Many residents of Anaktuvuk Pass and the North Slope Borough have objected to this road out of concerns that it will alter caribou movements and bring nonlocal hunters into traditional subsistence hunting areas.

e. 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. Several mining projects are being considered within the range of the WAH.

   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. The Rock Creek mine near Nome was closed for economic reasons during this reporting period before becoming fully operational. The facilities have been mothballed rather than removed.

   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 2008–2011.

   d. Alaska Gold conducted test work to determine whether to reopen the Independence Mine at the confluence of the Kugruk and Independence Rivers on the Seward Peninsula. No work was done on this project during this reporting period.

More information about potential industrial development within the range of the WAH is provided by Schoen and Senner (2002).

School programs

In 2008, 6 students from Elim and 4 students from Koyuk participated in the Onion Portage caribou project. In 2009, 6 students from Buckland and 7 students from Deering participated in this project. In both years all students were high school level. In addition to working with agency staff, the students learned subsistence skills from their chaperones. 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. During this reporting period reindeer from the Davis herd (Nome) were reportedly taken by hunters in the vicinity of Buckland and Selawik. In August 2011 (after this reporting period), a reindeer from the Noyukuk herd was harvested near Kiana. At this time only the Kakaruk (Teller) and Ongtowasruk (Wales) herds are still commercially viable. 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 (caribou with satellite or GPS collars purchased by federal agencies are excluded from these maps). With the demise of so many reindeer herds in this region since the mid 1990s, though the primary use of online satellite-collar maps now appears to be by hunters who use them to locate caribou.

As the availability of caribou in Unit 23 has declined in recent years, requests for access to real time locations of PTT- and GPS-collared caribou to aid hunters have increased. Residents of Unit 23 requesting this information are aware that residents of the Seward Peninsula can access this information and they consider it unfair to provide it to only some people within the range of this herd. Posting real time satellite collar information on the internet has been a controversial topic since it was first discussed by the WG. In addition to local subsistence hunters who desire this information year round, many visiting hunters want this information to help them find caribou during the fall hunting season, and most if not all commercial operators want this information during spring through fall. In contrast, many residents of Unit 23 who have long been frustrated with the influx of commercial operators and nonlocal hunters each fall strongly oppose making satellite and GPS collar location information available out of concern that it will attract additional hunters to this region and possibly concentrate them in traditional subsistence hunting areas. If the WAH continues to decline, hunters will likely experience more difficulty harvesting caribou and pressure to release satellite collar data will likely increase. Employing a wildlife management tool to aid hunters sets a bad precedent that will likely be difficult to back away from. When caribou herds decline to low levels, they need refugia from hunters. There are so few viable reindeer herds on the Seward Peninsula now that the department could probably provide better service to them through direct contact rather than by posting real time locations of satellite collared caribou for everyone to access over the internet. Unless posting of real-time satellite collar locations on the internet is resolved soon, this is likely going to become a controversial issue in the future.

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). Factors that contribute to these conflicts in Unit 23 include limited access points for guides and transporters, and the perception among residents of Unit 23 that commercial hunting activities and drop off hunters 'upstream' in the migration deflect caribou from traditional hunting areas. The Unit 23 User Conflict Working Group held meetings during January 2009 and May 2010 to address these concerns.

CONCLUSIONS AND RECOMMENDATIONS

The WAH is still very large despite the 4–6% annual decline from 2003 to 2011. In the previous report (Dau 2009) I stated that it was not clear whether episodic icing events had caused spikes of high mortality that had reduced its size despite the potential for continued slow growth, or whether it had entered a period of persistent decline. It now appears that the WAH has entered a phase of population decline following a 27-year period of growth and high abundance. 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. However, opportunistic observations by department staff and numerous reports from local residents and long-term guides and transporters suggest that predators (brown bears and, especially, wolves) have been abundant in recent years, and that they are taking many caribou. Additionally, after visiting hundreds of mortality sites, it is clear that icing events have also caused high, localized mortality. A period of slow population decline may be better than continued growth that could lead to an abrupt decline.

Despite the continued large size of this herd, local and visiting hunters have experienced difficulty harvesting caribou during recent fall hunting seasons due to delays in the onset of the fall migration, and to caribou moving through relatively narrow migration corridors. Limited availability of caribou appears to intensify conflicts among user groups even when local and nonlocal hunters are spatially separated. Local residents are concerned that high levels of airplane activity combined with numerous guided or drop off hunting camps are delaying caribou movements or deflecting them from important subsistence hunting areas.

Our level of investment in harvest assessment to document levels of human demand has probably been adequate during recent years when the herd was large and stable and access to caribou was limited by their distribution rather than population size. Now that this herd has clearly started to decline, ADF&G's Subsistence Division and DWC need to develop a comprehensive, statistically-based community harvest assessment program. An effective harvest assessment program must include the large communities of Kotzebue, Barrow and Nome on a regular basis. Because of sampling difficulties and expense, harvest assessment in these large hub communities has received relatively little attention over the past 25 years. The department should continue to monitor the 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 westward expansion of WAH caribou onto the Seward Peninsula has essentially stopped during recent years. This may provide refugia for the remaining reindeer on the western half of the Seward Peninsula.

The department should continue to monitor the health of caribou in this herd through annual serological surveys and health assessment collections at least once every 2 to 3 years. We should consider conducting intensive health assessments during spring as well as 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 caribou. Also, the social impacts from extending roads into historically remote, traditional subsistence areas must be considered in addition to their direct impacts on wildlife.

Conflicts among local subsistence hunters, nonlocal sport hunters, and commercial operators have continued in portions of WAH range. Data on camp locations is needed to assess whether airplane activity and itinerant camps affect caribou movements. The department should press the Big Game Commercial Services Board to require all commercial operators to provide latitude and longitude of all drop-off, pick-up, and camp locations. The department should also try to merge commercial operator contract data from DCCED with our hunter harvest data, and make this data available to department staff.

The department should continue to support the WG and help identify management issues to address. One such issue is salvage of diseased wildlife.

LITERATURE CITED

Alaska Department of Fish and Game. 2000. Community Profile Database. Division of Subsistence, Anchorage, Alaska.

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

———. 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 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 2002–June 30 2004. C. Brown, editor. Pages 177–218. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–33–1 and W–33–2. Juneau, AK, USA.

———. 2007. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 2004–June 30 2006. C. Healy, editor. Pages 174–231. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–33–3 and W–33–4. Juneau, AK, USA.

———. 2009. Units 21D, 22A, 22B, 23, 24, 26A *in* Caribou survey-inventory management report, July 1 2006–June 30 2008. P. Harper, editor. Pages 176–239. Alaska Department Fish and Game. Federal Aid in Wildlife Restoration, Grants W–33–5 and W–33–6. 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.

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.

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.

Joly, K., R. R. Jandt, C. R. Meyers and J. M. Cole. 2007. Changes in vegetative cover on Western Arctic Herd winter range from 1981–2005: potential effects of grazing and climate change. Rangifer Special Issue 17:199–207.

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.

Pritchard, A., K. Joly and J. Dau. 2012. Quantifying telemetry collar bias when age is unknown: a simulation study with a long-lived ungulate. J. Wildl. Manage. 76(7).

Rivest, L.-P., S. Couturier and H. Crepeau. 1998. Statistical methods for estimating caribou abundance using post-calving aggregations detected by radio telemetry. Biometrics 54:865-876.

Schoen, J. W. and S. E. Senner. 2002. Alaska's western Arctic: a summary and synthesis of resources. Audubon Alaska, Anchorage, Alaska.

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.

Wilson, R.R, M.B. Hooten, B.N. Strobel, and J.A. Shivik. 2010. Accounting for individuals, uncertainty, and multiscale clustering in core area estimation. J. Wildl. Manage. 74(6):1343-1352.

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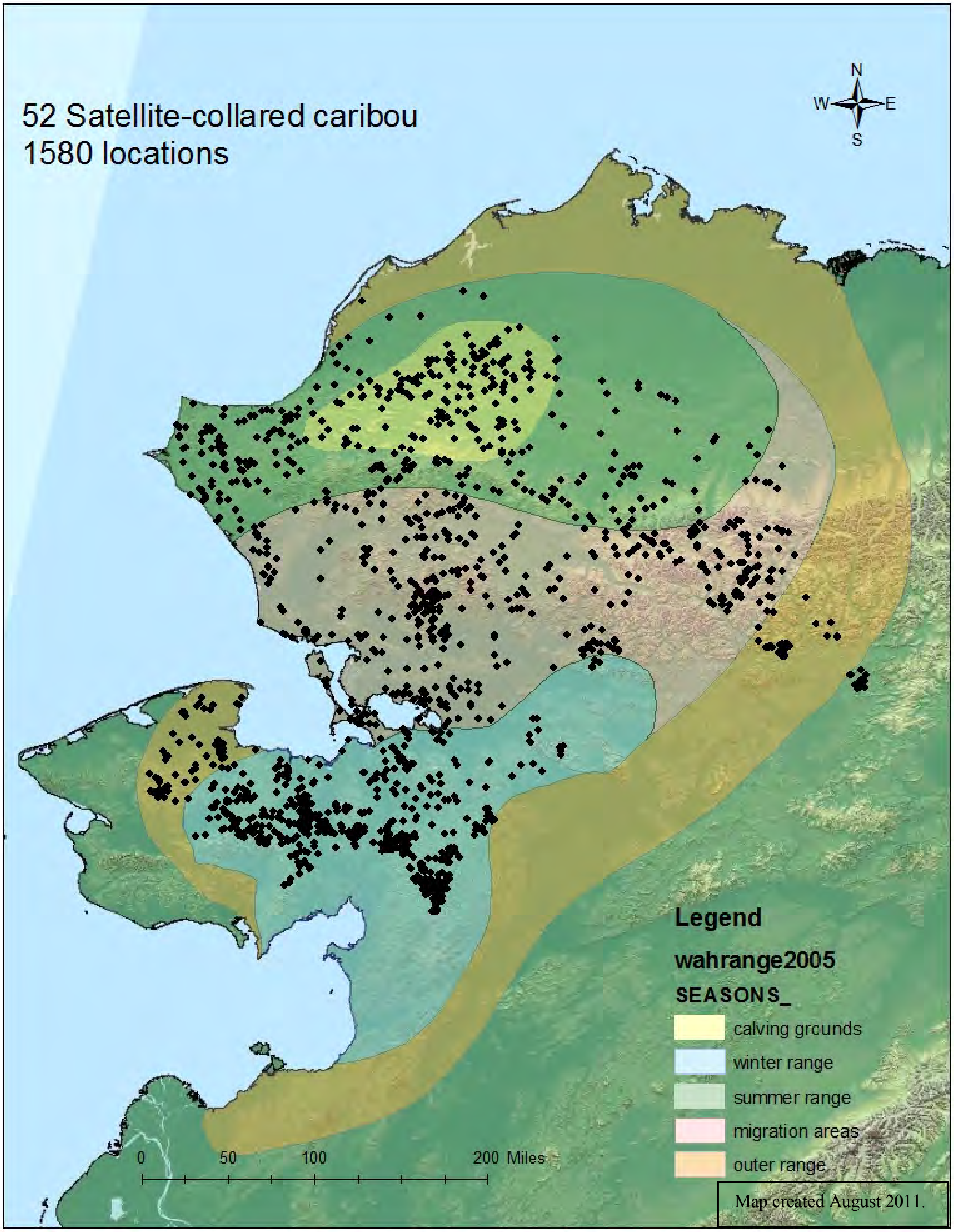

Figure 1. Locations of satellite-collared caribou compared to seasonal ranges of the Western Arctic caribou herd, 2008–2009. Data excludes first 8 months after collaring; all collars standardized to 1 location every 6 days.

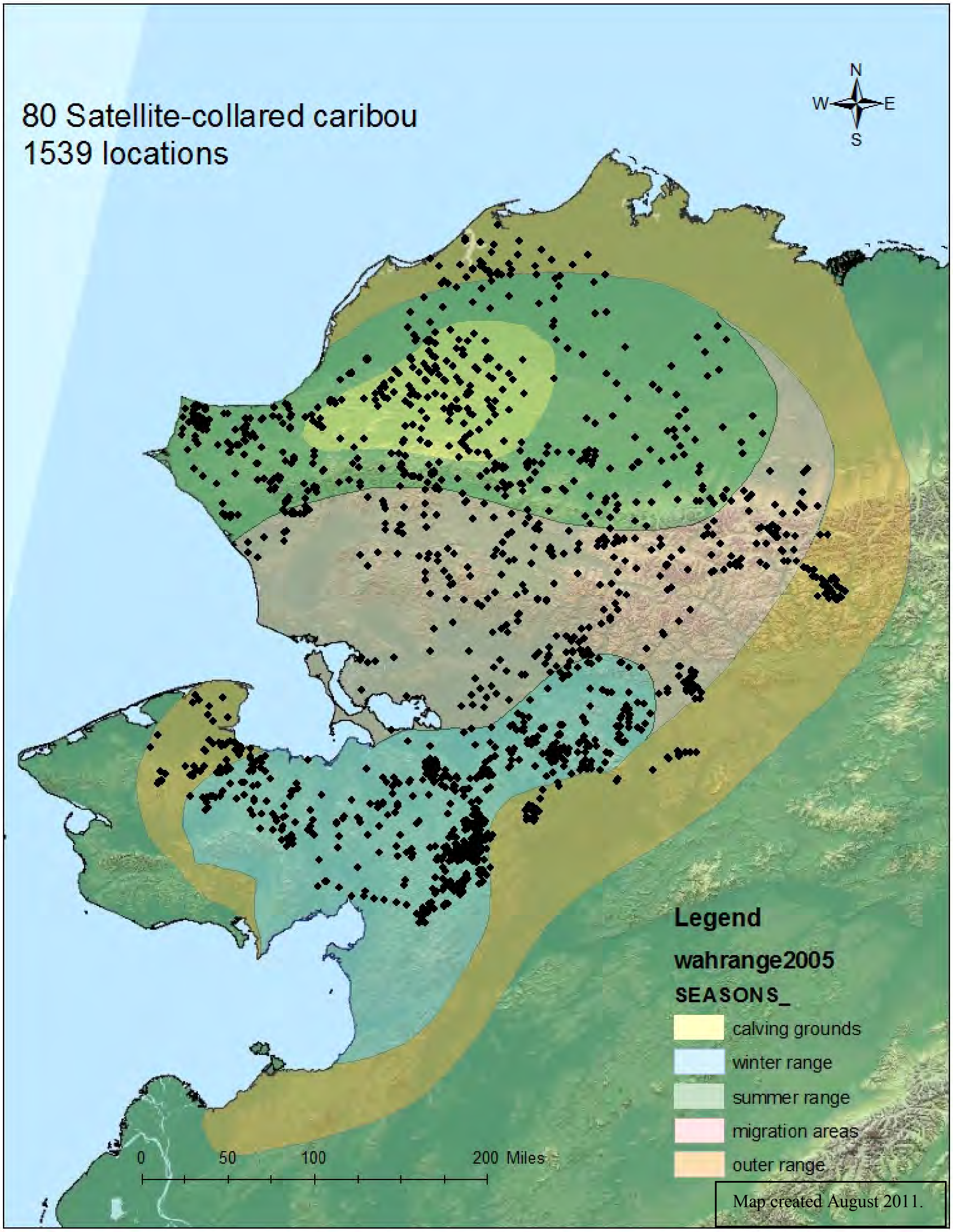

Figure 2. Locations of satellite-collared caribou compared to seasonal ranges of the Western Arctic caribou herd, 2009–2010. Data excludes first 8 months after collaring; all collars standardized to 1 location every 6 days.

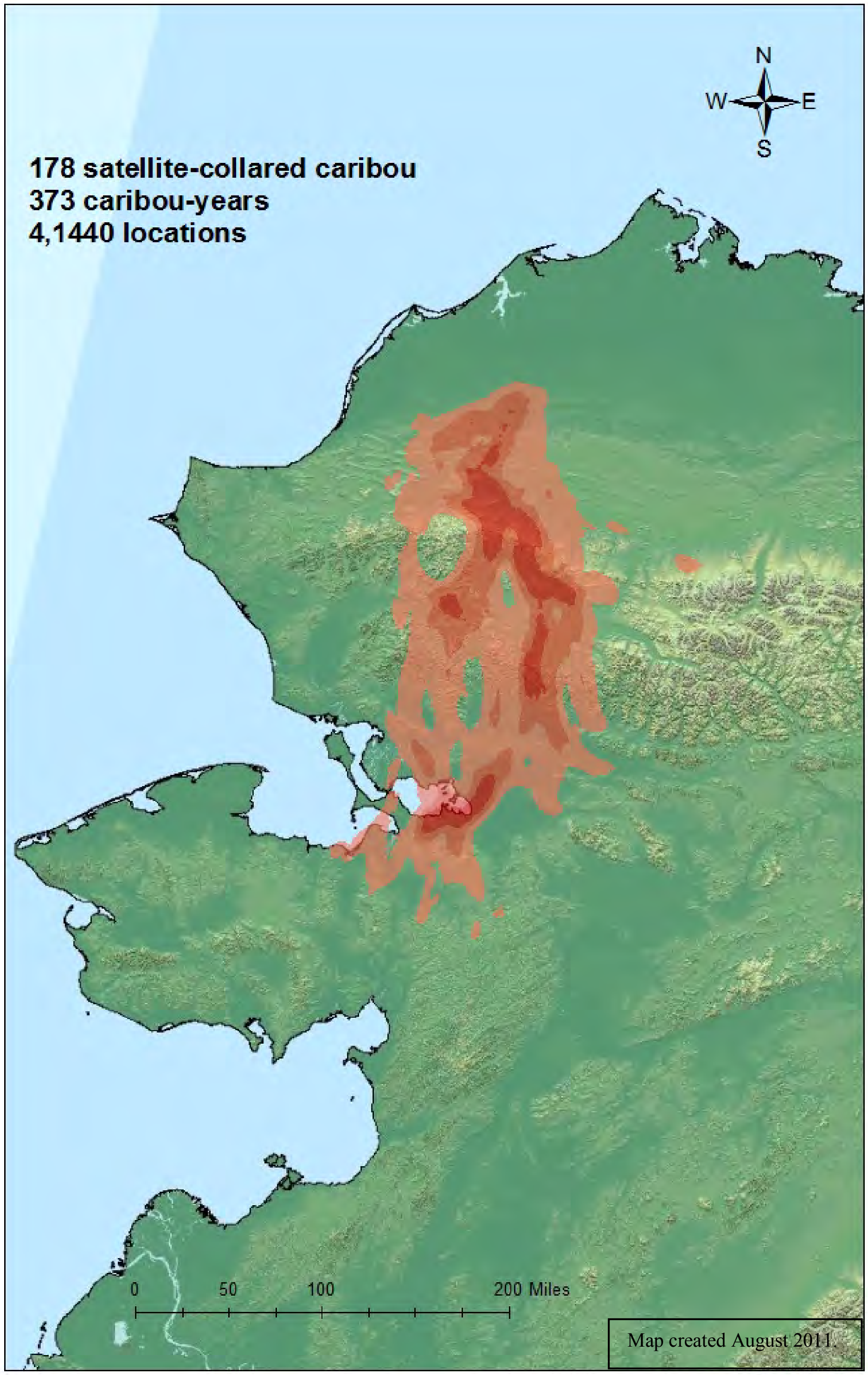

Figure 3. Spring (29 Apr–6 Jun) movements of satellite-collared Western Arctic herd caribou, 1988–2010. Data excludes first 8 months after collaring; all collars standardized to 1 location every 6 days. Shaded area is based on density of individual caribou track lines; darker color indicates heavier use.

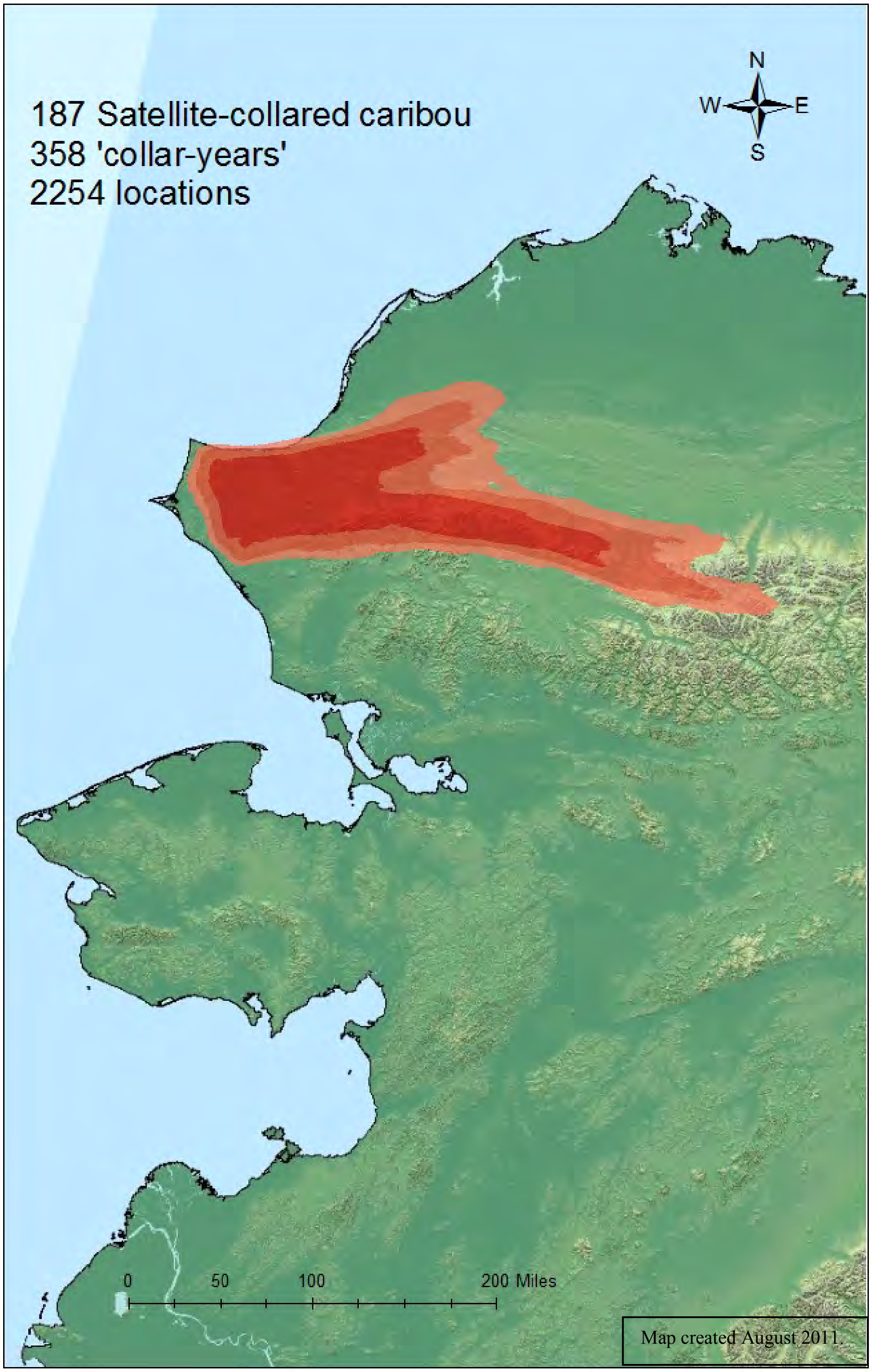

Figure 4. Postcalving and summer (14 June–30 July) movements of satellite-collared Western Arctic herd caribou, 1988–2010. Data excludes first year after collaring; all collars standardized to 1 location every 6 days; Shaded area is based on density of individual caribou track lines; darker color indicates heavier use.

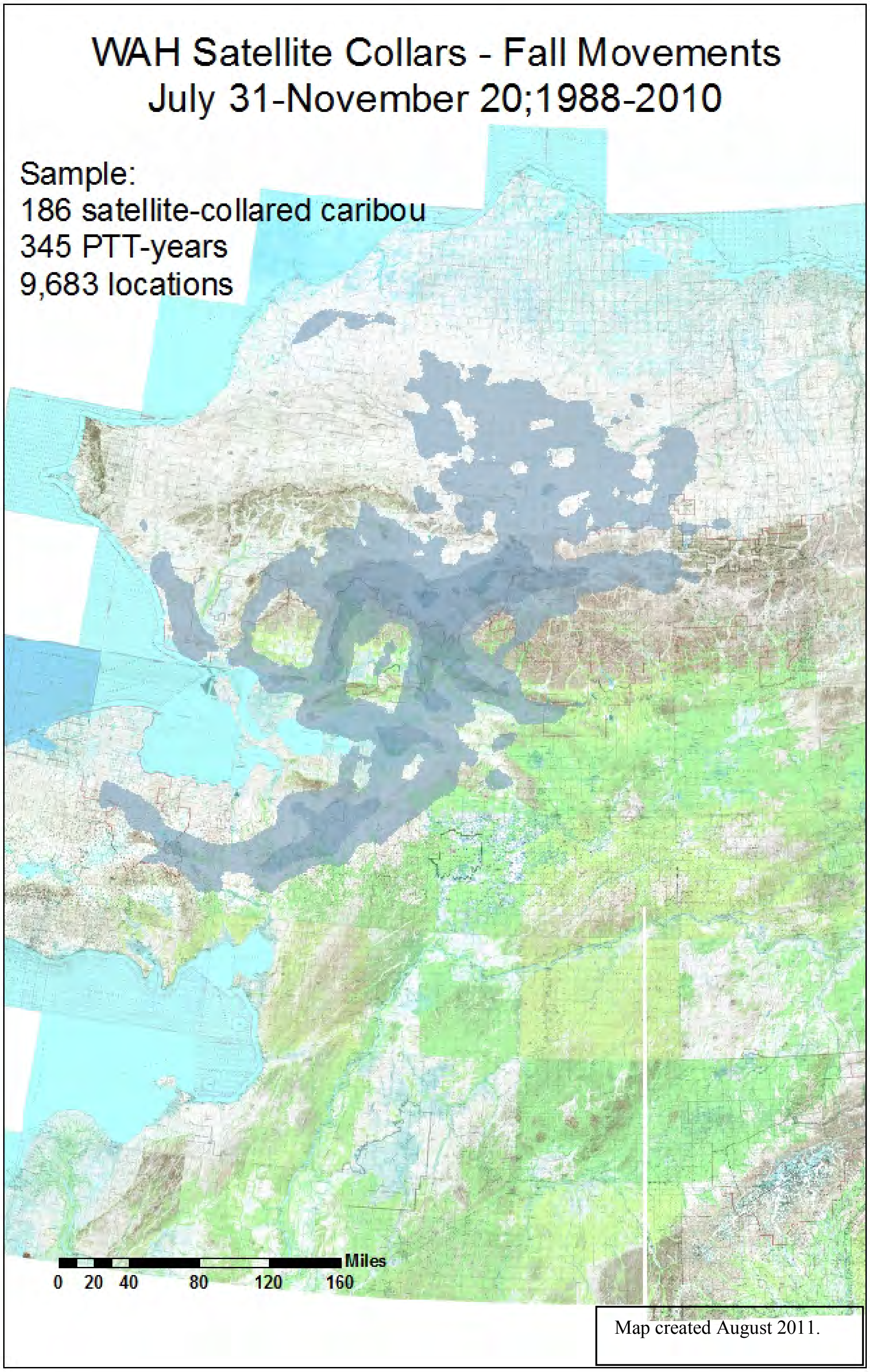

Figure 5. Fall (16 August–30 November) movements of satellite-collared Western Arctic herd caribou, 1988–2010. Data excludes first year after collaring; all collars standardized to 1 location every 6 days. Shaded area is based on density of individual caribou track lines; darker color indicates heavier use.

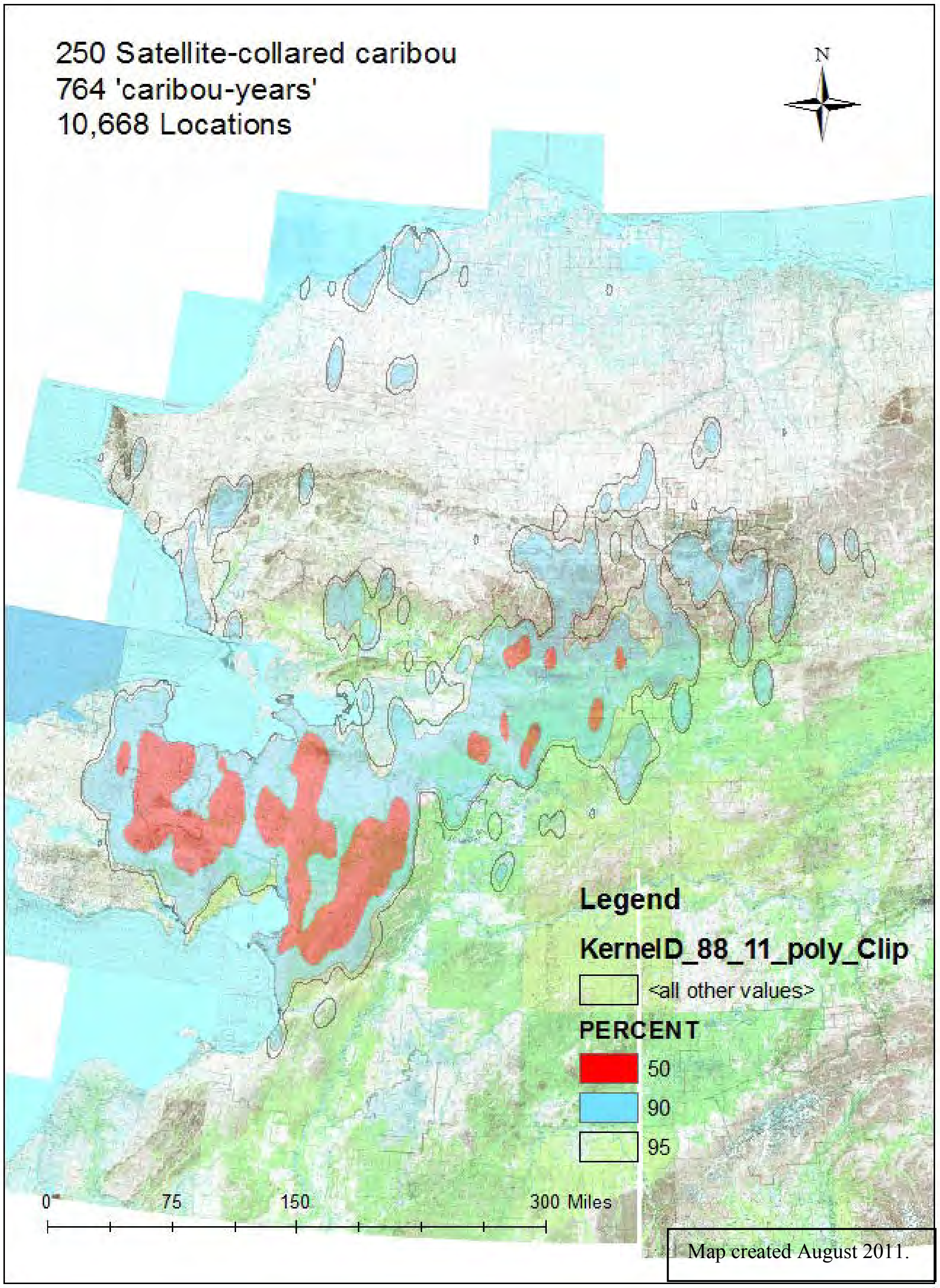

Figure 6. Kernel densities showing winter (21 November–28 April) distribution of Western Arctic Herd caribou, 1988–2011 (all years combined). Data excludes first 8 months after collaring; all collars standardized to 1 location every 6 days. Red area is 50% kernel, blue area is 90% kernel, and outer black line is 95% kernel.

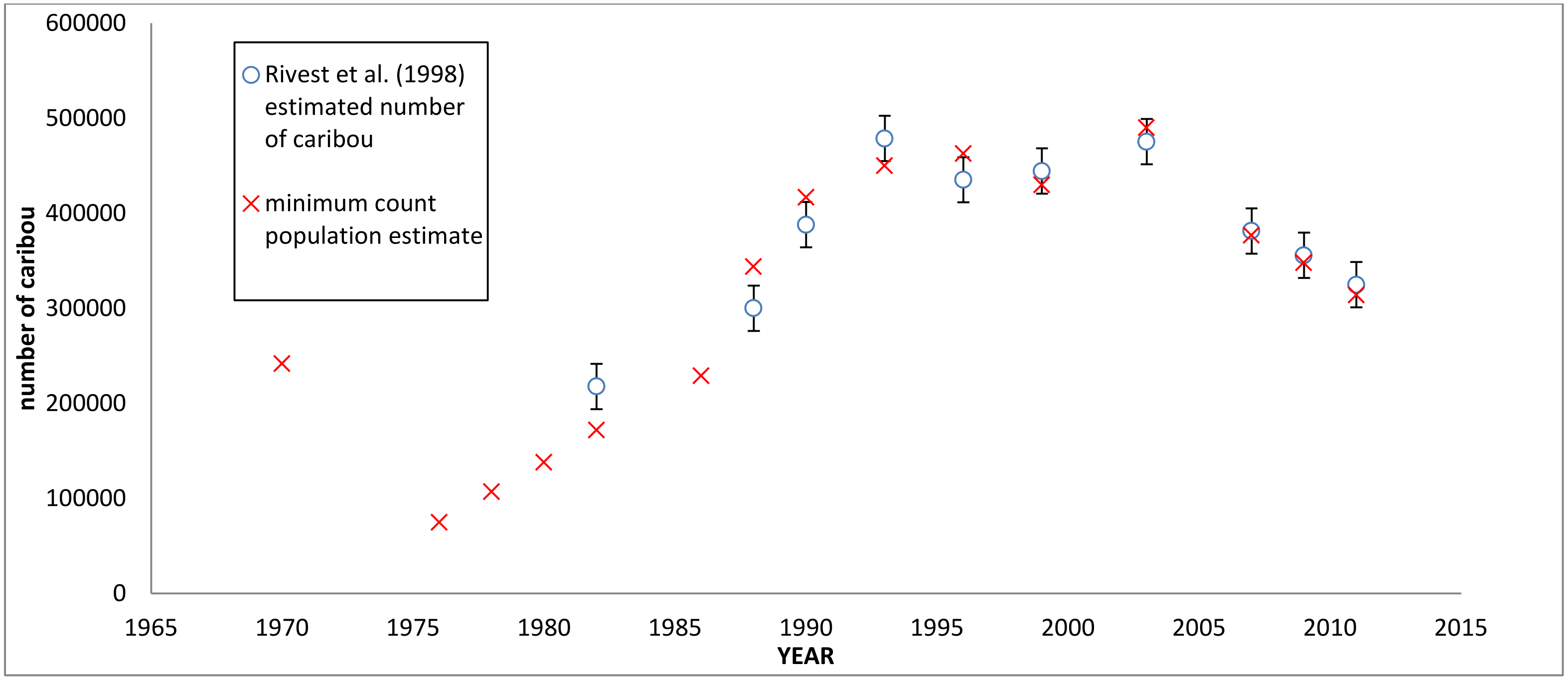

Figure 7. Western Arctic caribou herd photo census results, 1970–2011.Brackets around the open circles represent 95% confidence intervals for Rivest population estimates.

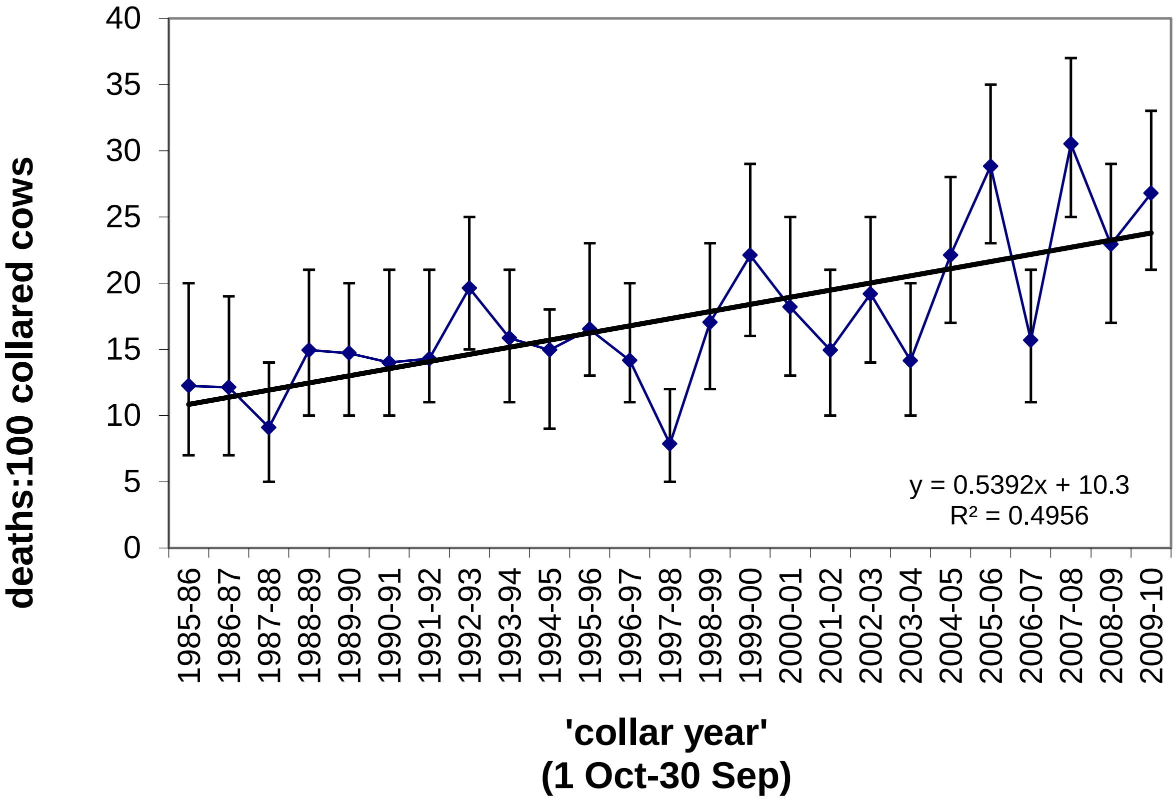

Figure 8. Adult cow mortality for the Western Arctic caribou herd, 1985–1986 through 2009–2010 (brackets indicate 80% binomial confidence intervals; estimates based on radiocollared cows excluding ST-3 and ST-14 satellite collars; estimates not corrected for age bias in sample of collared cows).

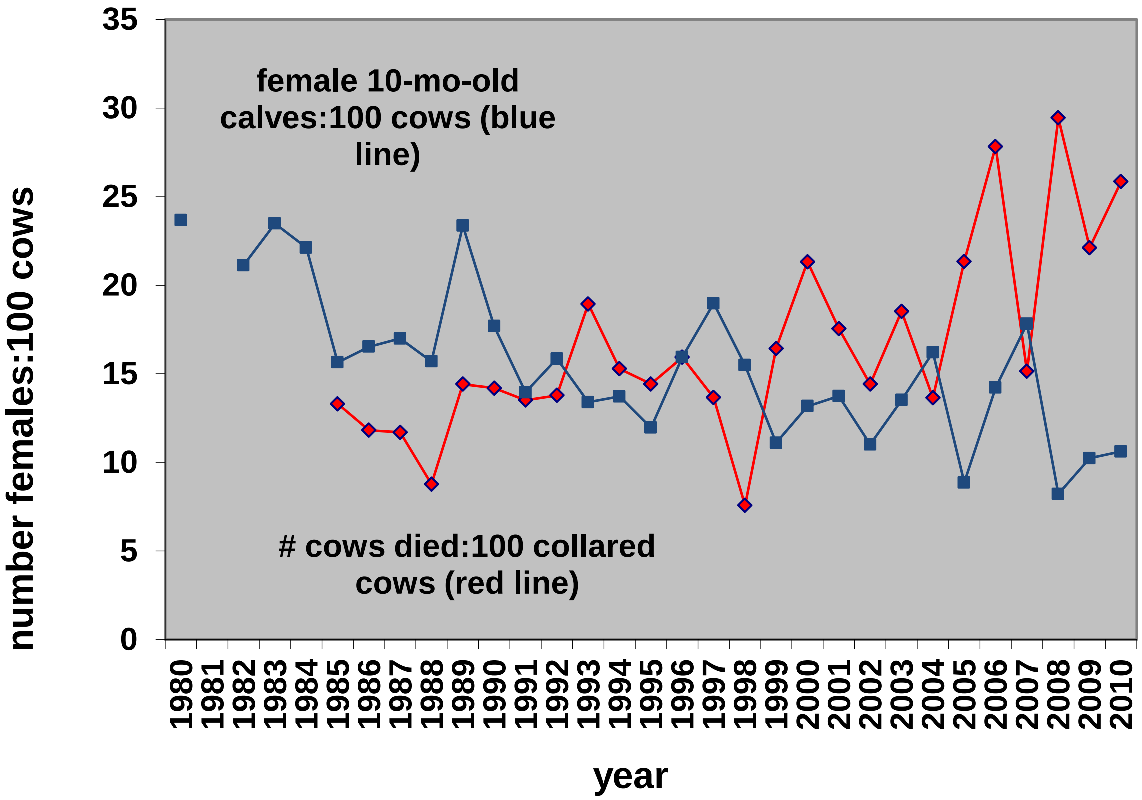

Figure 9. Indices of adult cow mortality and female calf recruitment for the Western Arctic caribou herd, 1980–2010.The spring calf:adult ratio is transformed to female calf:cow ratio based on fall composition data assuming equal male–female sex ratio at birth. Female calf recruitment is adjusted 3.3% down and adult cow mortality is adjusted 3.4% down to correct for age bias in the sample of collared adult cows.

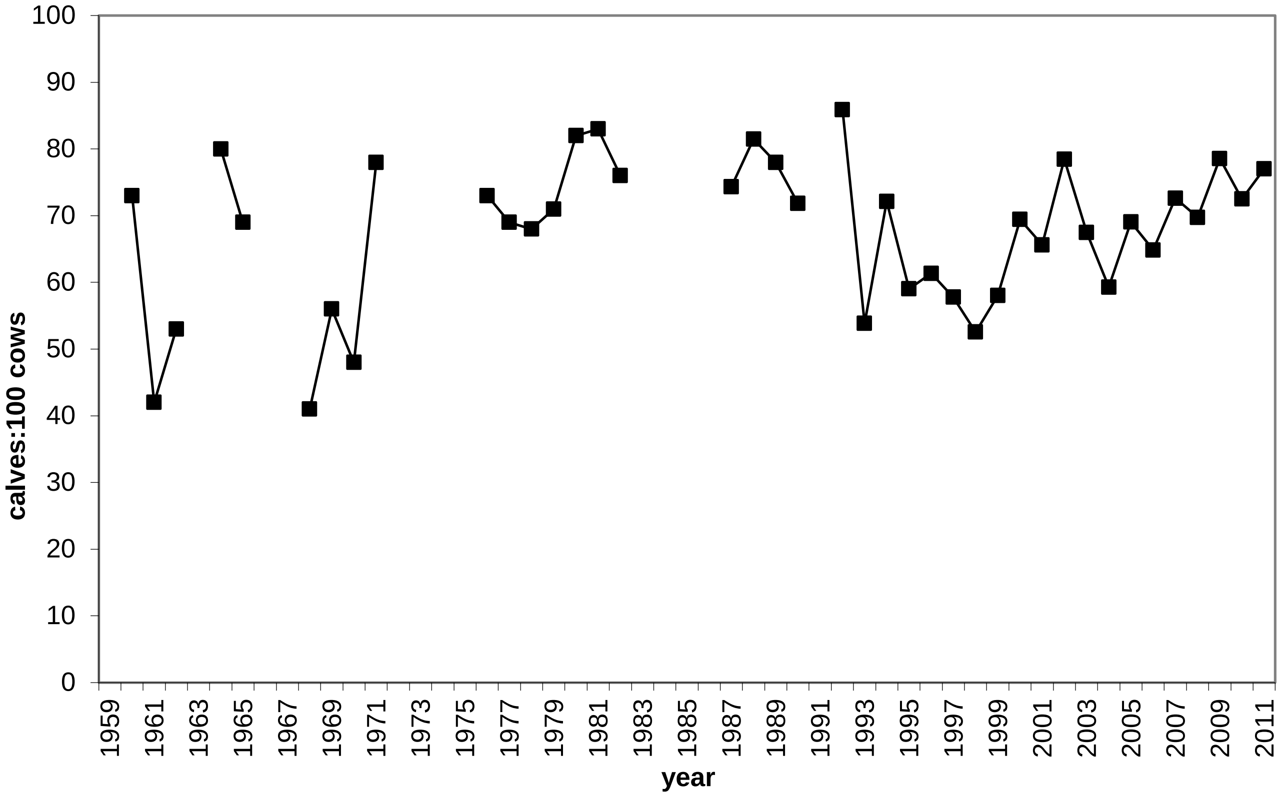

Figure 10. Western Arctic caribou herd calving survey results, 1960–2011. Telemetry-based surveys were initiated in 1987.

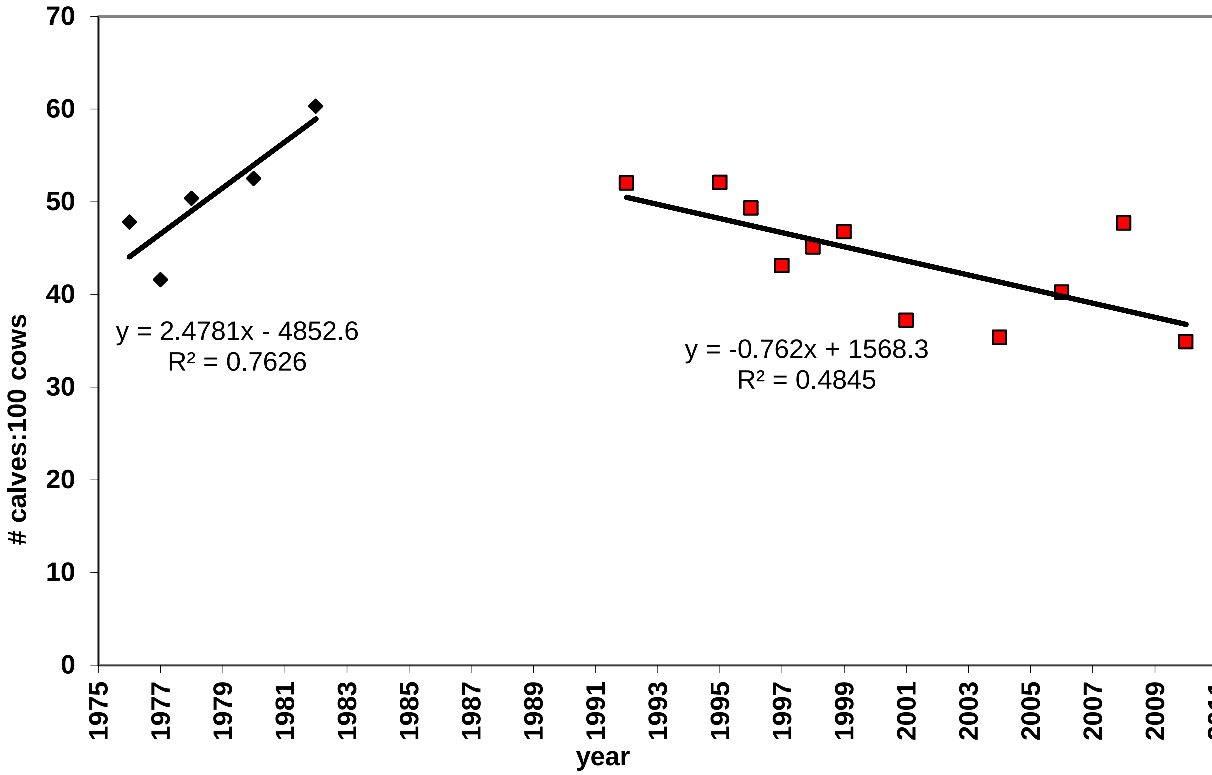

Figure 11. Fall calf:cow ratios with trend lines for the Western Arctic caribou herd. 1976–2010.

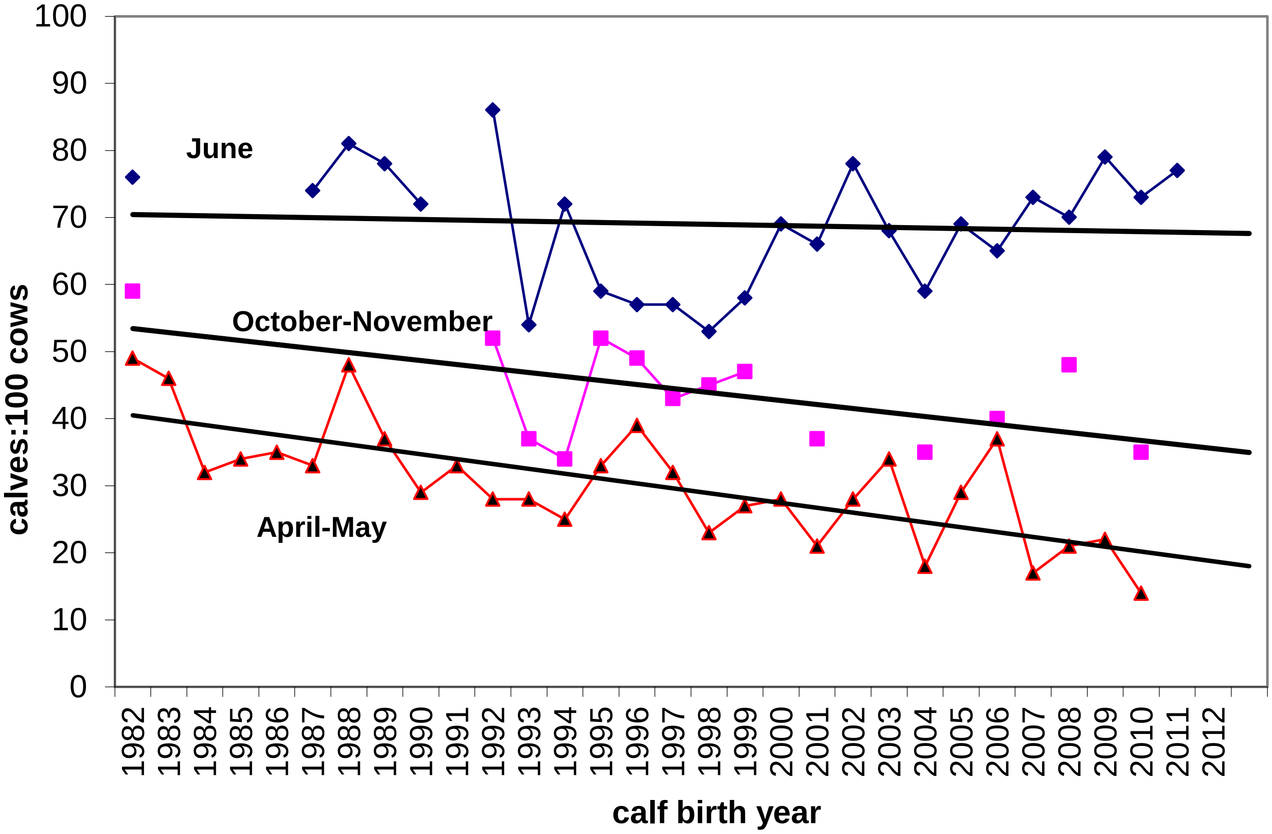

Figure 12. Unweighted least squares linear regression of calf:cow ratios during June, the subsequent fall (October–November) and following spring (April–May) for the Western Arctic caribou herd, 1982–2011 In this graph the April-May ratio for any specific year is shifted 1 year earlier to reflect year of birth. In contrast, in Figure 9, recruitment is plotted in the year the estimate was made to correspond with the period over which adult mortality is monitored. The April–May calf:cow ratio in this figure was calculated from the recorded calf:adult ratio using fall composition data from the closest point in time.

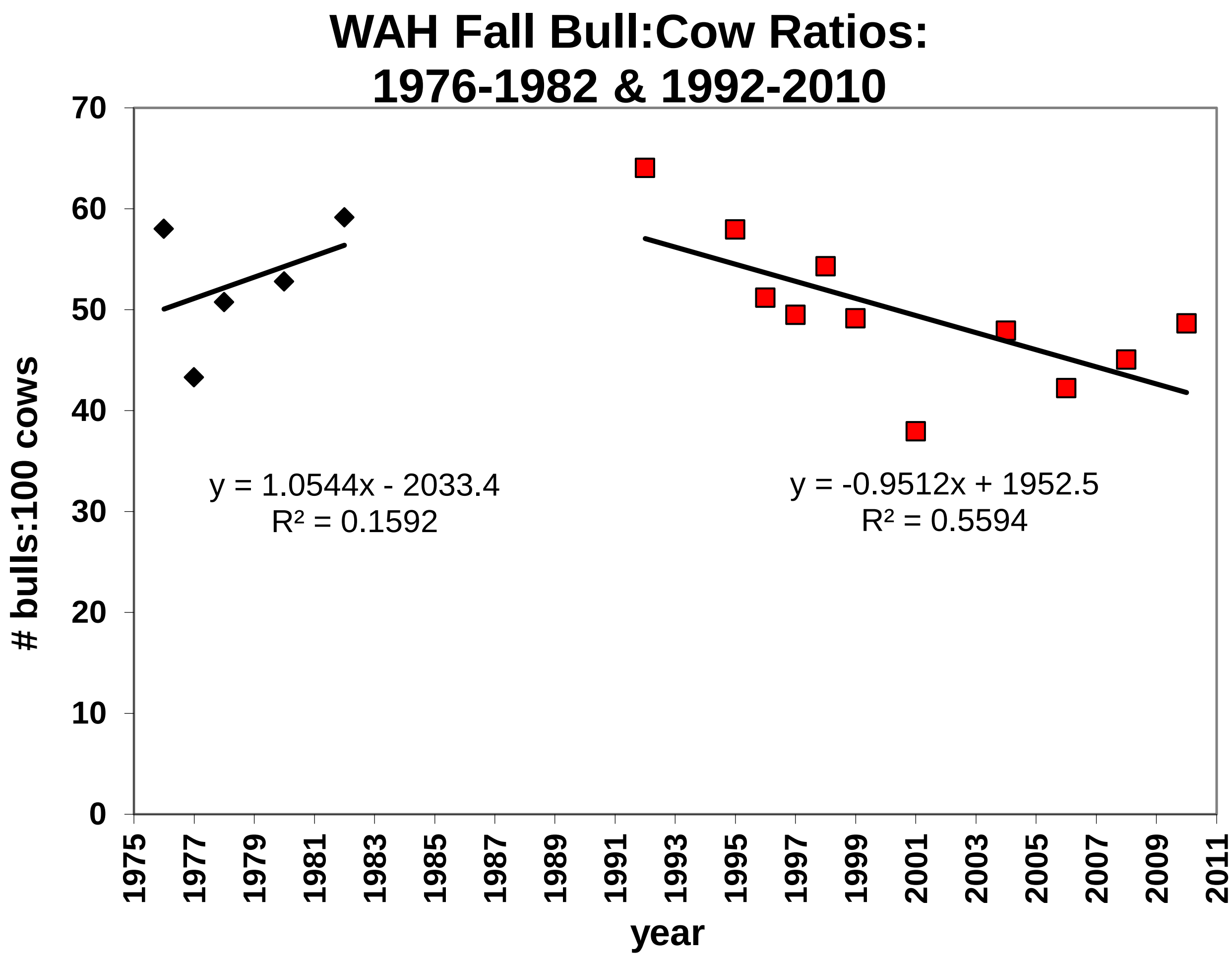

Figure 13. Fall bull:cow ratios with trend lines for the Western Arctic caribou herd, 1976–1982 and 1992–2010.

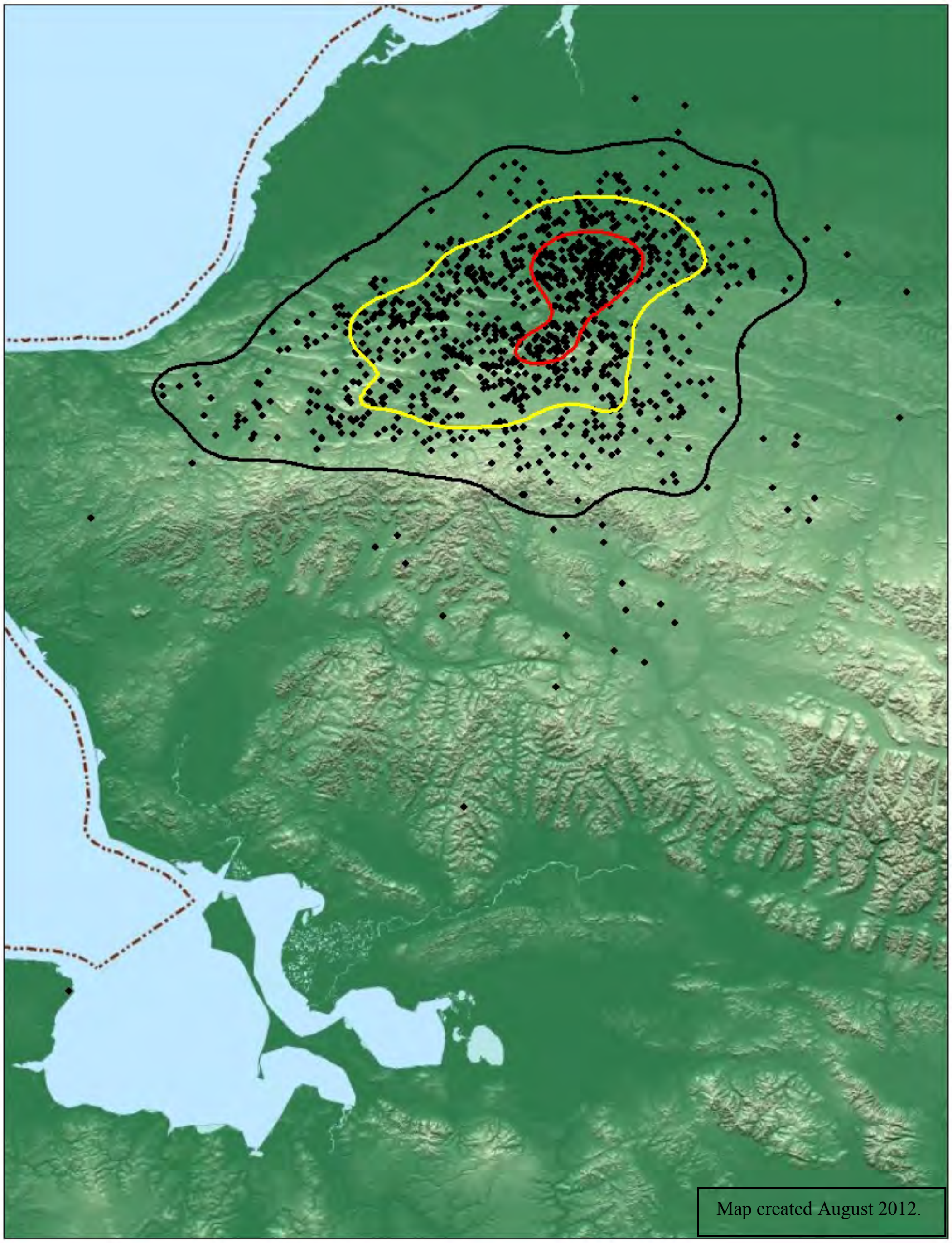

Figure 14. Kernel depiction of the WAH calving grounds based on 1092 VHF locations of radiocollared maternal cows, 1988–1989 and 1992–2012 (all years combined). Black dots represent locations of maternal cows. The black line represents the 95% isopleth (arbitrarily chosen to show the extent of calving), the yellow line represents the 64% isopleth and the red line represents the 18% isopleth. The 64% (outer core) and 18% (inner core) isopleths were selected by a Bayesian model and reflect statistical intensity of use rather than biological importance.

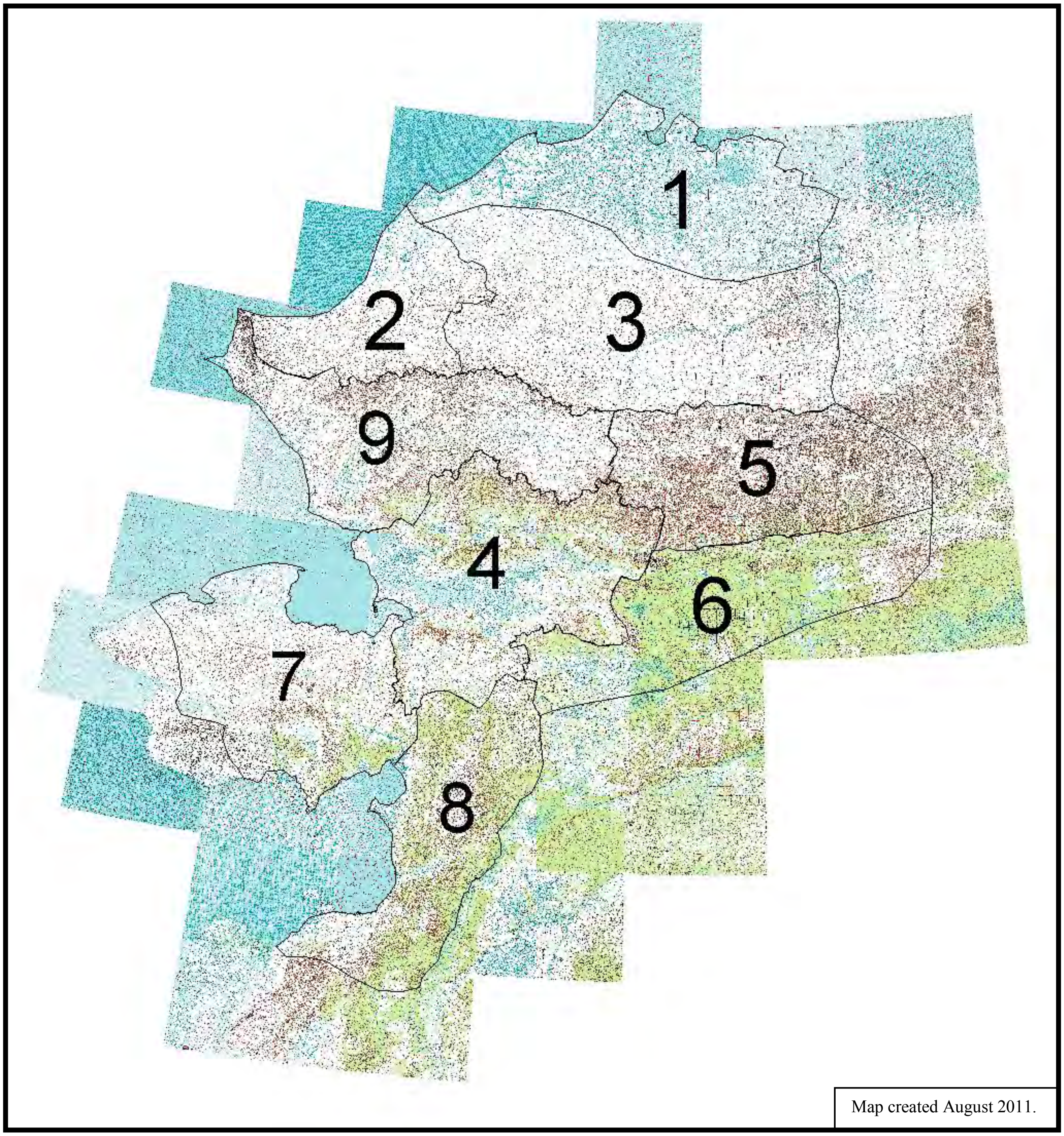

Figure 15. Subareas of Western Arctic herd range used to assess winter distribution (see Table 7 for geographic descriptions).

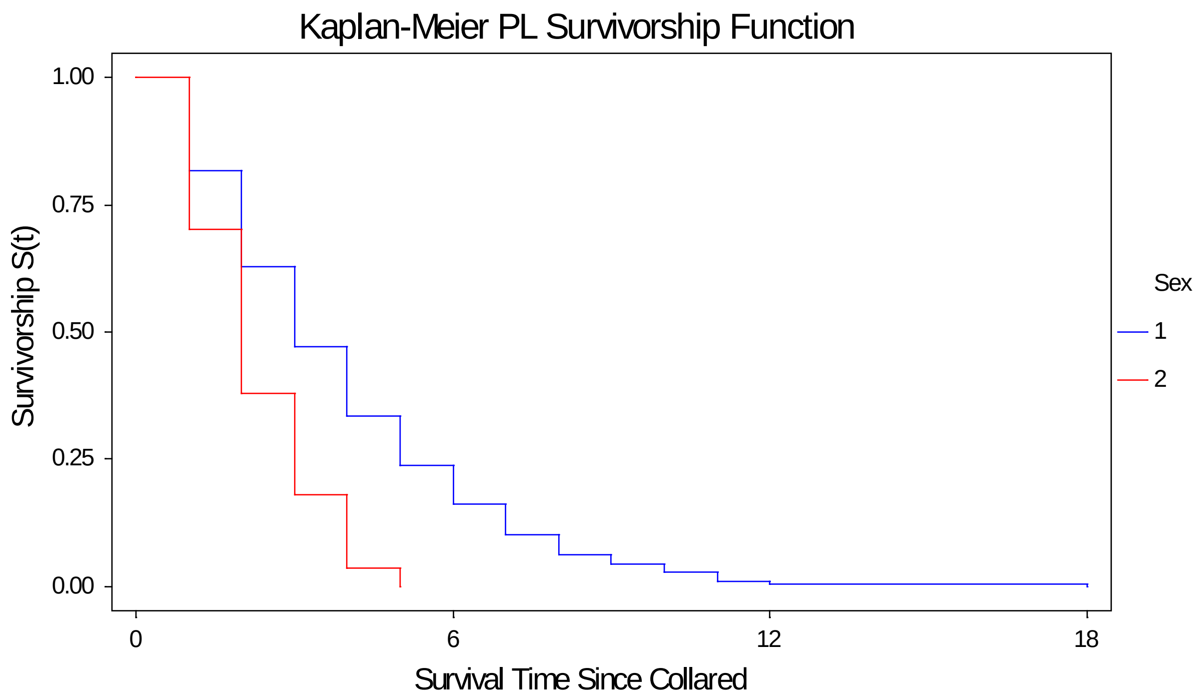

Figure 16. Kaplan-Meier Product-Limit survival estimates for collared bulls (sex=2, red line) vs. cows (sex=1, blue line), 1985–2011. Survival time is calculated from the time of collaring rather than time of birth.

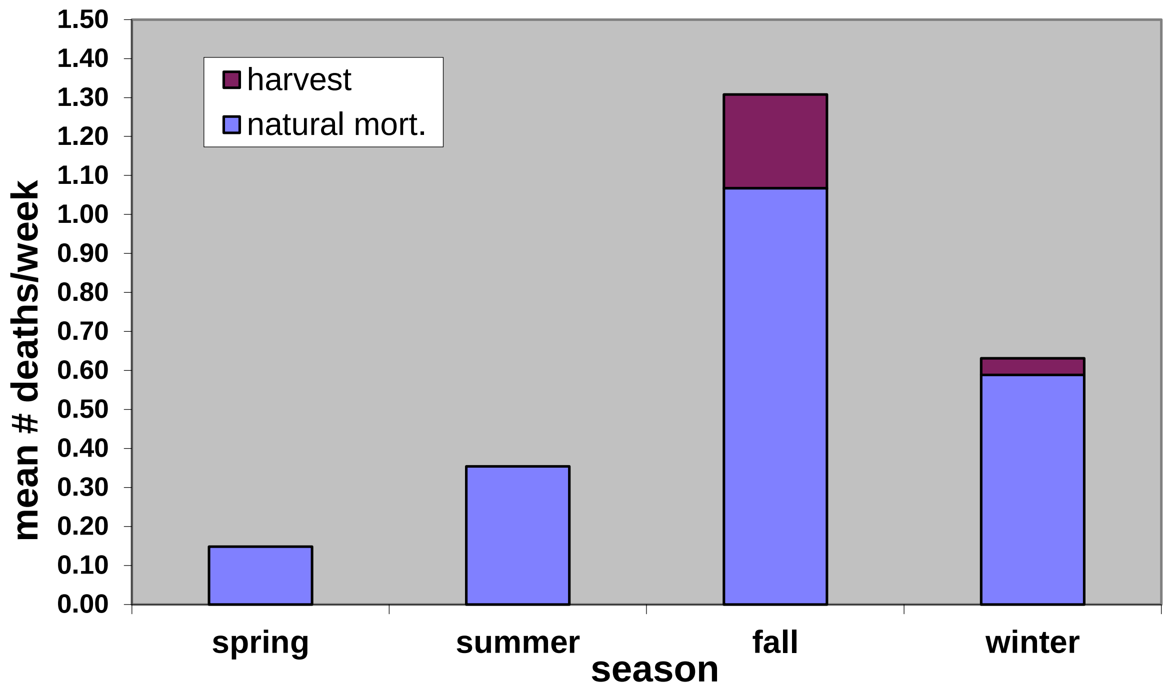

Figure 17. Seasonal mortality of radiocollared bulls, 1992–93 through 2010–11 (all years combined).

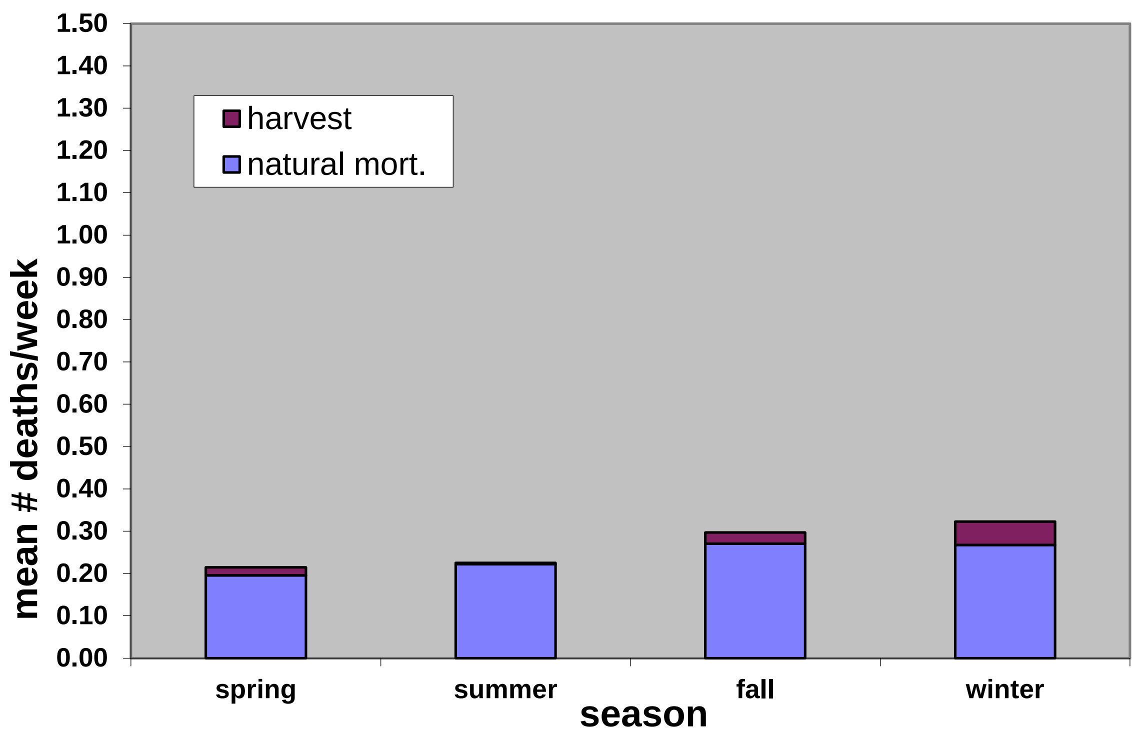

Figure 18. Seasonal mortality of radiocollared cows, 1983–84 and 1985–86 through 2010–11 (all years combined).

Table 1. Photo census population estimates of the Western Arctic caribou herd, 1970–2011.

Census year	Min. count pop. est.	Rivest est. pop. size	Pop. size[a]	Mean annual rate of change[b]	Estimated pop. size between censuses
1970	242,000		242,000		
1971				-18	199,000
1972				-18	164,000
1973				-18	135,000
1974				-18	111,000
1975				-18	91,000
1976	75,000		75,000		
1977				19	90,000
1978	107,000		107,000		
1979				14	122,000
1980	138,000		138,000		
1981				26	173,000
1982	172,000	217,863	217,863		
1983				1	221,000
1984				1	223,000
1985				1	226,000
1986	229,000		229,000		
1987				22	280,000
1988	343,000	300,299	343,000		
1989				10	378,000
1990	417,000	388,105	417,000		
1991				5	437,000
1992				5	457,000
1993	450,000	478,822	478,822		
1994				-1	473,000
1995				-1	468,000
1996	463,000	435,363	463,000		
1997				-1	458,000
1998				-1	453,000
1999	430,000	444,597	444,597		
2000				2	455,000
2001				2	466,000
2002				2	478,000
2003	490,000	475,391	490,000		
2004				-6	460,000
2005				-6	432,000
2006				-6	406,000
2007	377,000	381,501	381,501		
2008				-3	368,000
2009	348,000	355,828	355,828		
2010				-4	340,000
2011	314,000	324,963	324,963		

[a] Maximum value of minimum count or Rivest estimate

[b] Mean annual growth rate = e^r where e = 2.7183; $r = [\ln(N_{t2}) - \ln(N_{t1})]/t$; t = number of years between censuses; N_{t1} = population estimate at time_1; N_{t2} = pop. estimate at time_2.

Table 2. Annual mortality rate (uncorrected for age bias in collared sample) and binomial confidence intervals for Western Arctic caribou herd cows collared with conventional or lightweight satellite radio collars[a], 1987–1988 through 2009–2010 collar years (1 October–30 September).

Collar year	Sample size[a]	Nr died	Mortality rate[b] (%)	Binomial Confidence Intervals 80%	90%	95%
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	15	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	10–20	9–21	8–23
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	36	31	25–37	24–38	22–40
2008–2009	96	22	23	17–29	16–31	15–33
2009–2010	112	30	27	21–33	20–35	19–36

[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 3. Aerial calving survey results from observations of radiocollared cows in the Western Arctic caribou herd, 1987–2011.

Year	Median June survey date	With Calf	No Calf $\geq$1 hard antler	No Calf soft antlers	No Calf no antlers	Total	Maternal	Non-Maternal	Calves: 100 Cows
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	53
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
2009	6	35	20	6	9	70	55	15	79
2010	7	49	9	17	5	80	58	22	73
2011	9	47	10	13	4	74	57	17	77

Table 4. Fall population composition of the Western Arctic caribou herd, 1961–2010.

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
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
2010	2419	4973	1735	9127	35	23	49

Table 5. Short yearling[a] survey results of the Western Arctic caribou herd, 1980–2011.

Year	Number of caribou			Number			
	Adults	SY[a]	Total	Groups	Radio-collared cows	SY[a]:100 adults	3-yr moving average SY:100 adults
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	8518	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	13
2010	9890	1479	11369	47	53	15	13
2011	11316	1058	12374	52	58	9	

[a] Short yearlings are defined as 10- to 11-month-old caribou.

Table 6. Geographic distribution of radiocollared Western Arctic herd caribou during winter (Nov–Mar), 1983-84 through 2010-11; 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).

	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
Area[a]	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11
1	0	0	5	5	9	0	1	10	4	6	9	0	5	5	4	2	0	1	0	0	0	5	1
2	0	0	0	1	0	0	1	0	0	0	0	9	0	0	0	0	0	0	0	1	0	0	0
3	0	11	0	1	2	4	0	5	0	5	1	1	5	0	4	0	0	2	1	8	0	1	0
4	28	20	2	52	6	1	26	33	12	5	11	42	12	22	23	12	16	48	33	38	31	26	17
5	1	9	0	9	6	8	3	26	4	25	31	5	6	9	16	31	5	10	8	28	6	3	20
6	1	1	0	6	19	4	1	2	2	0	2	12	0	3	8	20	0	13	0	10	2	19	33
7	5	2	3	4	4	7	6	9	59	29	24	17	42	31	38	14	19	5	16	13	43	13	6
8	65	56	89	20	54	75	54	16	20	29	20	5	29	5	0	20	53	18	42	2	15	25	23
9	1	2	0	2	0	0	9	1	0	1	1	9	2	25	7	1	6	2	0	1	3	9	0
n_i[b]	77	57	75	61	70	90	78	63	81	88	67	72	63	58	69	86	78	70	69	121	78	68	81

[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 Creek; 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 7. Caribou density (number/mi^2) in 9 subareas of Western Arctic Caribou Range during winter (1 Nov–31 Mar), 1985–86 through 2010–11 (Note: subareas are shown in Figure 15).

Area [a]	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	09 10	10 11
1	0.00	0.00	1.28	1.24	2.42	0.00	0.18	2.57	0.98	1.50	2.33	0.00	1.25	1.39	1.20	0.66	0.00	0.14	0.00	0.00	0.00	1.06	0.24
2	0.00	0.00	0.00	0.41	0.00	0.00	0.34	0.00	0.00	0.00	0.00	4.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
3	0.00	1.58	0.00	0.12	0.33	0.64	0.00	0.77	0.00	0.72	0.23	0.21	0.75	0.00	0.60	0.00	0.00	0.14	0.04	1.03	0.00	0.09	0.00
4	5.06	3.96	0.54	12.11	1.53	0.28	6.41	8.05	2.83	1.33	2.66	9.77	2.86	5.31	5.74	3.01	3.74	4.26	2.76	7.65	6.06	4.93	2.99
5	0.27	2.00	0.00	2.42	1.98	2.45	0.74	7.53	1.04	7.02	8.46	1.33	1.55	2.47	4.61	9.45	1.45	1.05	0.77	6.55	1.30	0.64	4.25
6	0.11	0.16	0.00	1.20	4.00	1.02	0.29	0.35	0.54	0.00	0.48	2.50	0.00	0.77	1.77	4.58	0.00	1.02	0.00	1.75	0.34	3.21	5.41
7	1.01	0.42	0.84	1.16	1.25	2.24	1.96	2.65	17.38	8.52	6.96	4.99	12.40	9.37	11.82	4.49	5.73	0.51	1.62	3.16	10.34	2.88	1.22
8	15.77	14.76	26.31	6.34	17.09	25.42	18.03	5.26	6.80	9.50	6.42	1.53	9.20	1.71	0.16	6.86	17.53	2.08	4.66	0.60	3.95	6.24	5.50
9	0.13	0.39	0.00	0.43	0.00	0.00	2.57	0.22	0.00	0.31	0.41	2.42	0.65	7.04	2.09	0.34	1.78	0.24	0.00	0.26	0.57	1.90	0.00
N [b]	*378*	**417**	*437*	*457*	**479**	*473*	*468*	**463**	*457*	*450*	*444*	*455*	*466*	*478*	**490**	*460*	*432*	*406*	**382**	*368*	**355**	*340*	*325*

[a] Areas: 1 North Slope coastal plain west of Colville drainage; 17,322 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; 28,875 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 Creek; 16,281 mi^2

6 Koyukuk drainage south of Brook Range mountains, including Kanuti Flats, Galena Flats; 20,945 mi^2

7 Seward Peninsula west of Buckland and Koyukuk villages; 15,436 mi^2

8 Nulato Hills; 14,126 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 caribou herd population size in thousands using Rivest et al. (1998) estimates from Table 1. Numbers in italics are estimated 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 2009–10 and 2010–11, population assumed to be declining 4% annually (mean annual rate of change = e^r = 0.961) as measured between the 2007 and 2009 censuses.

Table 8. Annual harvest of Western Arctic herd caribou by hunter residency, regulatory year and unit, 1999–2000 through 2009–2010. Estimates of harvest by 'Residents within WAH range' were made using 'levels' model from Sutherland (2005); number of caribou taken by 'All other hunters' based on harvest ticket reports; 95% of total Unit 26A caribou harvest by visiting hunters was from the WAH.

		Residents within WAH range		All other hunters		Total harvest	
Reg. year	Unit	# 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	50	0	1390	9
	Total	14,544	96	586	3	15,130	
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	50	0	1436	9
	Total	14,876	97	509	3	15,385	
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	52	0	1433	9
	Total	14,404	97	505	3	14,909	
2002–03	21			0	0		0
	22	2247	15	69	0	2316	15
	23	9979	68	525	4	10,504	72
	24			19	0	19	0
	26A	1783	12	72	1	1855	13
	Total	14,009	95	685	5	14,694	
2003–04	21			0	0		0
	22	1860	16	32	0	1892	16
	23	7268	63	406	4	7674	67
	24			17	0	17	0
	26A	1899	16	89	1	1988	17
	Total	11,027	95	544	5	11,571	

Table 8. (continued)

Reg. year	GMU	Residents within WAH range # Caribou	%	All other hunters # Caribou	%	Total harvest # 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	110	1	1311	9
	Total	15,009	95	793	5	15,802	
2005–06	21			0	0	0	0
	22	1433	10	18	0	1451	10
	23	10,883	74	626	4	11,509	78
	24			4	0	4	0
	26A	1666	11	80	1	1746	12
	Total	13,982	95	728	5	14,710	
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	83	1	1359	14
	Total	8820	93	676	7	9496	
2007–08	21			1		1	
	22	331	3	39	0	370	4
	23	7548	72	465	5	8013	77
	24			9	0	9	0
	26A	1923	18	108	1	2031	19
	Total	9802	94	622	6	10,424	
2008–09	21			0	0		
	22	2763	18	34	0	2797	19
	23	10,951	73	543	4	11,494	77
	24			6	0	6	
	26A	632	4	87	1	719	5
	Total	14,346	96	670	5	15,016	
2009–10	21			0	0		
	22	1454	12	26	0	1480	12
	23	9354	78	393	3	9747	81
	24			19	0		
	26A	728	6	70	1	798	7
	Total	11,536	96	508	4	12,044	

Table 9. Availability of caribou, community population size, and estimated harvests of Western Arctic Herd caribou using the Sutherland estimator (ADF&G, unpublished data), 2008–2009 (community population size based on 2007 estimates).

	%WAH caribou in total harvest	Human Pop.	Relative Distance to Caribou	Total harvest estimate	80% confidence limits	WAH harvest
Unit 22						
Brevig Mission	100	328	Avg	141	0–339	141
Elim	100	309	Avg	131	0–330	131
Golovin	100	167	Avg	54	0–272	54
Koyuk	100	347	Far	16	0–279	16
Nome	100	3,495	Avg	111		111
Shaktoolik	100	214	Far	16	0–224	16
Shishmaref	100	608	Avg	293	90–498	293
Saint Michael	100	444	Far	16	0–210	16
Stebbins	100	598	Far	16	0–228	16
Teller	100	256	Avg	102	0–308	102
Unalakleet	100	724	Far	15	0–252	15
Wales	100	136	Far	16	0–238	16
White Mountain	100	215	Avg	80	0–291	80
TOTAL						1,007
Unit 23						
Ambler	100	277	Avg	311	238–384	311
Buckland	100	461	Avg	562	476–649	461
Deering	100	133	Close	282	158–405	282
Kiana	100	391	Close	634	524–743	634
Kivalina	100	398	Avg	476	396–556	476
Kobuk	100	119	Avg	96	19–172	96
Kotzebue	100	3,133	Close	4,375	3,812-4,937	4,375
Noatak	100	489	Avg	600	510–690	600
Noorvik	100	636	Close	968	848–1,088	968
Point Hope	100	704	Close	1,061	934–1,187	1,061
Selawik	100	869	Close	1,286	1,140–1,432	1,286
Shungnak	100	269	Avg	300	228-373	300
TOTAL						10,850
Unit 26A						
Anaktuvuk Pass	80	277	Close	539	467-612	431
Atqasuk	2	223	Avg	285	231-339	6
Barrow	3	4,052	Far	2053	1,795–2,312	62
Nuiqsut	1	403	Far	255	205-305	3
Point Lay	40	250	Avg	298	244-352	120
Wainwright	15	540	Far	322	272-373	48
TOTAL						670
Total Harvest						12,527

[a]Nome harvest was determined through RC900 harvest reports that were distributed through the statewide harvest vending system.

Table 10. Availability of caribou, community population size, and estimated harvests of Western Arctic Herd caribou using the Sutherland estimator (ADF&G, unpublished data), 2009–2010 (community population size based on 2007 estimates).

	%WAH caribou in total harvest	Human pop.	Relative distance to caribou	Total harvest estimate	80% confidence limits	WAH harvest
Unit 22						
Brevig Mission	100	328	Far	16	0–210	16
Elim	100	309	Avg	131	0–330	131
Golovin	100	167	Avg	54	0–272	54
Koyuk	100	347	Close	375	176–574	375
Nome[a]	100	3,495	Far	56		56
Shaktoolik	100	214	Far	16	0–224	16
Shishmaref	100	608	Close	689	453–926	689
Saint Michael	100	444	Far	16	0–210	16
Stebbins	100	598	Far	16	0–228	16
Teller	100	256	Far	16	0–218	16
Unalakleet	100	724	Far	15	0–252	15
Wales	100	136	Far	16	0–238	16
White Mountain	100	215	Avg	80	0–291	80
TOTAL						1,496
Unit 23						
Ambler	100	277	Avg	311	238–384	311
Buckland	100	461	Close	729	619–840	729
Deering	100	133	Close	282	158–405	282
Kiana	100	391	Avg	467	387–546	467
Kivalina	100	398	Far	476	396–556	476
Kobuk	100	119	Close	262	138–387	262
Kotzebue	100	3,133	Far	3546	3,030–4.061	3,546
Noatak	100	489	Far	0	0–98	0
Noorvik	100	636	Avg	801	690–912	801
Point Hope	100	704	Avg	894	772–1,016	894
Selawik	100	869	Avg	1119	968–1,269	1,119
Shungnak	100	269	Close	467	354–581	467
TOTAL						9,354
Unit 26A						
Anaktuvuk Pass	80	277	Close	539	467–612	431
Atqasuk	2	223	Avg	285	231–339	6
Barrow	3	4,052	Far	2053	1,795–2,312	62
Nuiqsut	1	403	Far	255	205-305	3
Point Lay	40	250	Close	526	453-599	210
Wainwright	15	540	Far	322	272-373	48
TOTAL						760
Total Harvest						11,610

[a]Nome harvest was determined through RC900 harvest reports that were distributed through the statewide harvest vending system.

Table 11. Number of hunters and caribou harvest by hunters residing outside the range of the Western Arctic caribou herd per regulatory year and unit, 2005–2006 through 2009–2010 (Note: this table erroneously assumes all caribou taken in Unit 26A were from the WAH; some are undoubtedly from the Teshekpuk caribou herd).

		Number of hunters			Caribou harvest			
Year	Unit	Succ.	Unsucc.	Total	Bulls	Cows	Unk.	Total
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	472	224	696	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	1	0	1	1	0	0	1
	22	24	21	45	37	2	0	39
	23	357	195	552	418	45	2	465
	24	7	28	35	5	4	0	9
	26A	73	24	97	109	5	0	114
	Total	462	268	730	570	56	2	628
2008–09	21	0	2	2	0	0	0	0
	22	21	23	44	33	1	0	34
	23	395	155	550	492	50	1	543
	24	5	19	24	5	1	0	6
	26A	62	24	86	84	8	0	92
	Total	483	223	706	614	60	1	675
2009–10	21	0	1	1	0	0	0	0
	22	15	29	44	23	3	0	26
	23	276	163	439	324	60	9	393
	24	18	63	81	13	6	0	19
	26A	58	22	80	60	12	2	74
	Total	367	278	645	420	81	11	512

Table 12. Numbers and percent of nonlocal hunters by transport methods and year for the Western Arctic caribou herd (all 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	557 (77)	4 (1)	89 (12)	29 (4)	9 (1)	4 (1)	32 (4)	0 (0)	724
2008-2009	526 (75)	2 (0)	90 (13)	35 (5)	11 (2)	5 (1)	28 (4)	0 (0)	697
2009-2010	411 (65)	5 (1)	92 (14)	32 (5)	12 (2)	9 (1)	70 (11)	4 (1)	635

Table 13. Percent positive results for brucellosis, haptoglobin levels, and sample sizes (in parentheses) from serology analyses of the Western Arctic caribou herd, 1962–2010 (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)
2009	5	(83)	7	(83)
2010			13	(60)

[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.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[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 an important subsistence resource for native people of Alaska and Canada. In addition, the PCH provides valued hunting and wildlife viewing opportunities for nonlocal Alaska residents and nonresidents. 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 (Fancy and Whitten 1991, Whitten and Fancy 1991, Whitten et al. 1992, Fancy et al. 1994, Griffith et al. 2002). 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 have been focused on monitoring population parameters to evaluate management objectives.

In 1987 the United States and Canada established the International Porcupine Caribou Board (IPCB) to coordinate management and research among 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 regularly to coordinate research and management activities and set priorities for future work.

A variety of factors affect PCH management, including IPCB and PCTC 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 Alaska 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). Estimates of population size could not be obtained during 2002–2009 due to inadequate survey conditions.

MANAGEMENT DIRECTION

The following goals, proposed by the IPCB in 1998 (International Porcupine Caribou Board 1998), have been 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 photo censuses every 2–3 years to estimate population size.
  - 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

ADF&G, with assistance from ANWR and YDE, estimated population size of the herd using the modified aerial photo–direct count extrapolation (APDCE) technique (Davis et al. 1979; Valkenburg et al. 1985) conducted at 2–4 year intervals during 1979–2001. The technique required monitoring postcalving aggregations by radiotracking radiocollared caribou from mid June through mid July. Aggregations of sufficient quality to conduct a photo census typically occurred when temperatures were >55°F and wind was <8 mph (Davis et al. 1979; Valkenburg et al. 1985). Groups of caribou were then photographed with a Zeiss RMK-A aerial camera mounted in the belly of a DeHavilland DHC-2 Beaver aircraft. Small groups of caribou were often photographed with handheld cameras or visually estimated. Estimated population size in a given year was the summation of the total number of caribou enumerated from photographs and caribou that were visually estimated.

Prior to 2010, photo census results were considered a minimum estimate of herd size. The method lacked an estimate of variance and underestimated herd size because groups of caribou having no radio collars can be difficult to detect and occasionally groups with radio collars are not detected. Furthermore, the magnitude of the bias likely varied between years and was largely affected by how well the herd aggregated and to a lesser extent the number of radio collars deployed within the herd.

Beginning in 2010, herd size was estimated by conducting a photo census survey as described above and applying a model developed by Rivest et al. (1998) to estimate herd size and provide a measure of uncertainty. The estimator is based on a 2-phase sampling design. Phase 1 uses the distribution of radiocollared caribou among groups of known size to estimate the number of caribou in groups without radiocollared caribou. Phase 2 uses a Horvitz–Thompson estimator and the proportion of active radio collars detected to expand the herd size from phase 1 to account for caribou represented by radio collars not located during the survey. Rivest et al. (1998) describe 3 detection models for use in phase 2. Of these models, the "homogeneity" model has been most frequently applied (Couturier 1996; Patterson et al. 2004) and is best suited for our data. This model assumes that 1) all active radio collars are identified in observed groups and 2) unobserved groups with radiocollared caribou are missed because they are outside of the surveyed area. Phase 2 calculations are not necessary if all radio collars are located and associated groups are counted. Also, the consequences of not meeting the assumptions of phase 2 are greatly mitigated when a high proportion of the active radio collars are detected and associated groups are counted. Finally, this estimator assumes random distribution of radio collars among caribou in the herd and a statistical test is provided to evaluate the appropriateness of this assumption for a given survey.

Parturition, Calf:Cow Ratios, and Early Calf Survival

Parturition rate was estimated by observing radiocollared females ≥4 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 ≥4 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 June).

Population Composition

Fall sex and age composition was estimated by classifying caribou from a helicopter near peak of rut to take advantage of presumed mixing of bulls, cows, and calf caribou. Peak rut was estimated as the date 228 days (gestation period) prior to the median calving date of the PCH estimated from parturition surveys conducted annually in early June. Caribou groups were located by radiotracking collared caribou (bulls and cows) from fixed wing aircraft. Approximately 200 caribou were classified per radio collar per group, utilizing a cluster sampling scheme (Cochran 1977). If less than 200 caribou were present in a group, all or most of the caribou in those groups were classified. Bull:cow and calf:cow ratios were generated using pooled data, and variance was estimated using variance in those ratios between independent clusters, weighted by cluster size.

Using techniques recommended by 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.

Historical composition data for the herd can be found in Whitten (1993a) and Stephenson (2005) for the postcalving period during 1971–1992 and in Whitten (1981, 1992) for the fall period during 1972–1980.

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 caribou and using satellite collars.

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. Underestimates of harvest for those communities was due to poor harvest reporting by local residents and a lack of subsistence household surveys. We adjusted annual local harvest from 200–500 to 400–700 annually for RY06–RY09. 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. Among similarly-sized communities, Anaktuvuk Pass consistently had the highest per capita harvest, 2 caribou/person. Because both communities show a high reliance on caribou, 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. During 1999–2009, YDE did not collect harvest data, but Canadian managers assumed averaged harvest was 4,000 annually. Beginning in 2010, hunters in Canada were required to report harvest as the result of a Harvest Management Plan implemented in that year. Canadian harvest estimates for 2010 will be available in the next report period. For years when harvest data were available (reported or estimated) data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY08 = 1 Jul 2008 through 30 Jun 2009).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We did not conduct a photo census of the herd in 2008 or 2009 due to inadequate aggregations. During 23–25 June 2008, we monitored the PCH by radiotracking radiocollared caribou. Most of the herd was distributed between the Kongakut and Hulahula Rivers at elevations of 2,500–5,000 feet. Radiocollared cows were among loosely aggregated groups except for a considerable concentration in the Okpilak River drainage that contained 58% of located radio collars. Two of 15 satellite-collared cows and 15% of radiocollared cows were located in the Firth River drainage near Mountain Creek. Fifteen of 20 radiocollared bulls were also located, mostly in the Jago River drainage and segregated from cows. Cool weather in the mountains and an apparent lack of insects prevented adequate aggregations for a photocensus at that time. The herd was monitored with satellite collars for 2 weeks following radiotracking flights. By late June and early July, most of the herd moved south across the Continental Divide and into the upper Sheenjek River drainage. We made 3 attempts to radiotrack and monitor the status of the herd for a photocensus on the south side of the Brooks Range. However, thunderstorms and low clouds prevented flights.

During 28–29 June 2009, movement and aggregation of satellite-collared caribou and favorable forecasted weather conditions indicated that adequate photocensus conditions might develop. During 30 June–2 July, we radiotracked the PCH to determine the feasibility of a photocensus. We located 89 of 95 radiocollared cows and all 14 radiocollared bulls. On 30 June, 75% of radiocollared caribou were located in 14 groups along the northern foothills of the Brooks

Range. Most groups were aggregated sufficiently for a photo census. However, the remaining radiocollared caribou were among large groups of migrating caribou in the upper Jago and upper Aichilik Rivers. Early on 1 July, snow and rain at high elevations in the Brooks Range apparently caused the PCH to move rapidly to the mountains. During the following 24 hours at least 50% of the PCH dispersed from aggregated groups and most caribou migrated south near the Continental Divide. Lead caribou travelled as far south as the headwaters of the Sheenjek River. During the next 2 weeks, the PCH remained segregated north and south of the Continental Divide and dispersed over large areas.

On 2–3 July 2010, we completed a photo census of the PCH, resulting in a population estimate of 169,000 caribou (95% CI 153,493–184,403 caribou). During the photocensus we located all radiocollars known to be active during spring 2010 on PCH bulls and cows (n=100). This included one cow originally radiocollared as a Central Arctic Herd (CAH) caribou, but travels with PCH caribou. Radiocollar distribution resulted in 21 groups containing only PCH radiocollars and 3 groups containing PCH and CAH radiocollars. We also located 4 groups that did not contain radiocollars. In total, 28 groups were identified, 25 groups were photographed with a large format camera mounted on a DeHavilland DHC-2 Beaver, 2 groups were photographed with a handheld digital camera from a Cessna 185 Skywagon, and 1 group was visually estimated from a Cessna 182 Skylane. Enumeration of all caribou on photographs and visual estimation of 1 group not photographed resulted in 175,843 caribou.

Although all radiocollars were located during the 2010 photo census, the homogeneity model in phase 2 was used to estimate the number of caribou in the group that was not photographed due to fog (visually estimated) and the number of PCH caribou in 3 groups that also contained CAH radiocollars. To apply the estimator, we treated all PCH radiocollars that were mixed in groups with CAH radiocollars (n = 3; 1 in each of 3 groups) or were located but not photographed (n = 3; all in a single group) as "missing." Because the estimator relies only on counts for groups with radiocollared caribou (i.e., the size of groups without radiocollars are estimated), we excluded from the input data all groups that were photographed but contained no radiocollars (n = 4). The resulting data set consisted of 20 groups that totaled 147,268 caribou, accounted for 94 of 100 PCH radiocollars, and produced an abundance estimate of 168,948 caribou (SE = 7,384, 95% CI = 153,493–184,403) (Table 2). The statistical test of randomness supported our reliance on the assumption of random distribution of collars ($p = 0.65$; Table 2).

Parturition and Early Calf Survival

Parturition rates of radiocollared females ≥4 years old were 77% ($n = 65$) in 2009 and 85% ($n = 41$) in 2010. Parturition rates in 2009 and 2010 did not differ significantly (95% binomial CI) from the long-term mean (1987–2008, $\bar{x} = 81\%$, Table 2).

Parturition rates for 3-year-olds were 100% ($n = 7$) in 2009 and 14% ($n = 7$) in 2010. One of 7 radiocollared 2-year-olds was parturient in 2009. Parturition rate of 2-year-olds was unknown in 2010 because no cow caribou of this age class were radiocollared. Parturition rates of 3-year-olds are difficult to compare between years due to small annual samples sizes. However, mean parturition for all 3-year-olds during 2005–2010 was 69% (n = 35).

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 75% in 2009 and 87% in 2010. Postcalving survival in 2009 was the lowest recorded since 1993 (Table 2).

Late June calf:cow ratio of radiocollared females ≥4 years old was 44:100 in 2009 and was one of the lowest recorded since 1987 (Table 2). The calf:cow ratio in 2010 was 65:100, which was above the long-term mean ($\bar{x}$ = 59:100). Fluctuations in calf:cow ratios between years may be the result of annual fluctuations in adult female body condition in the year following good or poor calf production (Cameron 1994).

Population Composition

In October 2009, 30 groups of caribou were located by radiotracking radiocollared caribou (bulls and cows, n=34) and sampled for age and sex composition. Caribou groups were distributed over a large geographic area extending from the foothills in the upper Coleen River drainage, Alaska, southeast to the Ogilvie Mountains, Yukon. In total, 6,897 caribou were classified as bull, cow, or calf resulting in an estimate of 40 bulls:100 cows and 21 calves:100 cows. However, substantial heterogeneity in composition was observed at both the group and regional scales (i.e. Alaska vs. Yukon). Similarly, heterogeneity was observed between groups identified using radiocollared bulls versus those identified using radiocollared cows, indicating both spatial and sexual segregation within the herd. Because the proportion of sampled radio collars that were on bulls was far less than the proportion of bulls in the population (compared to the proportion of sampled radiocollared cows to all cows), we focused sampling on groups identified from radiocollared cows; therefore groups that were predominantly bulls were underrepresented in our sample. Because of this, the bull:cow ratio from the pooled group data were likely biased low to an unknown magnitude.

In October 2010, 29 groups of caribou were located by radiotracking radiocollared caribou (bulls and cows, n = 53) and sampled for age and sex composition. Over 90% of the radiocollared caribou were congregated in Alaska in the upper East Fork Chandalar River. In total, 11,207 caribou were classified as bull, cow, or calf resulting in an estimate of 57 bulls:100 cows and 34 calves:100 cows. Heterogeneity in 2010 ratio data was likely reduced compared to 2009 because most of the herd was concentrated in one area and sampling effort was in concordance with the distribution of radiocollars. In addition, we sampled more groups identified from bull radio collars and several groups contained both radiocollared bulls and cows.

The most recent March composition survey occurred in 2010 and indicated a calf:cow ratio of 20 calves:100 cows. This is the lowest March calf:cow ratio recorded in the PCH (Table 2; D. Cooley, YDE, personal communication, 2011). The long-term mean calf:cow ratio in March is 34 calves:100 cows (range 20–56 calves:100 cows; Table 2).

Distribution and Movements

Calving Distribution. In April and May 2009, the PCH migrated from the south side of the eastern Brooks Range and central Yukon to the coastal plain foothills in northern Yukon. Seventy-seven radiocollared cows were observed during calving survey flights during 1–3 June. Of those, all but one was located within Ivvavik National Park. The remaining radiocollared cow was located within ANWR and no radiocollared 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 the Babbage River to the Alaska–Yukon border and was concentrated in the hills west of the Tulugag River and in the headwaters of the Spring River.

In April and May 2010, the PCH migrated from the eastern south side of the Brooks Range and from the Old Crow Flats and Ogilvie Basin to the coastal plain between the Babbage River and the Katakturuk River. Forty-eight radiocollared cows were observed during calving survey flights on 2–5 June. Of those, 16 radiocollared cows were located in Ivvavik National Park and 32 radiocollared cows were located in ANWR of which 9 were within the 1002 area. Calving extended east of the Firth River to west of the Hulahula River and was concentrated in the foothills east of the Jago River and on the coastal plain between the Kongakut River and Demarcation Bay.

In the 1980s and 1990s, most of the PCH calved in ANWR, often in the 1002 area. Since 2000 the PCH primarily calved in Ivvavik National Park. 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. In 5 of 9 years during 2002–2010, calving occurred on the coastal plain, primarily in Yukon between the Alaska–Canada border and the Babbage River.

Summer Distribution. Following calving in summer 2008, the PCH moved west and was distributed between the Kongakut and Hulahula rivers at elevations of 2500–5000 feet. Radiocollared cows were among loosely aggregated groups. However, a considerable concentration observed in the Okpilak River drainage contained 58% of located radio collars in late June (n = 64). Two of 15 satellite-collared cows and 15% of all radiocollared cows were located in the Firth River drainage near Mountain Creek. Fifteen of 20 radiocollared bulls were located, most of which 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. Some caribou remained in the upper Okpilak River drainage.

Following calving in summer 2009, the PCH moved to the northern foothills of the Brooks Range between the Kongakut and Jago rivers and in the upper Firth River drainage in mid to late June. Radiocollared cows were among loosely aggregated groups and generally segregated from bulls. By early July, approximately half of the herd migrated south near the Continental Divide and into the headwaters of the Sheenjek River.

Following calving in summer 2010, most of the PCH was distributed across the northern foothills of the Brooks Range between the Jago and Hulahula Rivers. By late June and early July, a portion of the PCH moved from the north side of the Brooks Range to the south side of the Brooks Range between the Sheenjek and East Fork Sheenjek rivers. Caribou that remained on the north side of the Brooks Range moved west, between the Canning River drainage and the Hulahula River drainage.

Fall Distribution. In August 2008 most of the PCH was in the northern Richardson Mountains near the Blow River in Yukon. Some caribou were scattered as far south as the Bell and Porcupine River drainages in Yukon, while others remained on the coastal plain near the Egaksrak River in Alaska. During September, most of the PCH, including 13 of 15 satellite collared 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-collared caribou migrated south to the Ogilvie Basin in Yukon.

In August 2009, the PCH was distributed over a large geographic area from the eastern North Slope to the Coleen River drainage in Alaska and from the Old Crow Flats to the Richardson Mountains in Yukon, as indicated by satellite collars. By late September, most of the PCH was distributed from the Coleen River drainage in Alaska to the Ogilvie Mountains in Yukon.

Winter Distribution. During winter 2008–2009, satellite collars indicated about 90% of the PCH wintered between the Wind River and Sheenjek rivers and were concentrated in the East Fork Chandalar River drainage near Arctic Village. The remaining PCH wintered in the Ogilvie Mountains. Caribou that wintered in Alaska partially mixed with Central Arctic herd caribou that were distributed from the Wind River to the North Fork Chandalar River.

During winter 2009–2010, satellite collars indicated about 75% of the PCH wintered in the Ogilvie Mountains. The remaining PCH caribou were mostly in the foothills of the Coleen River west of the Old Crow Flats.

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 resident hunters during RY02–RY09 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 (board) took no regulatory action and there were no emergency orders issued regarding the PCH during RY08–RY09. However, at its March 2010 meeting, the board changed the nonresident seasons and bag limits starting in RY10. The nonresident bag limit was changed from 5 caribou to 1 bull and the season was changed from 1 July–30 April to 1 August–30 September. These bag limit and season date changes were implemented for Units 26C, 25D, 25B, and that portion of Unit 25A east of the East Fork Chandalar River. These regulations were adopted by the board in cooperative management with Yukon, Canada to match nonresident regulations for the PCH in that country.

Harvest by Hunters. Nonlocal and nonresident hunters in Alaska harvested 93 PCH in RY08 and 128 in RY09 (Table 3). Most nonlocal and nonresident harvest occurs in Unit 25A in the Coleen, Sheenjek, and East Fork Chandalar river drainages. Overall, harvest and hunting pressure by nonlocal Alaska residents and 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 RY08 and RY09 is unknown because harvest data from northern Yukon has not been collected or was unavailable for RY08–RY09 and reporting by local Alaska residents is low. 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 primarily 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. In RY08, harvest was likely near the upper range for Arctic Village because caribou were concentrated near the community for several months during winter. Harvest was likely reduced in RY09 compared to RY08 because most of the herd was in Yukon during that winter. A small number of additional caribou were harvested by residents of Venetie in both years.

Harvest in Canada probably continued to be moderate to high 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 4,000 caribou but may be significantly more or less depending on herd distribution and movement throughout the year. Harvest was likely greater in RY09 compared to RY08 because most of the herd was in Yukon during the 2009–2010 winter.

Hunter Success. In RY08 and RY09, success rates for nonlocal Alaska residents and nonresidents combined were 49% and 50%, respectively, and remained similar to other years (Table 4). Most PCH caribou were harvested in Unit 25A and Unit 26C. Hunting pressure and success rates were low in Units 25D and 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 likely low in RY08 and RY09 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 RY08 and RY09 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). Population models (Walsh et al. 1995; Griffith et al. 2002; Arthur et al. 2003) suggest that an annual adult survival rate of less than 84% would result in a population decline such as that observed in the PCH from 1989 to 2001. USFWS data for survival of adults and yearlings for years after 2006 are currently being analyzed and will be available for the next report period (Tara Wertz, Fairbanks USFWS, personal communication, 2010).

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 (1991) as the primary calving area of the PCH. These studies indicate that, over time, the entire extent of the calving grounds may be important for caribou.

In recent years, the PCH has wintered partially or entirely on the south side of the Brooks Range between the Wind and Coleen Rivers in Alaska. The herd is often partially mixed with the Central Arctic herd. It is unknown whether the shift in winter range from the Ogilvie Mountains, Old Crow Flats, and Richardson Mountains in Yukon to Alaska is habitat related.

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). However, based on the 2010 photocensus, we estimate the PCH at 169,000 caribou, indicating the herd likely grew at an average annual rate of 2–3% since 2001, although rates may have varied substantially during that period.

Current and historic harvest rates of the PCH in Alaska are low; thus, consumptive use in Alaska has probably played a small or insignificant role in the periods of increasing or decreasing abundance observed in the PCH since the 1970s. Therefore, ADF&G and the Board of Game have maintained liberal hunting seasons and bag limits for residents. Nonresident hunting seasons and bag limits in Alaska were reduced in March 2010 to match licensed hunter seasons and bag limits in Canada, while maintaining most of the traditional nonresident hunt period (August–September) and typical harvest by nonresident hunters (1 bull).

We have little information about harvest levels or composition in Canada; however, harvest is thought to average 4,000 caribou annually and may be as high as 6,000 in some years (Porcupine Caribou Management Board 2010). Conservation concerns arising from the population decline during 1989–2001, the absence of a population estimate during 2002–2009, and population models that suggested a continued decline prompted the development and implementation of a Harvest Management Plan (HMP) in Canada (Porcupine Caribou Management Board 2010). The HMP outlines a harvest strategy that would restrict or liberalize harvest based on herd size. The plan allows for unrestricted harvest when the PCH is ≥115,000 caribou, institutes a voluntary bull-only harvest if herd size is 80,000–115,000, institutes a mandatory bull only harvest with annual limits if herd size is 45,000–80,000, and prohibits harvest (except for ceremonial purposes) if herd size is ≤45,000. The plan recognizes that the ability to conduct a photo census of the PCH on intervals of 2–3 years has been unreliable in since 2001 (e.g., adverse weather, lack of aggregations, etc.) and therefore uses trends in harvest and demographic indices including adult cow survival, parturition rates, calf survival, and body condition to trigger various harvest strategies when a current population estimate is not available. The plan also requires harvest reporting, regardless of herd size or harvest regime. The HMP was implemented for the 2010–2011 hunting season.

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 demographic indices (parturition rates, early calf survival, adult and yearling survival, population size, and seasonal distribution). We met regularly with these agencies as part of the Porcupine Caribou Technical Committee (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 RY08–RY09. Residents of Alaska (local and nonlocal) did participate in the State of Alaska's regulatory process through Advisory Committee and BOG meetings, and residents of Canada participated in the development and adoption of the HMP.

Based on the current population estimate of 169,000 caribou in July 2010, we likely met our management objective of 135,000 caribou in RY08 and RY09.

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.

COCHRAN, W. G. 1977. Sampling Techniques. John Wiley and Sons. New York, New York.

COUTURIER, S. 1996. Calving photocensus of the Riviere George Caribou Herd and comparison with an independent census. Rangifer Special Issue 9:283–296.

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.

PATTERSON, B. R., B. T. OLSEN, AND D. O. JOLY. 2004. Population estimate for the Bluenose–East Caribou Herd using post-calving photography. Arctic 57:47–58.

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.

PORCUPINE CARIBOU MANAGEMENT BOARD. 2010. Harvest Management Plan For the Porcupine Caribou Herd In Canada. Whitehorse, Yukon, 45 pages.

RIVEST, L-P., S. COUTURIER, AND H. CREPEAU. 1998. Statistical methods for estimating caribou abundance using postcalving aggregations detected by radio telemetry. Biometrics 54:865–876.

STEPHENSON, R. O. 2005. Units 25A, 25B, 25D, 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.

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TABLE 1 Porcupine caribou herd population estimates, 1961–2011.

Year	Population estimate[a]	Technique[b]
1961	110,000	Calving ground census
1972	99,959	APDCE
1977	105,000	APDCE
1979	105,683	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
2002–2009[c]		
2010	169,000	APDCE[d]

[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 due to poor aggregation or weather conditions for photography.
[d] Modeling developed by Rivest et al. (1998) applied to estimate herd size and apply confidence intervals.

TABLE 2 Porcupine caribou demographic data, 1987–2010[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	0.30	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	0.46	
1996	74	0.89	0.81	0.91	0.72	0.38	
1997	48	0.75	0.77	0.90	0.58	0.39	
1998	58	0.83	0.82	0.94	0.68	0.28	129,000
1999	39	0.84	0.83	0.86	0.70	0.56	
2000	44	0.73	0.61	0.82	0.44	0.27	
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]	
2009	65	0.77	0.57	0.75	0.44		
2010	41	0.85	0.76	0.87	0.65	0.20	169,000
	mean[i]	0.81	0.73	0.87	0.59	0.34	

[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.
[i] Mean is for years 1987–2010.

TABLE 3 Porcupine caribou herd harvest[a], regulatory years 1984–1985 through 2009–2010.

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	–[b]		
1999–2000	84	4	0	88	400	–[b]		
2000–2001	62	10	0	72	300	–[b]		
2001–2002	105	9	0	114	400	–[b]		
2002–2003	72	3	1	76	300	–[b]		
2003–2004	120	8	0	128	500	–[b]		
2004–2005	60	7	0	67	200	–[b]		
2005–2006	32	10	0	42	500	–[b]		
2006–2007	57	1	1	59	400–700	–[b]		
2007–2008	113	13	0	126	400–700	–[b]		
2008–2009	78	15	0	93	400–700	–[b]		
2009–2010	108	18	2	128	400–700	–[b]		

[a] A small proportion (<10%) of the reported harvest may be Central Arctic Herd caribou from Unit 25A.
[b] Canadian data unavailable.

TABLE 4 Porcupine caribou herd[a] local, nonlocal[b] and nonresident hunter success, regulatory years 1991–1992 through 2009–2010.

Regulatory year/	Unit				Total for
Hunters	25A	25B	25D	26C	Units 25 and 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	62	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 25A	25B	25D	26C	Total for Units 25 and 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
2008–2009					
Total hunters	140	10	18	52	220
Successful	74	1	1	32	108
% Successful	53	10	6	62	49
2009–2010					
Total hunters	195	14	16	39	264
Successful	108	2	4	18	132
% Successful	55	14	25	46	50

[a]A small proportion (<10%) of reported harvest in Unit 25A may be Central Arctic Herd caribou.

[b]Nonlocal includes Alaskans residing outside Units 25, 26B, and 26C.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[1]

LOCATION

GAME MANAGEMENT UNIT: Western half of Unit 25C and small portions of northern Unit 20B and eastern Unit 20F (3,090 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, 2009). The federal Bureau of Land Management (BLM) estimated the herd's size at around 1,000 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 1,200, based on missing radiocollared animals and a rough estimate of herd composition. Based on surveys since the late 1970s, it seems most likely that the herd grew from about 150 in 1978 to around 1,000 in 1992, was stable until about 1999, declined to about 600–800 by 2000, and to 500–700 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. Caribou radiocollared during that project provided information on herd movements and

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

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), participation and success were 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 one bull 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 completed in each of 2008 and 2009. On 26 June 2008, we conducted a survey to estimate the White Mountains herd population size using the radio-search technique (Valkenburg et al. 1985). We located all of the 17 functioning radio collars during the survey, and photographed groups of caribou with handheld digital cameras from a radiotelemetry-equipped Bellanca Scout fixed-wing aircraft.

On 6 July 2009, we estimated the White Mountains herd population size using the radio–search technique (Valkenburg et al. 1985). We located all of the 16 functioning radio collars during the survey, and photographed groups of caribou with an externally-mounted digital camera from a radiotelemetry-equipped Dehavilland Beaver fixed-wing aircraft.

Counts from digital photographs were used to estimate a minimum population, as well as a total population. The total population was estimated by assuming a random distribution of radio collars within the population, and extrapolating the number of caribou-per-collar observed in large groups to the proportion of collars observed away from large groups to account for uncollared caribou peripheral to the large aggregation (Seaton 2009).

We strive to maintain at least 20 radiocollared caribou in the White Mountains herd to aid in estimating herd dynamics. At the end of RY09, 16 caribou had functioning radio collars and we plan to deploy more in fall 2010.

Population Composition

We conducted composition surveys on 9 October 2008 and 7 October 2009 using an R-44 helicopter and a Bellanca Scout fixed-wing 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 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.

MORTALITY

Harvest

We estimated harvest by using data from returned harvest ticket and registration permit report cards. For RY08 and RY09, 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 or south of the Steese Highway were considered FCH animals. To separate harvest of the White Mountains herd from the Ray Mountains herd in Unit 20F, we considered caribou killed south of the Yukon River to be White Mountains herd animals. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size and Composition

During the 2008 photo census, we counted 677 caribou and estimated the population size to be 677–762 (Table 1). During the 2009 photo census, we counted 529 caribou and estimated the population size to be 529–605.

The June 2008 population estimate of 677–762 caribou was higher than the 2007 estimate of 590–650. In both 2007 and 2008, the minimum count grew by 15% from the previous year. It is likely that the herd was increasing at a high rate during this period, since 2 of the highest 5 calf:cow ratios ever recorded for the White Mountains herd were observed in 2007 and 2008 (Table 1). This increase is further supported by high survival of radiocollared adults during RY08 and RY09, when only 1 of 17 radiocollared cows died. However, in 2009, the herd minimum count decreased by 22%.

During fall composition surveys in 2008 and 2009, we classified 507 and 333 caribou, respectively (Table 1). During 2008, radiocollared FCH animals were mixed with the White Mountains herd, which makes the data collected that year less representative of the White Mountains herd alone. Bull:cow ratios during RY08–RY09 remained relatively high (39–46 bulls:100 cows) and continued to meet objectives.

Fall bull:cow ratios in the White Mountains herd have been variable (23–62 bulls:100 cows during 1983–2009). This probably reflects 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 can be in timbered areas, it is easy to miss groups and this could affect overall composition estimates.

Distribution and Movements

During RY04–RY09, 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 calving behavior in the White Mountains. This dispersed calving behavior is not unlike other small mountain herds (Barten et al. 2001). 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–RY09. The western wintering area burned in 1988, 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 of the fall and winter.

Fortymile herd caribou crossed to the north side of the Steese Highway in autumn 2008. On 9 October 2008, some mixing with the White Mountains herd was documented during the composition survey. When the FCH traveled back toward the center of their normal range in February and March 2009, some White Mountains herd animals went with them. On 29 March and 22 April 2009, 5 radiocollared yearling and 2-year-old female White Mountains caribou were found in the upper Salcha and Goodpaster Rivers, 80–120 miles from their typical winter range. These far-ranging White Mountains herd animals remained with the FCH at least through April, and had returned to the White Mountains herd by 16 June 2009 when we radiotracked the herd. If we assume that the percentage of radiocollared White Mountains herd caribou that dispersed with the FCH was representative of the ratio of uncollared WMH animals that dispersed with the FCH (5 of 16 radiocollared caribou, or 31%), then more than 200 animals may have participated in the journey away from their home range and back. Perhaps some of those White Mountains herd caribou did not return to their natal herd. Therefore, concurrent to the observed 22% decline in population, the fall percentage of calves in the population dropped by 14%, and some range overlap occurred between the WMCH and FCH. These two factors, independently or in combination, could account for the population decline from RY08 to RY09.

MORTALITY

Harvest

<u>Season and Bag Limit</u>.

Season/Hunt conditions	RY90–RY97	RY98–RY99	RY00–RY01	RY02–RY09
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 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.

<u>Alaska Board of Game Actions and Emergency Orders</u>. No emergency orders were issued by the department during RY08–RY09.

There were no board actions for the White Mountains caribou herd during RY08–RY09. Previous board actions are addressed in the background section of this report.

Harvest by Hunters. Harvest during fall general season 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 to bull only in RY02, and the FCH has not returned to the area in large numbers during the fall general season since RY00. Due to these factors, the fall harvest declined to previous levels, where it remained in RY08–RY09.

Permit Hunts. Many permits were issued annually but harvests were low for winter registration hunt RC879 (Table 3). In RY08, 233 permits were issued and 3 caribou were reported harvested. In RY09 111 permits were issued, and 2 caribou were reported harvested.

A 3% harvest level for sustainability was chosen for the White Mountains herd, based on the adjacent Delta caribou herd, which is also a small mountain herd (Seaton 2009). The total annual White Mountains herd reported harvest (fall and winter) was 22 in RY08 and 13 in RY09. This harvest represents 3% and 2% of the prehunt population estimate for those respective years.

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–RY07 (Table 1). The White Mountains herd could likely sustain a harvest higher than 3% because the large bull ratio remained high during RY08–RY09 (11 large bulls:100 cows) even though annual harvest was almost entirely bulls (97%). Another possibility is that an unknown proportion of the bulls reported harvested in the fall hunt were actually members of the FCH harvested in the White Mountains herd hunt area.

Hunter Residency and Success. Most 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 winter seasons opened) to RY07, 82% of the harvest occurred during the fall season (10 Aug–20 Sep). In RY08–Y09, 83% 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 RY08 and RY09 was 3- or 4-wheelers, which accounted for 58% 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 RY08–RY09, which was to maintain a stable or increasing population with a fall bull:cow ratio of at least 30 bulls:100 cows. The 2008 photo census results indicated an increasing population and the 2009 photocensus results showed a decreasing population, but compared to the previous 2 estimates in 2005 and 2007, the population appeared to be stable or increasing, and the fall composition counts indicated a bull:cow ratio of 46:100 in 2008 and 42:100 in 2009.

Mixing of the Fortymile and White Mountains herds may become a significant challenge in managing these caribou as separate populations. It is possible that as the Fortymile herd expands, it may engulf, overlap, or mix with the White Mountains herd. If so, we may reach a time when we need to manage the two herds as one. In the meantime, overlap of each herd into the other's hunt areas can create harvest allocation issues. If more White Mountains caribou leave the area after mixing with Fortymile animals, they may not return. It is also possible that the FCH could adopt the White Mountains as a calving range as they have in the past, leaving us no functional way to separate White Mountains caribou from Fortymile caribou.

When the FCH harvest was liberalized in RY00, 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.

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

BARTEN, N. L., R. T. BOWYER, AND K. J. JENKINS. 2001. Habitat use by female caribou: tradeoffs associated with parturition. Journal of Wildlife Management 65:77–92

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.

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.

______. 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.

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.

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TABLE 1 White Mountains caribou herd fall composition counts and estimated population size, 1983–2009.

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
10/09/08[c]	46	12	42	23	53	42	31	27	24	507	677[b]–762
10/07/09	42	9	15	9	64	44	34	22	27	333	529[b]–605

[a] Conducted with fixed-wing aircraft instead of helicopter.
[b] Minimum count from summer census.
[c] Some mixing with the Fortymile Caribou herd occurred; therefore this data is less representative of the White Mountains herd alone.

TABLE 2 White Mountains caribou harvest during fall general season[a], regulatory years 1987–1988 through 2009–2010.

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
2008–2009	18	1	0	19
2009–2010	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 2009–2010.

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	260 (64)	128 (88)	17 (12)	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
	2008–2009	233	181 (78)	49 (94)	3 (6)	2	1	0	3
	2009–2010	111	60 (54)	47 (96)	2 (4)	1	1	0	2

[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 2009–2010.

Regulatory year	Successful: Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Unsuccessful: Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
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
2008–2009	13	3	3	19 (17)	59	31	6	96 (83)	115
2009–2010	6	2	3	11 (10)	62	28	5	95 (90)	106

[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 2009–2010.

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
2008–2009	26	0	0	42	11	16	5	0	19
2009–2010	18	0	0	73	9	0	0	0	11

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CARIBOU MANAGEMENT REPORT

From: 1 July 2008
To: 30 June 2010[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 for hunters from several North Slope villages. In recent years, the average per capita harvest of caribou by North Slope villages within the TCH range was estimated at 0.9 caribou per person; most caribou harvested 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 1978). 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 (Fig. 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 based on minimum count estimates 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, Yokel et al. 2009).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Provide for subsistence and other hunting opportunity on a sustained yield basis.
- Ensure adequate habitat exists to maintain the TCH.
- Provide for viewing and other uses of caribou.

MANAGEMENT OBJECTIVES

- Encourage cooperative management of the herd and its habitats among state, federal, and local entities and all users of the herd.
- Develop a better understanding of relationships and interactions among North Slope caribou herds.
- Monitor herd characteristics and population parameters (on an annual or regular basis).
- Attempt to maintain a minimum population of 15,000 caribou, recognizing that caribou numbers naturally fluctuate.
- Maintain a harvest level of 900–2,800 caribou using strategies adapted to population levels and trends.
- Maintain a population composed of at least 30 bulls per 100 cows.
- Seek to minimize conflicts between resource development and TCH.

MANAGEMENT ACTIVITIES

- 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 immobilization drugs.

- Monitor disease, parasite, contaminant, and body condition levels.

- 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. During this reporting period, an extensive effort to quantify error associated with minimum herd size estimates led to adopting methods outlined by Rivest et al. (1998) for producing an estimate of abundance and associated variance that accounts for caribou in groups that do not contain a radio collar, as well as protocols for expanding the estimate to account for missing collars. This method can also assess the randomness assumption that is inherent to the overall methodology. It is notable that the method is incapable of dealing with variation in photo quality that can sometimes cause a large negative bias in the number of observable caribou. This method may also be a useful tool to deal with mixing of caribou herds during photocensus photography, as caribou that are associated with a different herd can be treated as missing, and the number of caribou that a collar represents can be estimated separately.

A photo census was completed on 8 July 2008. 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-2) aircraft was directed toward groups for photography. Photographs were taken with a floor-mounted Zeiss RMK-A camera. The software program Photoman (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 no active CAH collars were missing or thought to be associated with the TCH. The 286 9x9 photographs were developed by HAS Images (Dayton, Ohio). Photo layout occurred in early October 2008 and photographs were counted in December 2008.

An additional photo census was completed on 31 July, 2010, a month after the end of this reporting period; however, poor photo quality created difficulties with counting caribou, and an estimate was not finalized. While unsuccessful, this survey was interesting from the perspective of herd overlap and mixing. During this attempted photo census, radiocollared female caribou from both the CAH and WAH were observed and photographed in aggregations of predominately TCH caribou. Concurrently, 4 collared TCH caribou were not photographed, and were known to be with the CAH.

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 2008 and 2009, calving surveys were flown using a Cessna 182 and 185 on 2–9 June and a Cessna 182 on 6–12 June, respectively. For each observation of a collared cow, 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 distended udder (Whitten 1995). Cows with soft antlers (covered with velvet) were determined to be nonparturient. 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 (≥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.

Aerial fixed-wing fall composition surveys were flown using a Cessna 182 on 29 and 30 October 2008. In 2009, fall composition surveys were flown using a Roberstson R-44 with a Piper PA-18 spotter plane radiotracking ahead of the helicopter. During fixed-wing composition surveys approximately 100 caribou per radio collar were sampled for composition, and during helicopter composition surveys approximately 200 caribou were sampled per radio collar. Spring short-yearling surveys were flown using a Cessna 182 on 6–14 April 2009 and 7–9 April 2010. We used telemetry equipment to locate radiocollared cows and classified approximately 100 caribou in the area surrounding the collared animals. Calf:adult ratios in the case of fixed-wing surveys, and calf:cow and bull:cow ratios were calculated using cluster sampling methods (Cochran 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 starting 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 spring migration. We did not use mortality data from collared caribou instrumented with satellite 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 differential mortality rates; since then, we 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. We also utilized the sample of known-age female caribou, collared as 13-month-olds, to estimate a Kaplan-Meier survival curve.

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.

Health Assessments

In order to begin development of a health assessment protocol, for long-term evaluation of disease incidence and body condition, we collected 10 caribou of varying age and sex in March and June of 2009. Collections took place near Red Dog Mine in March and in the calving grounds in late June.

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 2010 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 to produce a cumulative calving distribution that is unbiased with respect to annual sample size.

To evaluate potential conflicts with oil and gas development, we updated estimates of migratory intensity and winter habitat use developed by Person et al. (2007) using data collected during the reporting period. As part of a cooperative project with the ADF&G Division of Subsistence, we analyzed data to refine estimates of proportional harvest in situations where communities are likely to harvest caribou from more than one herd during an annual cycle of harvest. To do this we utilized georeferenced harvest data from Barrow, Nuiqsut, and Atqasuk, along with monthly estimates of caribou distribution from the TCH, CAH, and WAH. Monthly fixed kernel estimates were created using a subsample of 1–3 locations per satellite-collared animal, per month, from each of the three herds. The relative density of use for each herd was then multiplied by the current population estimate for the herd to estimate the relative number of caribou in the vicinity of a harvest location. For example, if 100 caribou were harvested in a given area, and the monthly estimates of density indicated that 1,000 TCH caribou and 500 WAH caribou were present, then the harvest was split proportionally between the two herds.

HARVEST

Previous analyses show the registration reporting system is not effective in estimating caribou harvest within the range of the TCH (e.g. Georgette 1994). Community harvest surveys are preferred; however, during this reporting period, no community harvest surveys were completed within the range of the TCH by the Division of Subsistence. The most recent community harvest estimates were generated for Atqasuk, Barrow, and Nuiqsut from 2002 through 2007 (Braem et al. 2011). It is worth noting here that we did not use the 2002–2007 estimates for Barrow because sampling issues resulted in unreliable estimates. Preliminary results from that Barrow survey have been reported in the previous management reports, and are now thought to be gross overestimates of harvest (Braem et al. 2011). Because of the lack of recent community harvest surveys, community harvests were calculated based on previous estimates of per capita harvest. We used the estimated harvest from past survey reports and the human population for the year of the estimate 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 2008–2009 and 2009–2010. Because villages harvest caribou from more than one herd, we used the estimated proportional harvest based on rough summaries of caribou distribution to determine harvest for the remaining villages (Parrett, ADF&G, Fairbanks, unpublished data). Additionally, harvest by non-local hunters was determined through harvest-ticket reporting, with proportional harvest again estimated using knowledge of caribou distribution at the time of reported harvest to evaluate the likelihood that harvest came from the TCH or from an adjacent herd.

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 (Fig. 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 photo census. 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 radio tracking in the hours following photography, we did not hear any WAH frequencies among TCH photo census groups. Using Rivest et al.’s (1998) homogeneity method, which only takes into account those groups associated with collared caribou, and attempts to estimate the number of caribou not associated with groups with collars and with missing collars, the estimate is 68,931 (±16%). Using this method, we can infer that the 5 missing collared caribou amount to an estimated 4,500 missing caribou (i.e., point estimate minus the minimum estimate). It is notable, however, that of the 5 missing collared caribou, the two associated with the WAH returned to the TCH later that summer, but of the 3 caribou grouped with the CAH in July 2008, one died that summer, and the other 2 remained with the CAH for the two subsequent years, and were included in the 4 July 2010 CAH photocensus. These missing caribou illustrate difficulties in how we currently define caribou populations. If we retain the calving ground concept of herd delineation, then we must both conceptually and mathematically deal with herd overlap and both temporary and permanent immigration. The exponential growth rate (Johnson 1994) from 1984 to 2008 was 7%, and it was 5.8% 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 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%, despite short-yearling proportions of 24%, 21%, 14%, and 21%, respectively (Tables 1 and 2).

In previous years, we evaluated the chances that immigration may have influenced population growth rates (Parrett 2009). The WAH was considered the most likely source of emigrating caribou, as well as the hardest to detect emigration from because of the large size of the herd relative to the low number of collared caribou. We estimated the probability that a collared caribou would be part of an immigrating group of caribou conditioned on a source population assumed to be 400,000 animals with 100 randomly distributed radiocollared caribou, and emigrating populations ranging from 500 to 16,000. The cumulative probabilities, with the previous assumptions remaining stable, were also calculated (Fig. 3). The assumptions have remained relatively stable since that time.

Productivity, Recruitment, and Mortality Estimates

In 2009, we monitored 48 adult cows in early June. The parturition rate was 50% (24/48), and calving success was 40% (19/48). In 2010, we monitored 47 adult cows during the calving period. The parturition rate was 74% (35/47), and calving success was 47% (23/47). Both parturition and calving success rates were lower in 2009 and 2010 than the long-term averages for parturition (75%, 2002–2010) and calving success (60% 1994–2010; Table 2). In 2009, both measures of productivity were the lowest observed since 1994.

<u>Fall composition counts.</u> During fixed-wing surveys in late October 2008 we located 16 collared caribou, and classified 1,895 caribou in the vicinity of the collared animals, counting 296 calves (16% calves, or 19 calves:100 adults; Table 3). In addition to being a relatively small sample of the collared caribou, the distribution of the sample was highly skewed, as a very large proportion of the collared caribou were migrating south along the Chukchi coast, mixed with WAH caribou. As a result, these results may not be representative of the whole TCH population.

During helicopter surveys on 22 and 24 October 2009 we located 33 collared caribou, and classified 6,576 caribou in the vicinity of the collared animals. The calf:cow ratio was 18:100 (12:100 adults for comparison to fixed-wing surveys), and the bull:cow ratio was 46:100 (Table 3). In contrast to 2008, the 2009 composition survey was well distributed with respect to distribution of collared caribou, and the sample was generated from 44% of the active collars in the herd, including most of the collared bulls. Nevertheless, the cluster samples varied widely in composition (e.g., bull:cow ratios ranging from 20:100 – 268:100), and were skewed toward high bull:cow ratios. The distribution of collared caribou implied a large degree of sexual segregation, with more collared bulls in the mountains than on the coastal plain.

Short-yearling counts. In 2009, we located 38 collared cows during spring recruitment surveys. We classified 4,491 caribou in the areas surrounding the collared animals and saw 13% short yearlings (11-14%, 95% CI) or 14 short yearlings:100 adults (Table 2).

In 2010, we located 36 collared cows during spring recruitment surveys. We classified 4,102 caribou in the areas surrounding the collared animals and saw 13% short yearlings (11-16%, 95% CI) or 15 short yearlings:100 adults (Table 2). The percentage of short yearlings in the spring composition counts has declined an average of 0.48% per year since 1990 ($p=0.01$).

Mortality. The 2008–2009 collar-year started with 61 collared females. The female mortality rate in 2008–2009 was 13% (7–24%, 95% CI). The 2009–2010 collar year started with 65 collared females. The female mortality rate in 2009–2010 was 15% (9–26%, 95% CI). 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).

There were 68 known-aged females marked as yearlings between 1990 and 2009. Due to small sample sizes at the higher ages, the analysis was limited to ages 1-8 only (Fig. 4). Notable patterns included a higher mortality rate for one-year-olds (11%), followed by a period of very low mortality (<5%) from 2-6 years of age. It is interesting to note that adult female survival rates calculated from all radiocollared females are more than twice that of the average mortality rate calculated across age classes 1–8 (6.4%), implying that the animals from the larger sample of unknown-aged animals tend to be older than 8. In fact, the mean minimum age of the unknown age sample in 2011, assuming all unknown-aged animals were at least three years old when captured, was 7.4 years.

Capture, Health Assessments and Body Condition

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.

During 25–28 June 2009 we captured 34 female caribou and 13 male caribou. Twenty-five were new captures, including 10 yearling females, and 22 were recaptures. A total of 12 VHF, 14 PTT and 21 GPS collars were deployed.

During 21–23 June 2010 we captured 24 female caribou and 4 male caribou. Eighteen were new captures, including 10 yearling females, and 10 were recaptures. A total of 10 VHF, 4 PTT, and 14 GPS collars were deployed.

There were 3 capture mortalities in 2008, none in 2009, and 2 in 2010. 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 2010 ($p<0.0001$). 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 0.20 kg heavier for each day later the capture occurred in summer. Yearlings were an average of 0.27 kg heavier per day. After correcting for the Julian day of capture, there was no significant trend in capture weight during 1997 through 2010 for adults ($p=0.27$), or yearlings ($p=0.29$).

Health Assessment

Summary results from the 2009 health assessment collections are still pending. Generally, disease incidence, parasite levels, and body condition were normal, particularly when the timing of collections is considered. Some of the results are to be included in a manuscript currently being prepared in collaboration with the Circumarctic Rangifer Assessment Network (CARMA) comparing caribou morphometrics, body condition, and disease and parasite incidence across North America.

Distribution and Movements

General patterns of seasonal movement and the great diversity in wintering areas used by the TCH have been previously documented (Philo et al. 1993, Prichard et al. 2001, Carroll et al. 2005, Carroll 2007, Person et al. 2007). In 2008–2009, most caribou calved to the south and southeast of Teshekpuk Lake, with a few females that had wintered with the WAH calving well to the southwest of Teshekpuk Lake. In late June and early July, caribou were spread between Harrison Bay and Barrow in typical insect relief areas. By late July, caribou began to spread widely to the south and west, between the Colville River and Atqasuk. By late October, approximately one-third of the herd began to move southeast along the Chukchi coast, mixed heavily with WAH caribou. Those individuals eventually wintered in the vicinity of the Red Dog Mine, and the lower Noatak and Kobuk drainages. Approximately one-third of the collared caribou stayed in the vicinity of Atqasuk and Wainwright, spending the winter there. The remaining portion of the collared caribou wintered in the central Brooks Range, on the south side of the divide. This usage of wintering areas was interesting in that many of the widely disparate areas used historically in different years were used within a single year.

In 2009–2010, the calving distribution was normal for parturient caribou in 2009, but a large number of nonparturient caribou that migrated north with the WAH in May were distributed well to the west and southwest of Teshekpuk Lake (Fig. 5). Three parturient caribou calved on the periphery of the CAH and WAH calving distributions. Following calving, caribou were again distributed all around Teshekpuk Lake in late June, with a normal insect season distribution between Barrow and the Colville River delta. By mid August, females and males appeared to be segregating, with the bulls mixing with WAH collars along the Colville River near Umiat, and females still using the coastal plain. This segregation continued through rut, with major concentrations of bulls on the south side of the Brooks Range, between the Chandalar and Jim Rivers, and major cow concentrations in the Barrow–Wainwright–Point Lay area. In May, caribou on the south side of the Brooks Range were migrating north, but caribou that had wintered near Wainwright and Point Lay were very late in migrating. A large proportion of the parturient animals in the latter group calved in the vicinity of the Ikpikpuk River, well to the west of any calving area since 1990, although the Ikpikpuk was reported to be one of the calving areas when the TCH was first reported as a distinct herd (Reynolds 1981). In 2010, less than 10% of the parturient caribou used the historical core calving ground, as delineated by the 50% fixed kernel contour of the cumulative calving distribution (Fig. 6). 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. Some individuals, after having calved with the CAH for 3 years in a row, later returned to resume calving with the TCH; whether fidelity to calving grounds is less rigid that was previously thought, or we are doing a better job of observing and documenting this fluid behavior is unknown. Typically, it appears that individuals 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 caribou calving with adjacent herds remained associated with them throughout the summer, and this pattern has persisted since then. Parturient caribou appear to be much more likely to remain with an adjacent herd following calving 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 2009, the areas immediately to the northeast, southeast, and south of Teshekpuk Lake received the most consistent and concentrated use for calving (Fig. 7). The calving distribution in 2010 was unprecedented in recent history; and, whether or not this represents a shift in the calving ground remains to be seen.

HARVEST

Season and Bag Limit. The hunting seasons and bag limits were the same for both regulatory years of the reporting period.

2008–2009 and 2009–2010 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. There were no board of game actions or emergency orders associated with the TCH during the 2008–2009 or 2009–2010 regulatory years.

Human-Induced Harvest. It has been difficult to estimate TCH harvest because of annual variation in community harvest survey effort and location, widely varying wintering distribution of the TCH, and overlapping distribution of adjacent herds within village harvest areas. Typically, annual harvests come from more than one herd, although the proportions can be strongly skewed toward one herd or another. Results from our analysis of proportional harvest from different herds indicate that caribou harvested by Barrow residents have almost exclusively been from the TCH, at least during the period 2003 through 2008 (Parrett, ADF&G, Fairbanks, unpublished data). Harvest results previously reported (Parrett 2009) are now considered to be biased high, primarily due to a sampling design in Barrow that led to oversampling of households that were likely to harvest caribou, with an unknown stratification among households (Braem et al. 2011). Although the magnitude of the bias is unknown among years, it was felt that the sample in 2003–2004, which led to an estimate of 0.7 caribou per Barrow resident, was the most representative during the study. This estimate is still 40% higher than previous estimates of per capita harvest. Using per-capita harvest rates and current population levels for villages within the primary range of the TCH, we estimate that approximately 3,219 TCH caribou were harvested in 2008–2009 and 2009–2010 (Tables 5 and 6). Although the proportion of the harvest assumed to be from the TCH rather than adjacent herds has increased the estimated harvest, this is countered by the reduction in estimated per-capita harvest for Barrow by using data from 1992. The harvest rate from the TCH based on these per capita estimates is 4–5% of the 2008 population estimate.

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 Unit 26A, from which both WAH and TCH caribou are harvested, nonlocal hunters took 100 caribou in 2008–2009, and 71 caribou in 2009–2010. Success rates in Unit 26A for nonlocal hunters were 71% in 2008–2009, and 73% in 2009–2010. Successful hunters harvested an average of 1.6 and 1.4 caribou per person in each regulatory year, respectively. Although nonlocal hunters have typically been split evenly between residents and nonresidents, in 2009–2010 residents composed 75% of the hunters. Based on the distribution and timing of harvest, nonlocal residents are primarily harvesting WAH caribou in Unit 26A. If the harvest was entirely composed of TCH caribou, this would still amount to less than 3% of the annual TCH harvest.

Harvest Chronology. Caribou are harvested throughout the year, but most harvest by local residents occurs from July through October (Tables 7 and 8). Nonresidents and nonlocal residents harvested 95% of their caribou in August and September.

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; 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 local road systems, particularly the gas-well road near Barrow. Some additional harvest of TCH caribou occurs in Unit 26B along the Dalton Highway using dog team or highway vehicle.

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 radiotracking 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. 2008).

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 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 68,932 caribou is the highest population level ever recorded for the TCH. Multiple factors influence the quality of a photocensus 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 allow. 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 photocensuses of 2002 and 2008 were of relatively high quality. This is supported by the relatively small coefficients of variation estimated for the 2002 and 2008 surveys, relative to previous surveys (Table 1).

It is also worth noting that the herd population growth rate between 1984 and 2008, when calculated using estimated population size, is 1.4% lower than the growth rate calculated using minimum counts. As the number of collars in the herd has grown through time, both minimum count and statistical estimates have improved in quality, but more so for the minimum count method, where there is no upward adjustment for missed groups. Although the TCH has been a fast growing herd in recent years, the growth rate is likely not as high as has been previously reported.

Movement and range overlap 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, through the end of this reporting period, all movements observed have been emigration of the TCH into the adjacent WAH and TCH. As the TCH and CAH grow, more interchange between these herds may occur as range overlap increases.

Both parturition rate and calving success during the reporting period were 2 of the 3 lowest observed in the history of TCH studies. These metrics have been very variable over the long-term, making it difficult to detect changes in long-term trends. There does appear to be a detectable trend of slow decline in the short-yearling to adult ratio, perhaps an indication of density dependent recruitment. However, the lack of trend in both adult and yearling capture weights as well relatively stable parturition rates does not currently imply a density dependent nutritional problem. The ultimate cause of this decline in recruitment is unknown.

The use of the short yearling recruitment metric is potentially problematic for several reasons. A major issue with ratio-based data is the potential for the denominator to be an unstable base of comparison (McCullough 1994). Although statistically significant, there is a chance that that the calf:adult index may not truly represent a decline in recruitment. Two factors which could influence the denominator in a misleading manner are: 1) a changing demographic structure toward relatively more immature females which are non-productive, or 2) an increase in the number of males in the herd. Both factors are unlikely, given the long-term nature of this decline in the former case (Cameron et al, in press), and an apparently decreasing bull:cow ratio in the latter factor (Table 3).

A second but related issue with the utility of the short-yearling index may arise due to biased sampling. There is an unknown but probable bias toward sampling female-dominated groups during recruitment surveys due to late-winter sexual segregation. This bias would have the effect of making the index more of a short-yearling to cow ratio, rather than short-yearling to adult. Based on bull:cow ratio data collected in 2009, assuming a range from complete segregation of adults to complete randomization, spring calf:cow ratios could range from 15:100 to 22:100. Assuming that 50% of the calves are female calves, that would give a recruitment rate of 7–11 female calves:100 adults, which is well below the average female mortality rate of 15%. While the short-yearling index and female mortality rate are not directly comparable because the short-yearling recruitment rate indexes both female and male short yearlings within the adult population, the trends in adult female mortality and short-yearling recruitment do appear to be converging. Whether this apparent decline in recruitment is the result of heretofore undetected declines in productivity, declines in calf survival, or a product of both, is unknown. Regardless, persistently low recruitment rates will eventually cause a population decline, independent of any change in adult female mortality. The WAH appears to have a very similar rate of decline in the short-yearling ratio, but female mortality rates also appear to be increasing (Dau *In prep*), so the WAH population will likely decline at a faster rate than the TCH.

The shift in wintering grounds from areas near Atqasuk to the southeast of Teshekpuk Lake and the northern foothills of the Brooks Range, which was noted between 2004–2005 and 2007–2008 (Carroll 2007, Parrett 2009), has reversed to some extent, with extensive use of the area between Wainwright and Atqasuk in 2008–2009 and 2009–2010. Use of the northern foothills was less common than in the previous 4 regulatory years, and the central portion of the Brooks Range, between the Chandalar and Alatna rivers was a more common winter use area. The notable variation in wintering areas that has been previously documented (Prichard et al. 2001, Person et al. 2007) continues through the present. Although we have previously speculated that this may be the result of poor winter conditions (i.e., rain on snow events, Carroll et al. 2004) or gradual degradation of range quality (e.g., overgrazing of lichen, Parrett 2009), there is little evidence to support either speculation, and the return to previously used wintering areas may be evidence against this speculation. The shift in winter distribution to the mountains and foothills of the Brooks Range may have unverified consequences for both productivity and predation rates, if the mountains combine a relatively unused winter range with an increase wolf predation. 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 TCH ecology.

The current estimated harvest rate is just 4–5% of the current population; although this is lower than the approximately 10% harvest rate estimated for 2002–2005 and 6-8% harvest rates estimated recently, the poor quality of harvest data makes it difficult to conclude that the herd was actually sustaining those high harvest levels. Nevertheless, the conservative estimate of 4–5% is still approximately 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 caribou population declines due to impacts from 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. However, decreasing productivity and recruitment are likely to result in a changing age structure that is will result in a population decline in the future; that decline may be quite rapid if it is accompanied by a concomitant increase in adult mortality rates.

Research and Management Recommendations

- Improve the probability of detecting immigration between herds. This may require increased sample sizes of marked animals, increased communication and shared radio-tracking between herd managers, or some combination of both.

- Estimate the degree of sexual segregation during time periods where population-level data is being collected, particularly during insect relief aggregations and late-winter recruitment surveys. Improving 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

Bureau of Land Management. 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.

Braem, N. M., S. Pedersen, J. Simon, D. Koster, T. Kaleak, P. Leavitt, J. Patkotak, and P. Neakok. 2011. Monitoring of caribou harvests in the National Petroleum Reserve in Alaska: Atqasuk, Barrow, and Nuiqsut, 2003–2007. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 361, Fairbanks.

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.

Cameron, R. D., B. Griffith, L. S. Parrett, and R. G. White. Efficacy of cow:calf ratios for estimating calf production in arctic caribou. Proceedings of the 14th Arctic Ungulate Conference, Yellowknife, NWT (*In Press*).

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 Department 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.

Carroll, G.M., A.K. Prichard, R.S. Suydam, L.S. Parrett, and D.A. Yokel. 2004. Unexpected movements of the Teshekpuk Caribou Herd. Presented at 10th North American Caribou Workshop, Girdwood, Alaska.

———, 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. 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 8. Alaska Department of Fish and Game. Project 3.0 Juneau.

Dau, J. 2011. Units 21D, 22A, 22B, 22C, 22D, 22E, 23, 24, and 26A: Western Arctic caribou herd. Pages 187–250 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. 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.

Georgette, S. 1994. Summary of Western Arctic Caribou Herd overlays (1984–1992) and comparison with harvest data from other sources. Unpublished Manuscript. Alaska Department of Fish and Game, Division of Subsistence, Fairbanks, AK.

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.

Parrett, L. S. 2009. Unit 26A, Teshekpuk caribou herd. Pages 246–278 *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.

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.

Pedersen, S. 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.

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.

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. 60: 238-250.

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.

Rivest, L-P, S. Couturier, and H. Crepeau. 1998. Statistical methods for estimating caribou abundance using postcalving aggregations detected by radio telemetry. Biometrics 54:865–876.

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. 2008. Teshekpuk caribou herd movement though narrow land corridors around Teshekpuk Lake, Alaska. Proceedings of the 2008 Alaska Park Science Symposium.

Zar, J. H. 1999. Biostatistical Analysis. Prentice Hall. Upper Saddle River, New Jersey, USA.

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Table 1. Population estimates and exponential growth rates of the Teshekpuk caribou herd, 1978–2008.

Year	Minimum population estimate	Population estimate (%CV)[c]	r [d]
1978–1982	3000–4000[a]	N/A	N/A
1984	11,822[b]	18,292 (44%)	N/A
1985	13,406[a]	N/A	N/A
1989	16,649[b]	19,724 (32%)	6.8%
1993	27,686[b]	41,800 (26%)	12.7%
1995	25,076[b]	32,839 (34%)	-5.0%
1999	28,627 [b]	N/A	3.3%
2002	45,166 [b]	51,783 (9%)	15.2[e]
2008	64,106 [b]	68,932 (8%)	5.8%

[a]Derived from visual estimate.
[b]Derived using aerial photocensus minimum count.
[c]Population estimate derived only from photographed groups that included radiocollared caribou, with expansions to account for missing collars and groups of caribou with no marked caribou as described by Rivest et al. (1998); in some years the data was not collected in such a manner as to allow an estimate.
[d]$r = (\ln(N_{t2}) - \ln(N_{t1}))/t$, where t= number of years between censuses, N = population estimated at time t.
[e]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, 1999–2010[a].

Year	Calving surveys (June)			Short-yearling surveys (April)			
	Cows observed	Parturition[b] (%)	Live calves[c] (%)	N	Short yearlings: 100 adults	Short yearlings (%)	95% confidence limits[d]
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%
2009	48	50	40	4491	14	13	11-14%
2010	47	74	47	4102	15	13	11-16%
AVERAGE	33	75	60	1878	23	18	

[a]Data from 1990-1998 included in previous reports; see Parrett (2009).

[b]Number of collared cows with calf + collared cows with no calf with but hard antler or udder / number of mature collared cows observed.

[c]Number of collared cows with live calves at the end of calving surveys / number of mature collared cows observed.

[d]Calculated based on Cochran's cluster sampling method (1977). Cluster data unavailable for 1990–1992, 1994, 1997–1998.

Table 3. Teshekpuk caribou herd postcalving and fall composition counts, 1991–2007

	Helicopter surveys (July/October)						Fall fixed-wing surveys (October/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	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
2008	–	–	–	–	–	–	19	16	1895
2009[a]	46	28	18	11	61	6576	–	–	–

[a]In 2009, the helicopter survey took place in October.

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	13	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%
2008–2009	61	8	13	7–24%
2009–2010	65	10	15	9–26%
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. Before 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	Braem et al. 2011
Barrow	1987-1989	3016	1595	Braund et al. 1991
Barrow	1992	3908	1993	Fuller and George 1997
Barrow	2002–2006	4581	4478	Braem et al. 2011
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	Braem et al. 2011
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 2008–2009 and 2009–2010 regulatory years by residents living within Unit 26A.

Community	Human population	Per capita caribou harvest	Approximate total community harvest[a]	Approximate % TCH in harvest	Estimated average annual TCH caribou harvest	Assessments used to estimate per capita caribou harvest[a]
Anaktuvuk Pass	298	1.8	524	30	157	Anak. Pass 1990–1995
Atqasuk	218	.9	201	98	197	Atqasuk 2002-2007
Barrow	4127	0.5	2063	97	2002	Barrow 1992
Nuiqsut	396	1.1	451	86	388	Nuiqsut 2002-2007
Point Lay	226	1.3	292	20	58	Pt. Lay 1987
Point Hope	689	0.3	220	0	0	Pt. Hope 1992
Wainwright	547	1.3	695	60	417	Wainwright 1988, 1989, 1992
Total Harvest					3219	

[a]Citations associated with each harvest assessment are in Table 5.

Table 7. Sex and percent chronology of annual caribou harvest among Anaktuvuk Pass, 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] Pass	Bull	7%	15%	29%	27%	2%	0%	0%	0%	1%	4%	5%	9%	0%	475
	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]Unpublished data from Pedersen (ADF&G, Fairbanks)

[b]Data from Braem et al. 2011

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.

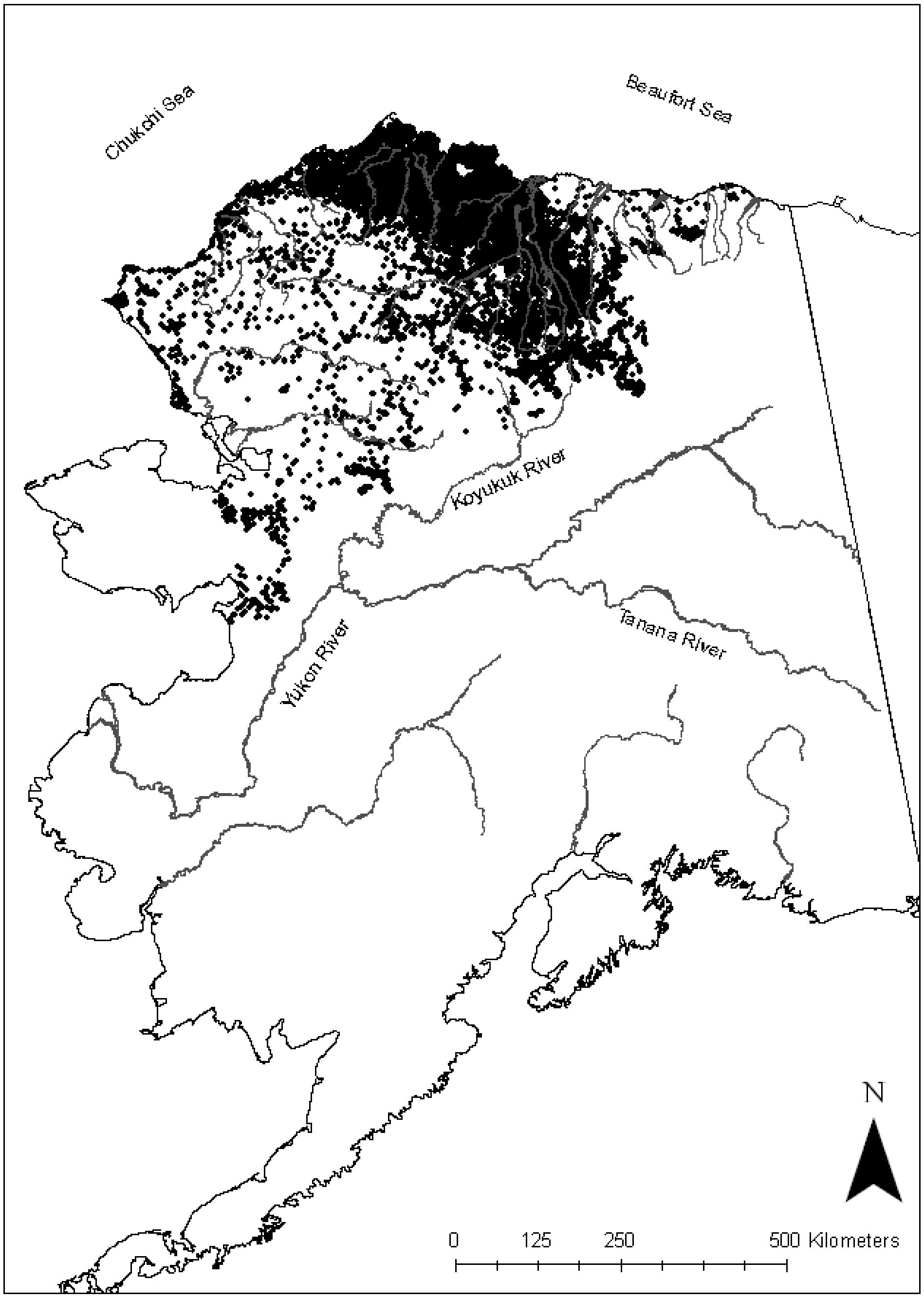

Figure 1. Locations of satellite-collared TCH caribou (GPS and PTT), 1990–2009. Locations were filtered for accuracy and the data set was reduced to no more than one location per day per caribou (from Prichard et al. 2007).

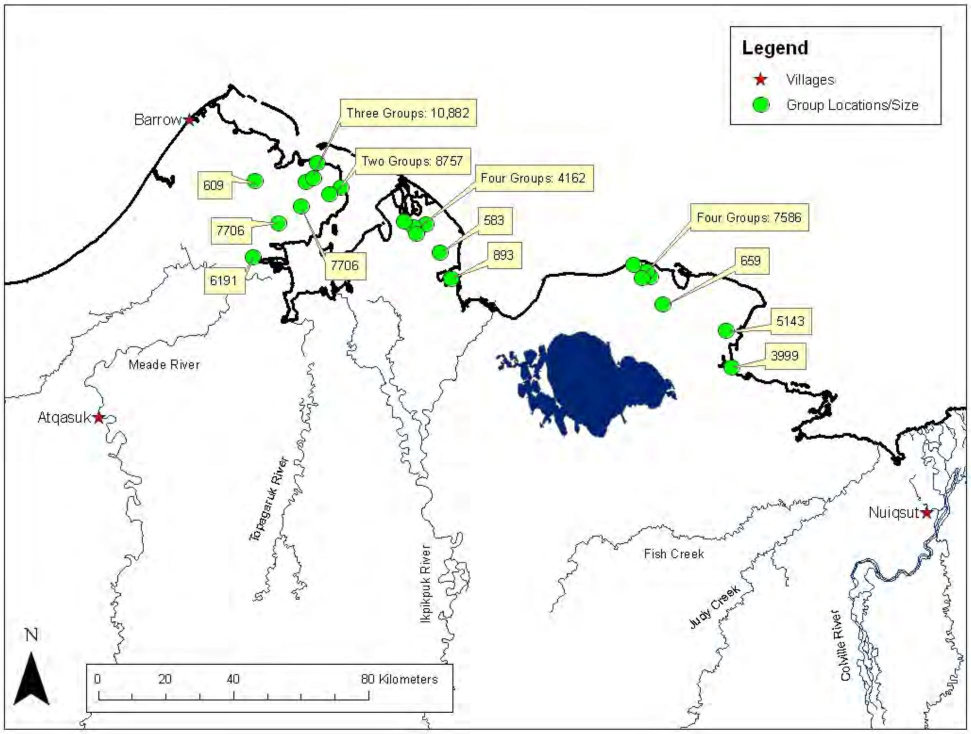

Figure 2. Locations and sizes of groups observed during the 8 July 2008 Teshekpuk caribou herd photo census.

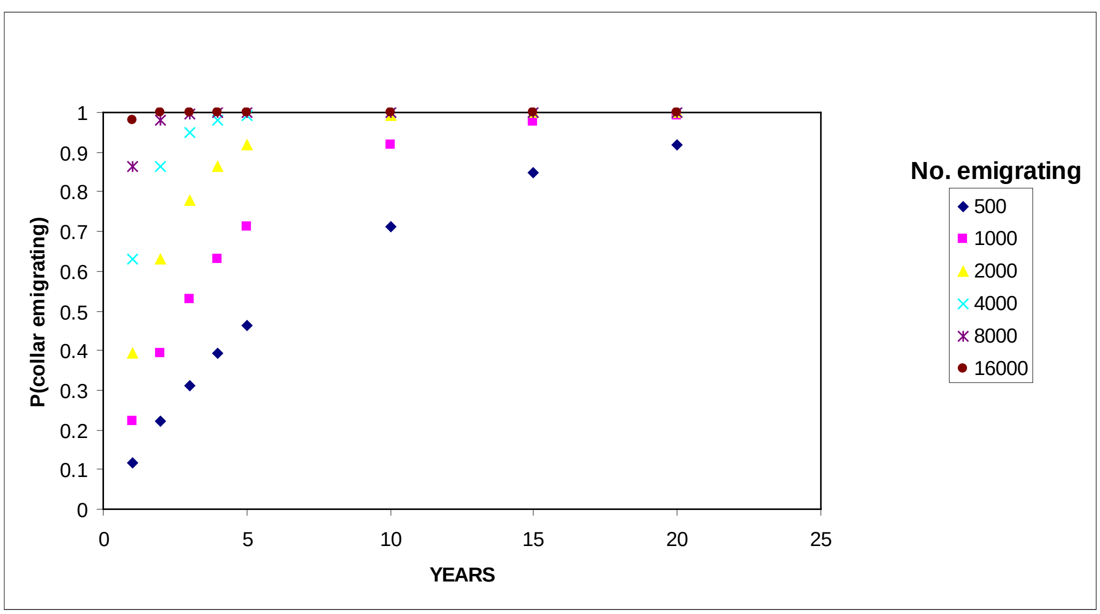

Figure 3. The probability that an emigrating group of caribou will have at least one collar in the group, given that the source population is 400,000, and there are 100 randomly distributed active collars in the herd.

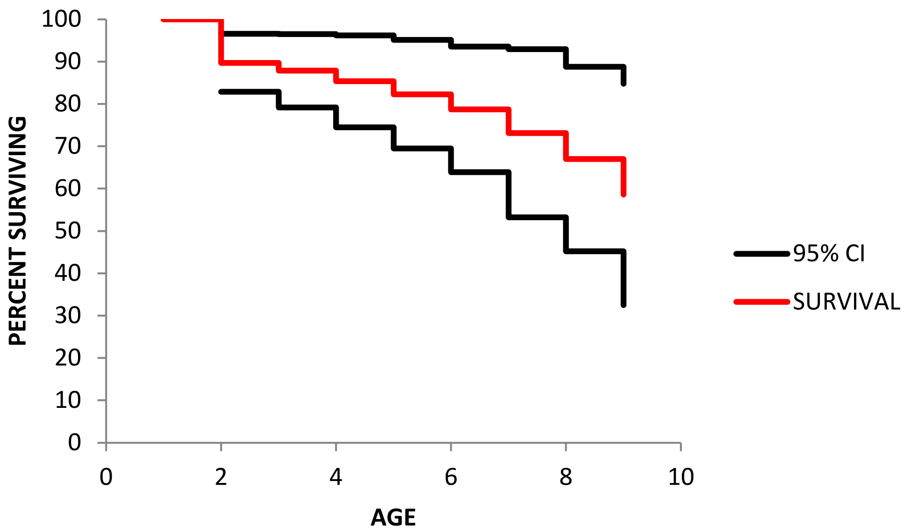

Figure 4. Kaplan Meier age specific survival, estimated from 12 months of age through 9 years of age.

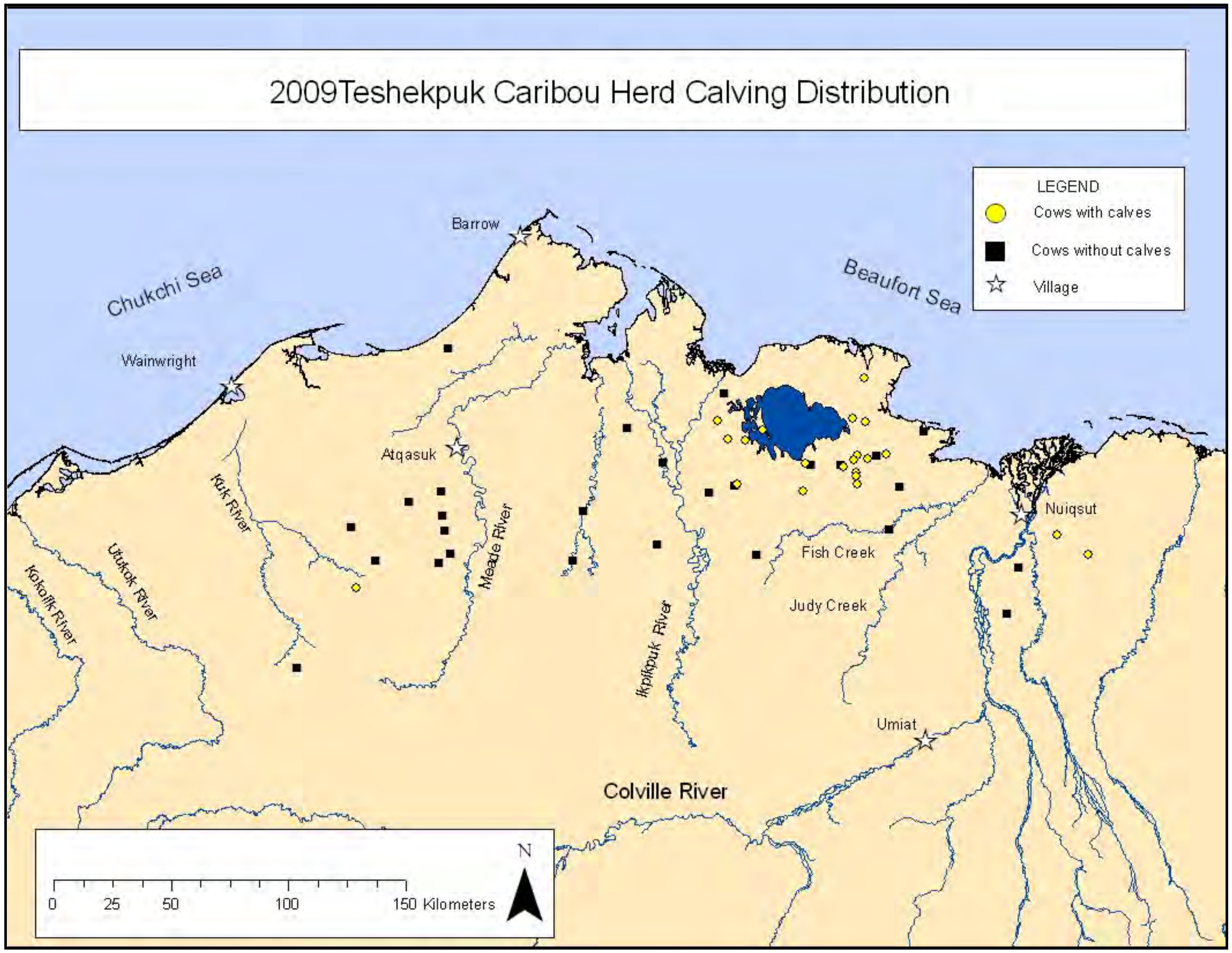

Figure 5. Distribution of collared female TCH caribou during the 2009 calving season. Locations are the first location where a cow was seen with a calf, or the location nearest the median date of calving, in the case of caribou not seen with calves.

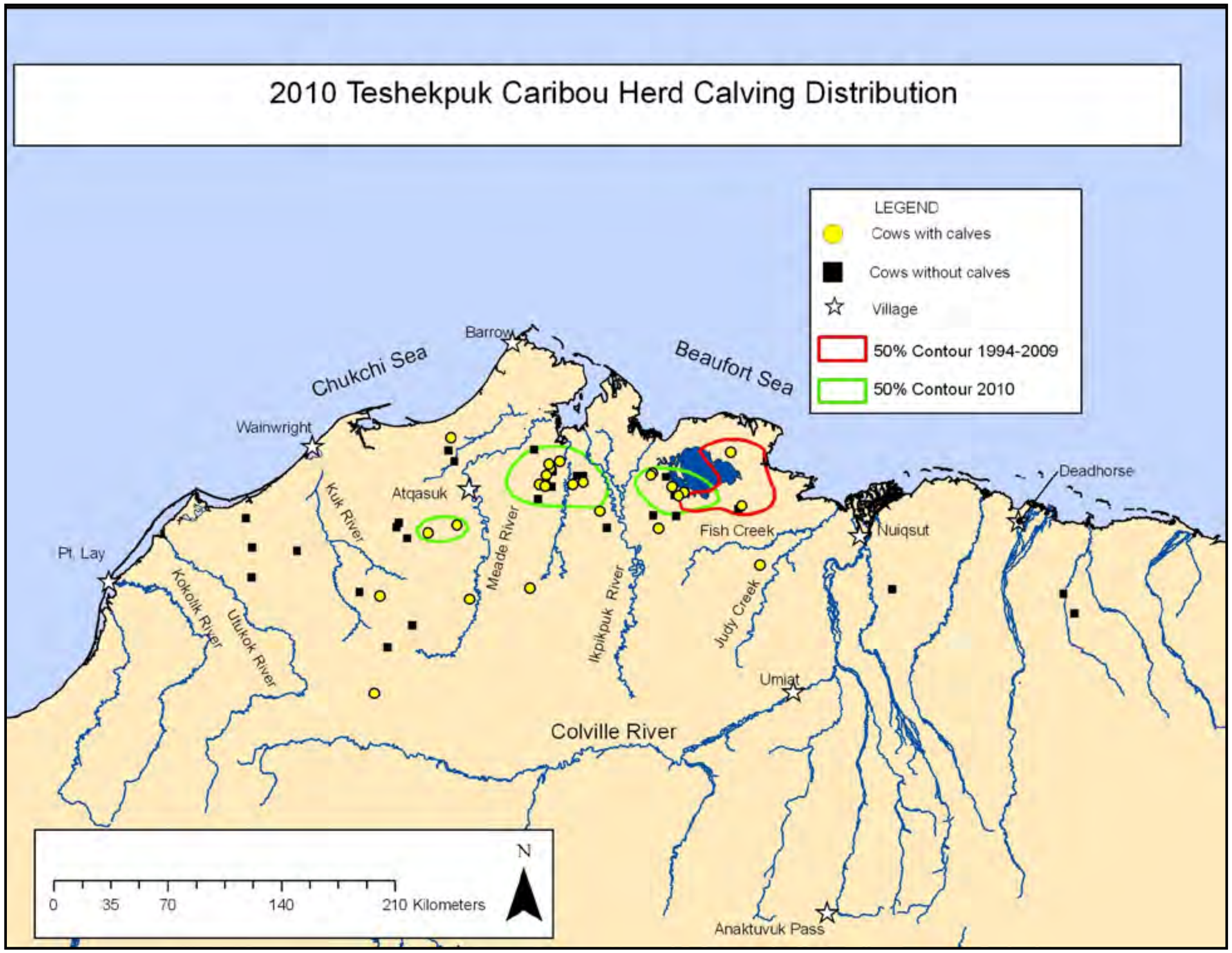

Figure 6. Distribution of collared female TCH caribou during the 2010 calving season. Locations are the first location where a cow was seen with a calf, or the location nearest the median date of calving, in the case of caribou not seen with calves. The 50% contours of the 2010 and 1994–2009 cumulative calving distributions are shown to illustrate the great difference between previously observed calving distributions and the distribution observed in 2010.

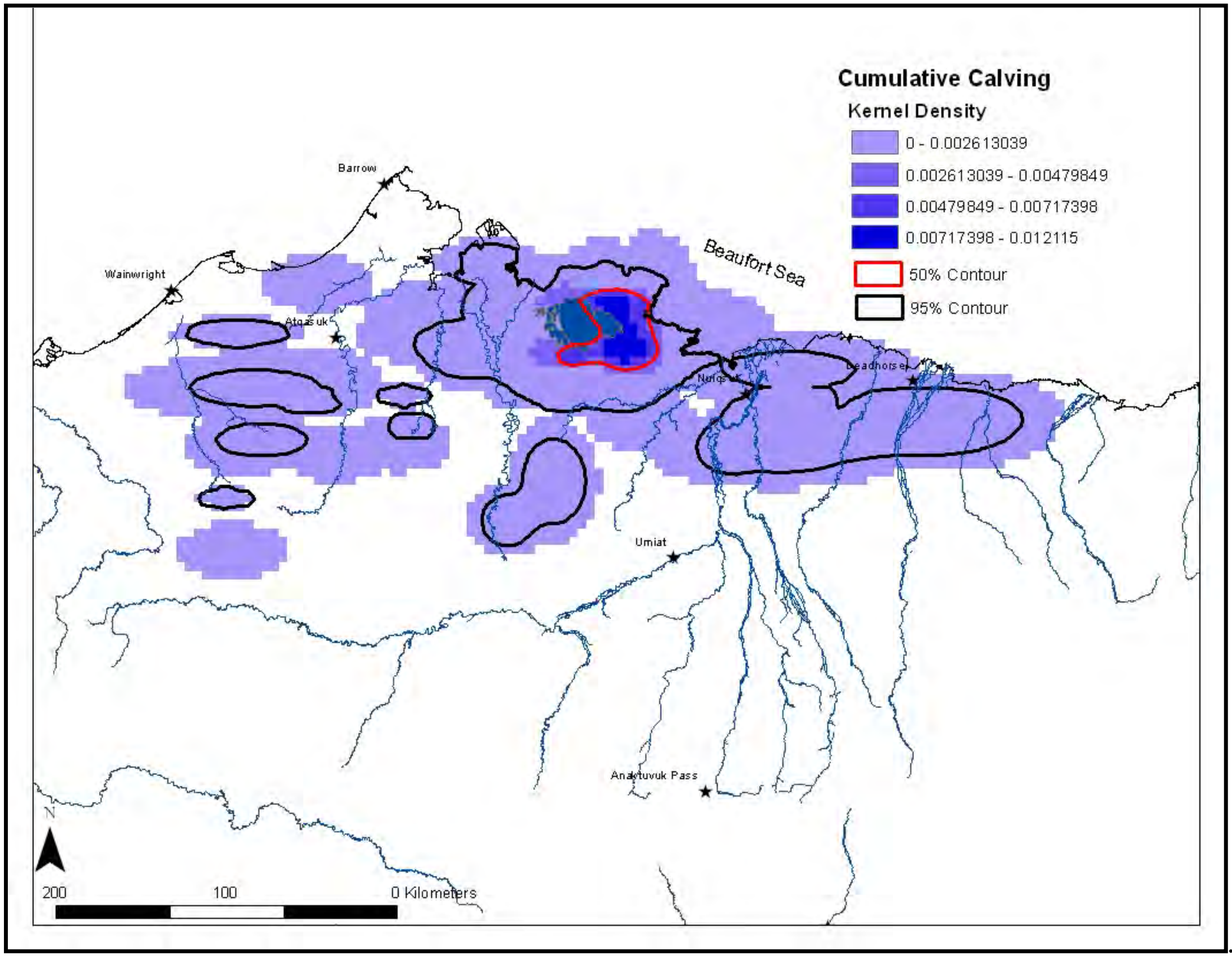

Figure 7. The cumulative TCH calving distribution, 1994–2010. Annual fixed kernel utilization distributions were summed and rescaled to present a historical distribution unbiased by annual sample size. Contours enclosing the 50% and 95% utilization distributions are indicated in red and black, respectively.

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 2008
To: 30 June 2010[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 5,000 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 increase was due to low adult mortality (<10%), high parturition rates (≥85%), and good fall calf recruitment 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 July through 30 June, e.g., RY86 = 1 July 1986 through 30 June 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 calves 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 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 at 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. During the mid 1990s, 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. During 2001–2006, research was renewed to study the effects of oil field development on production, growth, survival, and movements of caribou calves (Arthur and Del Vecchio 2009).

MANAGEMENT DIRECTION

During 2000–2010, the CAH grew substantially. Current management goals and objectives reflect this increase in population size, as well as intensive management (IM) population and harvest objectives that the Alaska Board of Game (board) established for the CAH. An IM designation means the board must consider intensive management if a reduction in harvest becomes necessary because of dwindling caribou numbers or productivity. In March 2000, the board established the IM population objective for the CAH as 18,000–20,000 caribou, and the harvest objective as 600–800 caribou (Title 5 Alaska Administrative Code [AAC] 92.108). In 2004 the board increased intensive management objectives to a population of 28,000–32,000 caribou, and harvest of 1,400–1,600 (5 AAC 92.108), in order to reflect the 2002 population estimate.

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 1,400 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 28,000–32,000 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 1,400 caribou if the population is ≥28,000 caribou.

Objective 4: Maintain a ratio of at least 40 bulls:100 cows. (Goals 1, 2, 3)

Objective 5: 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 surveys. (Objectives 3 and 4)
- Radiocollar 10 yearling females annually. (Objectives 1 and 2)
- Radiotrack during early summer, fall, and winter to determine seasonal distribution. (Objectives 1 and 2)
- 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)
- Work with the oil industry and other agencies to minimize disturbance to caribou from resource development. (Objectives 1 and 2)
- Regulate caribou hunting along the Dalton Highway to reduce conflicts between consumptive and nonconsumptive uses. (Objective 5)

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 radiocollared animals. These aggregations usually occurred when temperatures were >55°F and wind was <15 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 maintained 60–80 radio collars (VHF [very high frequency transmitters], GPS [Global Positioning System] transmitters, and PTT [Platform Terminal Transmitters]) in the CAH. All 3 transmitters operate using emission of an electromagnetic signal at a specified frequency which is detected by receivers tuned to the frequency. PTT and GPS also use orbiting satellites to receive and relay transmitter signals, resulting in automated tracking. Caribou were captured using a handheld netgun from an R-44 helicopter and manually restrained with hobbles and hood while we collected measurements and fitted the radio collars. In most years, ten 10-month-old calves were captured annually and fitted with conventional VHF radio collars in March–April or June–July. Calves captured in March–April were weighed. Adult female caribou were recaptured and fitted with new VHF radio collars approximately 4 to 6 years after radio collars were originally deployed.

Approximately 25–50 GPS radio collars 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 radio collars were removed in March 2006, and the 4 remaining automatically released on 10 June 2006. Therefore, no satellite radio collars were on CAH caribou during June 2006–June 2008. In July 2008, 10 GPS radio collars were deployed on adult females as part of the survey and inventory program to aid in locating the CAH during photo censuses, spring and fall migrations, and winter distribution. These radio collars will automatically release in June 2011. In addition, 4 GPS pathfinder radio collars were deployed on adult females in July 2008. These radio collars were removed in June 2009 and the animals were refitted with GPS radio collars. An additional 3 GPS radio collars were deployed in June 2009. In June 2010, 12 GPS satellite radio collars were deployed on recaptured adult females.

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 serologic disease surveillance, and trace mineral analysis.

Parturition and Early Calf Survival

Parturition and early calf survival (survival to 2 weeks) data were stratified between Unit 26B West (west of the west bank of the Sagavanirktok River) and 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, Fairbanks). 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, 3–9 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 concomitant with a research project (Arthur and Del Vecchio 2009). 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 the peak of calving likely 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 2009). 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

In 2009 and 2010, fall sex and age composition was estimated by classifying caribou from an R-44 helicopter near peak of rut to take advantage of the presumed mixing of bulls, cows, and calf caribou. Peak rut was estimated as the date 228 days (gestation period) prior to the median calving date of the CAH. Caribou groups were located by radiotracking radiocollared caribou from a fixed-wing aircraft. Approximately 200 caribou were classified per radio collar per group utilizing a cluster sampling scheme (Cochran 1977). If less than 200 caribou were present in a group, all or most of the caribou in that group were classified. Bull:cow and calf:cow ratios were generated using pooled data. Caribou were classified as cows; calves; and small, medium, or large bulls. Composition surveys in 2009 and 2010 were conducted on the south side of the Brooks Range east of the Dalton Highway to the East Fork Chandalar River, and north of the North Fork Chandalar River.

No fall composition surveys were conducted during 2003–2008 because: (1) harvest was low compared to population size and bull:cow ratios were not a concern (2) lack of funding, and (3) lack of an adequate sampling design. Fall composition was estimated from a helicopter in mid October 2000, 2001, and 2002 by locating random groups and groups with radio collars. The composition surveys during 2000–2002 occurred in the Brooks Range in the Chandalar Shelf, Atigun Pass, Galbraith Lake, and upper Sagavanirktok River areas.

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 (S. Pederson, ADF&G files, Fairbanks). Caribou harvested by hunters from Nuiqsut included animals from the Teshekpuk and Western Arctic caribou herds, as well as some CAH caribou (Braem et. al. 2011).

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

2010 photo census*:* We completed a photo census on 9 July 2010 which resulted in 70,034 caribou (Table 1). Conditions were considered good with an initial temperature of 60°F and winds from the west ≤15mph. We located 57 active CAH radio collars out of a possible 62. Three of the 5 missing radiocollared caribou may have joined with the PCH caribou. Sixteen groups of caribou were photographed from the Beaver aircraft with 3 groups of caribou along the coast between Milne Point and Kalubik Creek, west of Prudhoe Bay. East of Prudhoe Bay, 4 groups were on the Sagavanirktok River delta, 5 groups of caribou were found between Bullen Point and Point Thompson, 3 groups were on the Canning River delta, and 1 group was in the Sadlerochit Mountains. We counted 69,820 caribou from photographs. From the airplanes, we counted an additional 214 caribou that were not photographed, resulting in 70,034 caribou. We located 2 PCH and 2 TCH radio collars in 3 of the groups. These caribou represent an unknown number of caribou from the PCH and TCH herds; however, based on a 2008 census of the TCH and a 2010 census of the PCH, we estimated that these radio collars represented approximately 5,000 caribou (7.1%; 850 caribou per TCH radio collar and 1,690 PCH caribou per radio collar) that potentially were not CAH animals.

We did not estimate the number of caribou represented by the 5 missing CAH radio collars or caribou represented by groups with no radio collars that were not located. In future analyses, we will model an abundance estimate as described by Rivest et al. (1998) and will apply the model to previous censuses where data are appropriate. In general, this model will adjust the population estimate upwards to account for missing radio collars and for caribou not located in radiocollared groups.

2008 photo census: We also completed a photo census on 3–4 July 2008 which resulted in 66,772 caribou (Table 1). We located all 60 of the active CAH radio collars. We photographed 14 groups from the Beaver aircraft: 1 group on the Sagavanirktok River delta, 3 groups on the Kadleroshilik River near the coast, 4 groups on the Staines River, 1 large group on the Canning River delta, and 5 groups scattered from just east of the Canning River to the mouth of the Hula Hula River. From those photographs we counted 66,475 caribou. From the airplanes, we counted an additional 297 caribou that were not photographed, resulting in 66,772 caribou. We located 2 PCH and 2 TCH radio collars in 2 of the groups. These caribou represent an unknown number of caribou from these herds; however, based on a 2008 census of the TCH and a 2010 census of the PCH, we estimated that these radio collars represented approximately 5,000 caribou (7.5%; 850 caribou per TCH radio collar and 1,690 PCH caribou per radio collar) that potentially were not CAH animals.

Historical population size and summary: 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 2010 (15 years) was 9.4%. Between photo censuses the annual rate of increase was 4% from 1995 to 1997, 11.2% from 1997 to 2000, 8.4% from 2000 to 2002; 13.1% from 2002 to 2008, and 2.4% from 2008 to 2010 (Table 1). High parturition rates, good calf survival, and low adult mortality since 1997 contributed to the increase in population size (Tables 2 and 3). We determined that immigration from the PCH and TCH likely played a minor role in contributing to the increase. High annual rates of increase (≥12%) have been reported for other Arctic caribou herds (Carroll 2007, Dau 2007).

A photo census represents the caribou that were located and present during the photo census; we do not locate all caribou in the herd, and caribou from other herds may be present. However, we do conduct photocensuses during optimal conditions when caribou are aggregated and we attempt to locate all radio collars. We note when radio collars from other herds are present and estimate how many caribou those radio collars may represent. Applying the model described by Rivest et al (1998) on future and previous censuses should help correct for some of the biases associated with missing radio collars and missing groups without radio collars.

Parturition and Early Calf Survival

Parturition rates: Parturition rates of radiocollared females ≥4 years old throughout Unit 26B in 2009 and 2010 were 75% (n = 44) and 97% (n = 37), respectively. Except for 2009, parturition rates were high since 1998 (≥83%; Table 2). ADF&G staff also observed lower parturition rates in the Teshekpuk caribou herd in 2009. Overall, high parturition rates contributed to the increase in population size in the CAH since 2000 (Tables 1 and 2). Parturition rates were similar between Unit 26B West and Unit 26B East (Table 2). Parturition rates for 3-year-olds were 60% (n = 5) in both 2009 and 2010. Although the low sample size increases the possibility of sampling error, these parturition rates were slightly lower compared to previous years, when parturition rates ranged 71–100% for 3-year-olds (Table 4). No 3-year-olds were radiocollared in 2008. In general, parturition rates for 3-year-olds were good during 1998–2007 (≥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, Boertje in prep). 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).

We observed no significant differences in parturition rates between Unit 26B West and Unit 26B East during 1994–2010, 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 compared to Unit 26B East ($P = 0.003$; Table 2). This occurred during part of the period when the herd was declining (1992–1995).

Arthur and Del Vecchio (2009) determined mean fidelity to a specific calving area for Unit 26B West or Unit 26B East. Mean fidelity was 92% ($n = 46$) for radiocollared cows with calving locations obtained in ≥5 calving seasons during 1997–2006 (Arthur and Del Vecchio 2009).

<u>Peak of calving:</u> During 2007–2010, we did not radiotrack during the entire calving period to determine peak of calving; however, we can provide some information about approximate peak of calving dates. In 2009, 44% ($n = 36$) of the radiocollared cows ≥ 3 years old, who were considered pregnant, had a calf by 3 June. In 2010, 57% ($n = 39$) had a calf by 4 June.

In 2008, peak of calving may have occurred slightly earlier compared to 2009 and 2010 when 66% ($n = 32$) had a calf by 2 June. In 2007, peak of calving appeared to have occurred after 6 June because by 6 June only 29% ($n = 56$) of the radiocollared cows ≥ 3 years old, who were considered pregnant, had a calf. Arthur and Del Vecchio (2009) determined peak of calving 2001–2006. During 2002–2006, peak of calving occurred 2–6 June. In 2001, peak of calving occurred approximately 9–10 June, possibly due to late snowmelt on the coastal plain.

<u>Early summer calf survival</u>: The late June calf:cow ratio of radiocollared females ≥4 years old throughout Unit 26B was 52:100 ($n = 42$) in 2009 and 85:100 ($n = 39$) in 2010. The low value observed in 2009 reflects the lower parturition rate we observed. The PCH also experienced a lower late June calf:cow ratio in 2009 (Caikoski in prep). Except for 2009, the ratio has been high since 1997 (≥75:100; Table 3), indicating consistently high early calf survival, which contributed to the increase in population size observed during 2000–2010. During years when the herd was declining or stable (1994–1996), late June calf:cow ratios were lower (<65%; Table 3). Late June calf:cow ratios were similar between Unit 26B West and Unit 26B East (Table 3).

The late June calf:cow ratio for radiocollared 3-year-olds was 60:100 ($n = 5$) in 2009 and 40:100 ($n = 5$) in 2010. The sample of radiocollared cows did not include any 3-year-olds in 2008. During 1998–2010, calf:cow ratios for 3-year-olds appeared to be lower (33–71:100) and more variable than for older cows (Table 5). Calves born to 3-year-olds tended to have lower survival rates, although 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).

Population Composition

In October 2009, 19 groups of caribou were sampled for age and sex composition. Fifty-nine percent of the active radio collars ($n = 63$) were distributed among these groups. Sampled caribou groups were distributed on the south side of the Brooks Range in the upper Chandalar

River drainages. We classified 6,648 caribou and observed ratios of 50 bulls:100 cows and 33 calves:100 cows (Table 6). The observed ratio of 33 calves:100 cows was lower than previous years; however, these results reflected the lower parturition and early calf survival rates of radiocollared cows we observed during calving surveys in June 2009 (Table 2).

In October 2010, 12 groups of caribou were sampled for age and sex composition. Thirty-five percent of the active radio collars (n = 59) were distributed among these groups. Sampled groups were distributed on the south side of the Brooks Range in the upper Chandalar River drainages. We classified 3,787 caribou and observed ratios of 50 bulls:100 cows and 46 calves:100 cows (Table 6). In 2010, we observed higher calf:cow ratios of 46:100, similar to the trend observed during calving surveys in June 2010 (Tables 2 and 6). Surveys in both 2009 and 2010 may be biased toward locating groups representing more cows because we had radio collars deployed only on female caribou.

No fall composition surveys were conducted during 2003–2008. Bull:cow ratios have been high since 1976 (≥50:100), indicating harvest had little effect on sex ratios. Calf:cow ratios also have been high, implying summer calf survival rates were relatively high and contributed to the growth of the herd.

Distribution and Movements

Calving distribution. Distribution of calving in 2009 and 2010 was similar to the 7 previous years. During 2002–2010 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 rivers in 2003–2010. 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 2009).

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 <15 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.

In July 2008, the CAH moved as far east as the Canadian border and then returned to their usual summer range (Lenart 2009). Movement this far east had not been documented previously for the CAH. Previously documented long-range movements occurred in July 2004 when CAH caribou were found as far east as the Hulahula River in Unit 26C and in late July 2001 when an estimated 5,000 Central Arctic caribou were found inland in the Fish Creek drainage in

Unit 26A. No unusual summer movements were noted in 2009 and 2010, although the CAH continues to expand its summer range further east toward Kaktovik in Unit 26C.

Fall Distribution. During the rut in October, large concentrations of caribou can be found on the south side of the Brooks Range on Chandalar Shelf in Your and Thru Creeks and the North Fork and Middle Fork Chandalar River and as far east as the East Fork Chandalar River. On the north side of the Brooks Range, caribou can be located around Galbraith Lake, Accomplishment Creek, and in the upper Sagavanirktok River.

During 2008–2010, most of the CAH were on the south side of the Brooks Range by mid October. In 2007, no radiotracking flights were conducted during mid October and no satellite or GPS radio collars were on CAH animals. In fall 2006, most CAH animals remained on the north side of the Brooks Range during rut.

Winter Distribution. During RY01–RY09, most of the CAH wintered on the south side of the Brooks Range between the Dalton Highway, north of the Upper South Fork Koyukuk River and the latitude of the confluence of Middle and North Fork Chandalar Rivers, east to the East Fork Chandalar River. This was similar to winter distribution observed during the late 1990s. It appears that the CAH has been expanding its winter range during the previous 10–15 years, which may be related to the herd growing.

In RY09, 48 radiocollared caribou were located on the south side of the Brooks Range (91%, n = 53). In RY08, 55 radiocollared caribou were located on the south side of the Brooks Range (95%, n = 58). Although we did not radiotrack west of the Dalton Highway, it is possible that more caribou wintered on the north side in both years. 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. In 2006, some of the caribou wintered on the south side of the Brooks Range, west of the Dalton Highway in Gates of the Arctic National Wildlife Refuge, as far west as the Tinayguk River drainage in Unit 24B (Lenart 2009).

Distribution of CAH caribou south of the Brooks Range varied each year, as indicated below:

Regulatory year	Date of Radiotracking	Percent of CAH on south side of Brooks Range	Number of radio collars 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	10–11 Mar, 7 Apr	95	58
2009–2010	29, 30 Mar, 18 Apr	91	53

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.

Mixing with Other Herds.

Teshekpuk Caribou Herd — Mixing with TCH caribou frequently occurs in both summer and winter because herd ranges overlap along the Colville River in summer and early fall in particular. 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 Gates of the Arctic National Wildlife Refuge. In RY03 some mixing occurred when the TCH traveled to the Arctic National Wildlife Refuge for the winter (Lenart 2009). In addition, mixing during calving also may have occurred. Annually since 2004, 1–5 radiocollared TCH cows have calved with the CAH. These animals frequently switch back and forth between the Teshekpuk and Central Arctic herd from year to year.

Porcupine Caribou Herd — Mixing with the PCH during fall and winter occurred frequently during RY01–RY10. In RY10 and RY08, mixing occurred extensively west of Arctic Village to the Dalton Highway. In RY09, no mixing occurred because the PCH wintered near the Canadian border and in Canada. During RY01–RY07, 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).

Mixing with the PCH during summer occurred less frequently during RY01–RY10. However, in 2010, mixing occurred during postcalving aggregations at the end of June and first part of July between the Canning River and Kaktovik along the coastal plain and into the foothills. No mixing was observed in 2009. In 2008, 2 radiocollared PCH caribou were located among 10,000–20,000 CAH caribou during CAH postcalving flights and a CAH photo census. These 2 PCH radio collars 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 because the PCH returned to Canada shortly after calving. 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.

Western Arctic Caribou Herd ─ Mixing with the WAH occurs occasionally during winter. In RY09 and RY10, no known mixing occurred. In RY08, a few WAH satellite radio collars were near the Dalton Highway and some mixing with the CAH may have occurred. Some mixing with WAH caribou may have occurred during winter RY03 when approximately one-third of the WAH wintered on the south side of the Brooks Range, west of the Dalton Highway in Gates of the Arctic National Wildlife Refuge (J. Dau, ADF&G unpublished data, Kotzebue). This occurrence was not repeated in winters RY04–RY07. 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 (>5,000) were observed. No mixing of CAH and WAH during summer has been documented.

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 TCH and 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 (5AAC 85.025).

RY96–RY07, seasons and bag limits:

Unit and location	Resident open season and bag limit	Nonresident open season and 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
Remainder of Unit 26B	1 Jul–30 Apr; 2 caribou; however, 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

RY08–RY09 seasons and bag limits:

Unit and location	Resident open season and bag limit	Nonresident open season and 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, cow caribou may be taken only from 1 Oct–30 Apr	1 Jul–30 Apr; 2 bulls
Unit 26C	1 Jul–30 Apr and 23–30 Jun; 10 caribou; however, only bull caribou may be taken 23–30 Jun	1 Jul–30 Apr; 5 caribou
Unit 26C	1 Jul–30 Apr; 10 caribou; however, only bull caribou may be taken 23–30 Jun	1 Jul–30 Apr; 5 caribou

RY10 seasons and bag limits:

Unit and location	Resident open season and bag limit	Nonresident open season and bag limit
Unit 25A, those portions east of the east bank of the East Fork Chandalar River extending from its confluence with the Chandalar River upstream to Guilbeau Pass, Unit 25B, and the remainder of 25D	1 Jul–30 Apr; 10 caribou	1 Aug–30 Sept.; 1 bull

Unit and location	Resident open season and bag limit	Nonresident open season and bag limit
Remainder of Unit 25A	1 Jul–30 Jun; 10 caribou; however, cow caribou may be taken only from 1 Jul–15 May	1 Jul–30 Jun; 5 caribou; however, cow caribou may be taken only from 1 Jul–15 May
Unit 26B northwest, 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 Jun; 5 caribou per day; however, cow caribou may be taken only from 1 Jul–15 May	1 Jul–30 Apr; 5 caribou
Unit 26B, south of 69°30′N latitude	1 Jul–30 Jun; 5 caribou; however, cow caribou may be taken only from 1 Jul–15 May	1 Jul–30 Jun; 5 caribou; however, cow caribou may be taken only from 1 Jul–15 May
Remainder of Unit 26B	1 Jul–30 Apr; 5 caribou	1 Jul–30 Apr; 5 caribou
Unit 26C	1 Jul–30 Apr and 23–30 Jun; 10 caribou; however, only bull caribou may be taken 23–30 Jun	1 Aug–30 Sept; 1 bull

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 by hunters who possess a valid Alaska Bowhunter Education Program card or a recognized equivalent certification. In addition, no motorized vehicles except licensed highway vehicles on specified publicly maintained roadways, aircraft, and boats 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. Caribou seasons and bag limits within the CAH range remained the same during RY96–RY07. However, several regulations related to bow hunting along the Dalton Highway were put into effect in RY02 and rescinded in RY04 (Lenart 2009).

During the March 2008 Board of Game (board) meeting, the bag limit for caribou within the DHCMA during 1 July–30 September was changed from 1 bull caribou to 2 bull caribou.

During the March 2010 board meeting, the season and bag limit for caribou was changed in Units 26B and 25A (winter range of CAH). In northwest Unit 26B, the bag limit for resident hunters was changed from 10 caribou to 5 caribou per day and the season was changed from 1 July–30 April to no closed season; except cows could be taken only during July 1–May 15. This change in seasons and bag limits was comparable to Unit 26A caribou regulations reflecting similar hunting patterns and regulations for residents of Nuiqsut in particular. The nonresident season and bag limit did not change in this portion of Unit 26B. In Unit 26B south of 69° 30', both the resident and nonresident seasons were changed from 1 July–30 April to no closed season. Bag limits were liberalized for both resident and nonresident hunters to a bag limit of 5 caribou and cow caribou could be taken only during July 1–May 15. This was a change for resident hunters from a bag limit of 2 caribou and cow caribou could only be taken only during October 1–30 April and for nonresident hunters from a bag limit of 2 bulls. The bag limit was changed similarly in the remainder portion of Unit 26B, but the season continued to end 30 April because this portion of Unit 26B includes the calving grounds of the CAH.

Regulations in Unit 25A were also changed to increase harvest opportunity on the winter range of the CAH. In Unit 25A east of the east bank of the East Fork Chandalar River extending from its confluence with the Chandalar River upstream to Guilbeau Pass, regulations were changed to reflect appropriate harvest regimes for the PCH range, similar to changes made in Unit 26C. A summary of these changes are described by Caikoski (in prep). In the remainder of Unit 25A, where the CAH winters, the resident and nonresident seasons were changed from 1 July–30 April to no closed seasons; however, only bull caribou could be taken 16 May–30 June. The bag limits remained 10 caribou for resident hunters and 5 caribou for nonresident hunters.

Hunter Harvest, Success, and Residency. In RY08, 1,362 hunters reported hunting and 580 hunters reported harvesting 717 caribou (43% success rate). In RY09, 1,301 hunters reported hunting and 629 hunters reported harvesting 799 caribou (48% success rate). Preliminary data (reported by 30 May 2011) in RY10 indicated that 1,217 hunters reported hunting and 700 hunters reported harvesting 984 caribou. The total number of hunters reporting will likely increase after the season closes. Reported harvest increased beginning in RY04 compared to RY00–RY03 (Table 7); but is still <2% of the estimated CAH population level. Success rates in RY08 and RY09 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.

In RY08, 320 nonresidents reported hunting and 157 of these reported harvesting 181 caribou (49% success rate). A total of 1,014 residents reported hunting and 411 resident hunters reported harvesting 522 caribou (41% success rate). In RY09, 255 nonresidents reported hunting and 172 nonresident hunters reported harvesting 193 caribou (67% success rate). A total of 1,004 residents reported hunting and 445 resident hunters reported harvesting 588 caribou (44% success rate).

During RY08 and RY09, a small proportion of hunters were nonresidents (23% and 20%), similar to previous years (Lenart 2005, 2007, 2009). Nonresidents took 25% and 24% of the harvest and, in general, nonresident hunters were highly successful (Tables 7 and 8). Nonlocal Alaska resident hunters also had good success (>40%) in both years (Table 8).

Reported harvest of cows during RY08 and RY09 (47 and 41, respectively) was low (Table 7). Preliminary data for RY10 indicated a higher harvest of cows (158), as would be expected because the cow season was lengthened. The harvest of cows by Nuiqsut residents was estimated at 8% of their annual harvest during RY02–RY06 (Pedersen 2008).

Bowhunters accounted for 25% and 28% of the harvest in RY08 and RY09 (Table 7). In general, the number of successful bowhunters using the DHCMA has remained stable since RY00 with an average of 200 caribou harvested annually. In years when the harvest was lower, it was probably due to caribou distribution.

Braem et al (2011) estimated a 5-year average of 61 caribou annually (RY02–RY06) by Nuiqsut residents who likely represent most of the local harvesters. Because Nuiqsut residents tend to hunt to the west of their village, only 13% of the total harvest is estimated to be from the CAH, based on the timing and location of harvest and distribution of caribou (Braem et al 2011). Additional local harvest of the CAH may be occurring in other units when the caribou are distributed near Kaktovik in summer (Unit 26C) and near Wiseman and Coldfoot (Unit 24A) and Arctic Village in fall and winter (Unit 25A).

Harvest Chronology. During RY08 and RY09, most reported harvest occurred in August (61% and 56%, respectively), similar to previous years (Table 9). Preliminary data for RY10 indicates a similar trend where 68% of the harvest occurred in August. In all years, 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 proportion of harvested 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 (Braem et al 2011). A little more than 50% of the harvest taken by Nuiqsut hunters occurs in summer and fall.

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 RY08 and RY09, the proportion of successful hunters who used highway vehicles to access caribou was 40% and 45%, respectively (Table 10). Airplanes were the second most common transport method in both years (36% in RY08 and 26% in RY09). The proportion of successful hunters using airplanes increased beginning in RY07 (Table 10). In previous years, either airplanes or boats (including airboats) were the second most common transport method. There has also been an increase in the use of boats (including airboats), particularly in the Ivishak and Echooka drainages. During RY02–RY10, the proportion of successful hunters who used boats increased to 16–29% compared with 5–15% during RY92–RY01 (Lenart 2007). 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; Fairbanks ADF&G files).

Natural Mortality

Radiocollared caribou were relocated infrequently in fall and winter, making it difficult to accurately estimate adult mortality or determine causes of mortality. 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 more abundant and snowfall is deeper than on the north side. However, there have been no studies of predation rates on the CAH. During RY97–RY09 we determined minimum mortality rates of 4–19% among radiocollared cow caribou ≥1 year old:

Regulatory year	Number of mortalities	Number of radio collars 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
2008–2009	10	69	14
2009–2010	10	58	17

CONCLUSIONS AND RECOMMENDATIONS

High parturition rates, early summer calf survival, and low adult mortality during 2002–2010 contributed to a population increase of 120% in the CAH in 8 years (10% annually; Tables 1–3). The population size increased again during 2008–2010 (2.4% average annual increase), although at a lower annual rate than observed between the 2002 and 2008 photo censuses (13% average annual increase). Distribution during calving and postcalving in 2002–2010 was similar among years. During summers, the CAH seemed to be distributed mostly east of Prudhoe Bay, particularly near the Canning River, and further east in some years. 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 <2% of the herd (Table 7). 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) and airplanes have increased in recent years. 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 the road. Harvest by bowhunters averaged 32% 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 2010 to increase the bag limit and liberalize the season added to this opportunity. In addition, liberalizing the season and bag limit for RY10 did not negatively affect the bull:cow ratio in the population. We observed 50 bulls:100 cows during the fall composition survey in 2010, which is considered moderately high.

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 1,400 caribou without precluding population growth, because the herd grew and sustainable harvest exceeded 1,400. 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.

We met our first and third objectives, to maintain a population of at least 28,000–32,000 caribou and a harvest of at least 1,400 caribou if the population is ≥28,000. In 2008 and 2010 the population size was >66,000 caribou and could provide a harvest of at least 1,400 caribou. We also met our second objective, to maintain accessibility of seasonal ranges for CAH caribou. Based on radiotelemetry and anecdotal observations, CAH animals were able to access calving, postcalving, summer, fall, and winter ranges. We met our fourth objective, to maintain a ratio of at least 40 bulls:100 cows. In October 2009 and 2010 the bull:cow ratio was 50 bulls:100 cows. We met our sixth objective, to reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. Few conflicts between consumptive and nonconsumptive appeared to arise during RY08–RY09.

LITERATURE CITED

ARTHUR, S. M., AND P. A. DEL VECCHIO. 2009. 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. Final Research Technical Report. Grants W-27-5, and W-33-1 through W-33-4, Project 3.46. Juneau, Alaska, USA.

BOERTJE, R. D., C. L. GARDNER, AND K. A. KELLIE. In prep. Increasing Fortymeile Caribou Numbers, Fluctuating Nutrition, and Changing Distribution: When to Manage for a Stable Herd. Alaska Department of Fish and Game, Wildlife Technical Bulletin No. 14, Juneau, Alaska.

BRAEM, N. M., S. PEDERSEN, J. SIMON, D. KOSTER, T. KALEAK, P. LEAVITT, J. PATKOTAK, AND P. NEAKOK. 2011. Monitoring of caribou harvests in the National Petroleum Reserve in Alaska: Atqasuk, Barrow, and Nuiqsut, 2003–2007. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 361, Fairbanks.

CAIKOSKI, J. R. In prep. Units 25A, 25B, 25D, and 26C caribou. Pages XXX_XXX *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2008–30 June 2010. Alaska Department of Fish and Game. Project 3.0. 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. 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.

COCHRAN. W.G. 1977. Sampling Techniques. Third Edition, New York: John Wiley & Sons, Inc.

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.

DAU, J. 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.

———. 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.

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.

RIVEST, L-P, S. COUTURIER, AND H. CREPEAU. 1998. Statistical methods for estimating caribou abundance using postcalving aggregations detected by radio telemetry. Biometrics 54:865-876.

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.

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TABLE 1 Central Arctic herd estimated population size, 1978–2010.

Year	Population survey: Date	Population survey: Method[a]	Estimated 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[c]
2010	9 July	APDCE	70,034 [c]

[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). Methods except Gasaway represent a total minimum count of the herd.
[b] Ninety-percent confidence interval was 14,677–23,414.
[c] Includes 2 PCH and 2 TCH radio collars found during the censuses. These caribou represent an unknown number of caribou from these herds; however, we estimated that these radio collars represented approximately 5,000 caribou.

TABLE 2 Central Arctic herd caribou percent parturition of radiocollared females, 1994–2010.

Year	Date	Percent parturition by subunit for females ≥4 years old[a]		
		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)
2009	1–3 Jun	74 (19)	76 (25)	75 (44)
2010	2–5 Jun	91 (11)	100 (26)	97 (37)

[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, 1994–2010.

		Late June calf:cow ratios (calves:100 cows) by subunit for females ≥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)
2009	23–24 Jun	56 (17)	48 (25)	52 (42)
2010	22–23 Jun	92 (12)	81 (27)	85 (39)

[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 radiocollared 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 percent parturition of known-age radiocollared females, 1994–2010.

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)
2009	1–3 Jun	0 (6)	60 (5)	– 0	75 (4)	79 (28)
2010	2–5 Jun	0 (1)	60 (5)	100 (4)	– 0	96 (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 late June calf:cow ratios (calves:100 cows) of known-age radiocollared females, 1994–2010.

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)
2009	23–24 Jun	0 (4)	60 (5)	(0)	75 (4)	55 (29)
2010	22–23 Jun	(0)	40 (5)	75 (4)	(0)	92 (25)

[a] Only GPS radiocollared 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 surveys, 1976–2010.

Date	Bulls: 100 cows	Calves: 100 cows	Percent calves (no. calves)	Percent cows (no. cows)	Percent small bulls of all bulls (no. small bulls)	Percent medium bulls of all bulls (no. med bulls)	Percent large bulls of all bulls (no. larger bulls)	Percent bulls (no. bulls)	Sample size	No. groups	No. collars
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 (473)	41 (1016)	36 (354)	37 (362)	27 (264)	40 (980)	2469		
22 Oct 1996	61	67	29 (898)	44 (1344)	15 (120)	43 (351)	43 (349)	27 (820)	3062		
12 Oct 2000	84	57	24 (784)	42 (1388)	45 (528)	40 (468)	14 (167)	35 (1163)	3335		
13 Oct 2001	73	54	24 (978)	44 (1803)	38 (501)	39 (507)	23 (303)	32 (1311)	4092		
24 Oct 2002	67	72	30 (523)	42 (722)	36 (177)	43 (208)	21 (102)	28 (487)	1732		
13-14 Oct 2009[a]	50	33	18 (1193)	55 (3641)	37 (676)	40 (718)	23 (420)	27 (1814)	6648	19	37
23 Oct 2010[a]	50	46	23 (889)	51 (1930)	57 (554)	17 (164)	26 (250)	26 (968)	3787	12	21

[a] Beginning in 2009, sampling methods differed slightly from previous years. See methods.

TABLE 7 Reported Central Arctic caribou herd harvest by sex and method of take, regulatory years 2000–2001 through 2009–2010[a].

Regulatory year	Reported harvest				Total hunters	Percent successful hunters[c]
	Male	Female	Unk	Total (harvest by bow)[b]		
2000–2001	465	28	1	494 (214)	804	52
2001–2002	496	16	4	516 (192)	918	47
2002–2003	389	23	3	415 (96)	851	41
2003–2004	389	11	4	404 (136)	717	48
2004–2005	588	42	4	634 (228)	989	52
2005–2006	635	45	7	687 (239)	1104	52
2006–2007	798	37	6	841 (301)	1331	53
2007–2008	620	68	2	690 (183)	1380	42
2008–2009	669	47	1	717 (180)	1362	43
2009–2010	737	41	11	789 (220)	1301	48
2010–2011[d]	800	158	26	984 (212)	1217	na

[a] Source: Harvest ticket reports from Unit 26B 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] Preliminary data for caribou reported harvested by 30 May 2011. The season is opened until 30 June 2011.

TABLE 8 Reported Central Arctic caribou herd hunter residency and success, regulatory years 2001–2002 through 2009–2010[a].

Regulatory year	Successful hunters				Unsuccessful hunters				Total hunters
	Alaska resident	Non-resident	Unk	Total (%)	Alaska resident	Non-resident	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
2008–2009	411	157	12	580 (43)	603	163	16	782 (57)	1362
2009–2010	445	172	12	629 (48)	559	83	17	659 (51)	1301[b]
2010–2011[b]	477	198	25	700 (na)	390	98	20	508 (na)	1217

[a] Source: Harvest ticket reports from Unit 26B in ADF&G WINFONET database.
[b] Total hunters includes 13 hunters who were not determined successful or unsuccessful.
[c] Preliminary data for caribou reported harvested by 30 May 2011. The season is opened until 30 June 2011.

TABLE 9 Reported Central Arctic caribou herd harvest chronology, regulatory years 2000–2001 through 2010–2011[a].

Regulatory year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May /Jun	Unk[b]	Total
	Harvest chronology by month (%)												
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
2008–2009	30 (4)	439 (61)	149 (21)	38 (5)	6 (<1)	0 (0)	0 (0)	0 (0)	3 (<1)	48 (7)		4	717
2009–2010	16 (2)	446 (56)	237 (30)	18 (2)	1 (<1)	0 (0)	1 (<1)	0 (0)	7 (<1)	56 (7)		7	789
2010–2011[c]	15 (1)	674 (68)	235 (24)	29 (3)	7 (<1)	0 (0)	0 (0)	0 (0)	4 (<1)	13 (1)	1	6	984

[a] Source: Harvest ticket reports from Unit 26B in ADF&G WINFONET database.
[b] Includes the occasional animal reported taken illegally in May and June.
[c] Preliminary data for caribou reported harvested by 30 May 2011. The season is open until 30 June 2011.

TABLE 10 Reported Central Arctic caribou herd, number of caribou harvested by transport methods, regulatory years 2000–2001 through 2010–2011[a].

Regulatory year	Airplane	Horse/Dog	Boat	Airboat	Snowmachine	4-Wheeler/ Other ORV	Highway vehicle	Unk	Total
	Transport methods (%)								
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
2008–2009	259 (36)	20 (3)	93 (13)	46 (6)	0 (0)	1 (<1)	287 (40)	11 (2)	717
2009–2010	208 (26)	29 (4)	143 (18)	43 (5)	0 (0)	1 (<1)	355 (45)	10 (1)	789
2010–2011[b]	322 (33)	6 (<1)	172 (17)	105 (11)	0 (0)	2 (<1)	374 (38)	3 (<1)	984

[a] Source: Harvest ticket reports from Unit 26B in ADF&G WINFONET database.
[b] Preliminary data for caribou reported harvested by 30 May 2011. The season is open until 30 June 2011.

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.

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