Caribou
Management Report
of survey-inventory activities
1 July 1998–30 June 2000

Carole Healy, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2001

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

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

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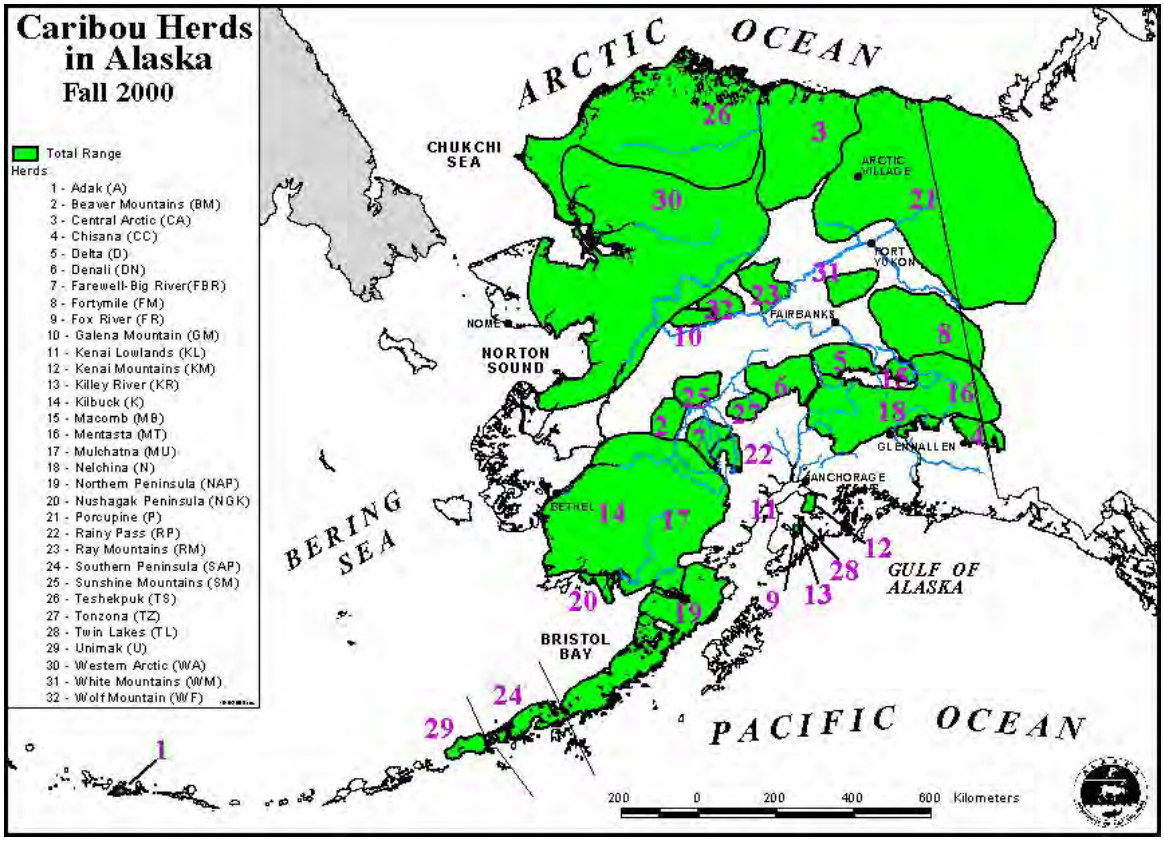

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNITS: 7 and 15 (8,397 mi^2)

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

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

There are 5 small caribou herds on Kenai Peninsula following reintroductions in 1965-66 and 1985-86. The Kenai Mountains caribou herd (KMCH) occupies that portion of Unit 7 drained by Chickaloon River, Big Indian Creek, and Resurrection Creek. The Kenai Lowlands caribou herd (KLCH) summers in Subunit 15A north of the Kenai airport to the Swanson River and in the extreme western portion of 15B; the herd winters on the lower Moose River to the outlet of Skilak Lake and the area around Brown's Lake in Subunit 15B. The Killey River caribou herd (KRCH) inhabits the upper drainages of Funny and Killey rivers in Subunit 15B. The Fox River caribou herd (FRCH) occupies the area between upper Fox River and Truuli Creek in Subunit 15C. The Twin Lakes caribou herd (TLCH) occupies the area drained by Benjamin Creek in Subunit 15B. The 1990/00 estimated population sizes of the KMCH, KLCH, KRCH, FRCH and TLCH were 325, 140, 600, 70, and 65 caribou, respectively.

The KMCH has been hunted annually since 1972. The number of permits issued and animals harvested sharply increased, as hunters became aware of the KMCH. From 1972 to 1976, the department issued an unlimited number of registration permits and the season was closed by emergency order when necessary. In 1977, a limited permit system was initiated and remains in use. Following the 1985 peak in population numbers, the KMCH began to decline for unknown reasons. The department reduced harvest from 1987 to 1990. Biologists surveyed the herd in fall 1992 and tallied 390 caribou, however, calf recruitment was only 14%. A March 1996 survey revealed the herd had grown to at least 425 animals, with a slightly increased calf percentage of 17%. Beginning in 1996 this herd showed a steady decline with 290 caribou counted on March 5, 2000. Population trends correlated with harvest data collected since the early 1970s suggested the carrying capacity for this herd's range was 350 to 400 caribou. During the past 5 years the mean annual success rate was 22%.

The Kenai Lowlands herd has grown slowly compared to the other 4 Kenai Peninsula herds and is currently at its largest population size. Growth has been limited by predation rather than by habitat. Free-ranging domestic dogs and coyotes probably killed calves in summer, and wolves preyed on all

age classes during winter. In addition to natural mortality, several caribou are killed annually by highway vehicles. The KLCH was hunted in 1981, 1989, 1990, 1991 and 1992. The department issued 5 permits the first year and 3 permits, for bulls only, in subsequent years. Biologists believed harvests were not a significant mortality factor.

The Killey River, Fox River, and Twin Lakes herds have grown steadily since the reintroduction of 80 caribou in 1985 and 1986. The herds occupied subalpine habitat rarely used by moose; however, the caribou may have competed with Dall sheep for winter range. Caribou have been absent from this area since 1912 (Palmer 1938). Biologists documented instances of wolves killing caribou that may explain the slow growth of the Twin Lakes and Fox River herds. As the caribou population builds and the moose population declines due to forest maturation, wolf predation on caribou should increase. The Killey River herd has been hunted since 1994 and the Fox River herd since 1995.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

The management objective for the Kenai Mountains caribou herd is to maintain the posthunting herd at 350 to 400 animals until we can determine the carrying capacity of the winter range.

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

Management objectives for the Killey River, Fox River, and Twin Lakes caribou herds are to: 1) reestablish viable caribou populations throughout suitable and historic, but unoccupied, caribou habitat in Subunits 15B (Killey River and Twin Lakes) and 15C (Fox River); and 2) provide for additional opportunities to hunt caribou on the Kenai Peninsula.

METHODS

Biologists flew aerial surveys to determine the number, distribution, and composition of caribou herds. A Piper Super Cub (PA-18) was used to locate the herd, followed by a Bell Jet Ranger (206B) helicopter to determine the sex and age composition. Surveyors classified caribou as calves, cows, or bulls and calculated ratios. The department collected harvest data through a mandatory reporting requirement in the drawing permit program.

POPULATION STATUS AND TREND

Population Size

Kenai Mountains Caribou Herd. The KMCH has had 3 population peaks in its 35-year history and is currently declining. The original introduction grew to a preseason population of 339 animals by 1975. Hunters reduced the population to 193 by 1977. The herd reached another preseason peak of 434 in 1985 and declined to an estimated 305 animals in 1988. In 1996 the herd increased to 452 animals then declined the following year to 419, postseason. Since 1997, the herd declined to 290 caribou counted in March 2000. (Table 1).

Kenai Lowlands Caribou Herd. The KLCH increased steadily from 96 animals in 1995/96 to a peak of 140 caribou counted during spring 1999. The population declined slightly the following year to 131 (Table 2). The primary management concern was low recruitment caused by predation.

Killey River, Fox River and Twin Lakes Caribou Herds. The KRCH (Table 3) has grown steadily since their introductions in the mid-1980s. The KRCH increased at a mean annual rate of increase of 22% (range = 13-31%) between fall 1991 and 1993. The herd remained stable over the next 2 years at about 300 animals then increased to 400 in 1997. The January 1999 survey conducted by the Fish and Wildlife Service only revealed 380 caribou; however, animals were widely scattered and it is believed the count did not accurately assess the herd's size, since 546 animals were counted in June 1999.

Fox River Caribou Herd. The FRCH (Table 4) mean annual rate of increase was 29% (range = 14-49%) between fall 1991 and 1994 and only increased 9% by spring 1996. The herd declined by 9% the following spring then increased 16% by spring 1998. Predation by wolves and brown bears was the suspected cause of a reduction in herd size to 67 by the fall of 1998, when a survey revealed there were no calves in the herd. A survey was not completed in 1999/00.

Twin Lakes Caribou Herd. The TLCH (Table 5) herd followed a similar growth pattern with a mean annual increase of 25% between fall 1992 and 1994 and remained stable in 1995. In spring 1997 the herd increased again, followed by a 9% decline in January 1998. These growth rates appeared normal for recently introduced herds on excellent range; however, the KRCH has been difficult to survey and may have been larger during fall surveys. Over the past five years this herd has declined from a high of 75 in 1996/97 to approximately 65 in 1999/00. The indication that this herd is declining suggests predation rather than insufficient range.

Population Composition

Kenai Mountains Caribou Herd. There were 29 calves:100 cows and 41 bulls:100 cows in March 1996. Calves composed 17% of the herd. We did not collect herd composition data from 1996 to 1999 due to limited budgets, however, annual surveys were completed to determine population size. Data from fall 1992 were included for comparisons. Herd composition for 1992 was 24 calves:100 cows and 43 bulls:100 cows; calves composed 14% of the caribou observed. Calf recruitment increased slightly between fall 1992 and March 1996. The mean percentage of calves in the herd between 1990 and 1995 was 17%, with a high of 20% in 1990. The ratio of bulls to cows remained relatively stable from 1990 to 1995 with a mean of 41:100 (range = 39-43:100). Observations during the 1996 to 1999 surveys indicated the calf to cow ratio was still low.

Kenai Lowlands Caribou Herd. Biologists only surveyed the KLCH during spring because of poor fall survey conditions. The area where this herd aggregated during the fall rutting period was heavily timbered making it difficult to locate and classify caribou. Data collected from 1996 to 2000 indicated the mean June calf percentage was 21 %, (range = 17 to 29%) (Table 2). Surveyors counted a low of 17 calves in 1997 compared to a high of 29 young in 1999. The population increased from 96 to 140 caribou during the same period. Because fall surveys were not conducted, bull to cow ratios were not available. Incidental observations suggested the ratio was probably stable and at a minimum of 35 bulls per 100 cows.

Killey River Caribou Herd. Biologists surveyed the KRCH during fall 1993 and tallied the following ratios: 44 calves:100 cows and 56 bulls:100 cows; calves composed 22% of the 281 caribou observed. Although surveyors did not classify bulls as small, medium, or large, field notes indicated many bulls were in the medium to large category. Composition surveys were not conducted in fall of 1994 or 1995. In 1996 calves comprised 23% of the 376 caribou counted, and the bull to cow ratio remained stable. The January 1998 survey revealed a decline of 36 caribou when compared to the June 1997 count. Although this count may reflect predation and mortality due to hunting, it is believed the 1997 count of 376 and the 1998 counts were low. A composition survey of 509 of 546 caribou observed on June 23, 1999 revealed the following ratios: 25 calves:100 cows, 36 bulls:100 cows and calves comprised 16 percent of the total classified. Although a survey was not completed in 1999/00 the herd is believed to have increased again, and was estimated at 600 animals (Table 3).

Fox River Caribou Herd. Biologists completed composition surveys on the FRCH in fall of 1993. They counted 57 caribou in 1993 with the following ratios: 23 calves:100 cows and 61 bulls:100 cows; calves composed 22% of the caribou observed. Composition surveys were not conducted in 1994 and 1995. In 1996, we counted 81 caribou and 19% were calves. Only aerial surveys to assess the herd's population size were completed in 1997. These data indicated the herd increased from 57 caribou in 1993 to 96 in 1997. A survey in November 1998 revealed a decline to 67 caribou, and no calves were observed in the herd (Table 4).

Twin Lakes Caribou Herd. A fall composition count was completed on the Twin Lakes caribou herd in the fall of 1993. The following ratios were observed: 26 calves and 30 bulls:100 cows. Calves composed 17% of the 36 animals classified. In 1994 and 1995 we conducted only aerial surveys revealing 45 and 48 animals, respectively. Seventy-three caribou were counted in 1996, 19% were calves. An aerial survey completed in 1997 indicated that the herd declined by 10% to 66 animals then declined 18% in 1998 to 54 (Table 5). In June 1999 the herd was composed of 11(20%) calves, 37 (69%) cows and 6 (11%) bulls.

MORTALITY

Harvest

Season and Bag Limits.

Kenai Mountains Caribou Herd — Open season for resident and nonresident hunters in Unit 7 north of the Sterling Highway and west of the Seward Highway was Aug. 10 to Sept. 30 between 1993 and 1996. In 1997 and 1998, the season was Aug. 10 to Sept. 30 and Nov. 10 to Dec. 10. In 1999, the season was extended to Aug. 10 to Dec. 31. The bag limit was 1 caribou by drawing permit only and up to 250 permits could be issued.

Kenai Lowlands Caribou Herd — Open season for resident and nonresident hunters in the portion of the Kenai National Wildlife Refuge of Subunit 15A was 1 to 20 Sept. The bag limit was 1 bull caribou by drawing permit only, and up to 3 permits could be issued. The season was closed beginning fall 1993.

Killey River Caribou Herd — Open season for resident and nonresident hunters in Subunits 15B south and west of Killey River in the Kenai National Wildlife Refuge was Aug. 10 to Sept. 20. The bag limit was 1 caribou by drawing permit only; up to 150 permits could be issued. In 1999, two drawing permit cow hunts were opened from Aug. 10 to Sept.10 (hunt 610) and Sept. 15 to Oct. 10 (hunt 612). Twenty permits, each for two caribou, were issued for each hunt for a total of 80 permits.

Fox River Caribou Herd — Open season for resident and nonresident hunters in Subunits 15C, that portion north of Fox River and east of Windy Lake, was Aug. 10 to Sept. 20. The bag limit was 1 caribou by drawing permit only, and no more than 30 permits could be issued.

Twin Lakes Caribou Herd — The Board of Game has not authorized hunting on this herd.

Board of Game Actions and Emergency Orders.

The Board of Game extended the season for the KMCH during this reporting period.

Permit Hunts.

Kenai Mountains Caribou Herd — Hunting of this small introduced population was regulated by registration or drawing permit. Number of permits issued was unlimited between 1972 and 1976. Since 1977, permits have been limited in number and issued through a drawing. The department received 1348 applications for 250 permits in 1998, and 1451 applications for 250 permits in 1999. The mean annual harvest for the past 5 years was 23 caribou (range = 18–27), and bulls averaged 51% of the harvest (Tables 6 and 10). Permittees harvested 17 bulls and 8 cows in 1998 and 11 bulls and 13 cows during 1999.

Kenai Lowlands Caribou Herd — The season was closed during this reporting period.

Killey River Caribou Herd — The department received 412 applications in 1998 for the 50 permits and 353 applications in 1999 for the 25 permits issued to hunt the KRCH. Permittees harvested 26 bulls in 1998, and 13 bulls and 1 cow in 1999 (Tables 8 and 12).

In 1999, a total of 80 permits were issued to 40 hunters, allowing the harvest of cow caribou. Thirty percent of the permittees hunted, and 1 bull and 5 cows were harvested (Table 13).

Fox River Caribou Herd — The department received 144 applications in 1998 and 77 in 1999 for the 10 permits issued to hunt the FRCH. Permittees harvested 3 bulls and 1 cow in 1998, and 1 bull and 1 cow in 1999 (Tables 9 and 14).

Twin Lakes Caribou Herd — The TLCH was not open to hunting during this reporting period.

Hunter Residency and Success**.**

Kenai Mountains Caribou Herd — Sixty percent of permittees reported they did not hunt in 1998, while 50% did not go afield in 1999 (Table 10). Twenty-five (25%) of the 101 hunters in 1998 were successful and 24 (19%) of the 124 hunters in 1999 were successful (Tables 10 and 15).

Local residents harvested 3 caribou, nonlocal residents harvested 20 caribou and nonresidents harvested 2 caribou in 1998 (Table 15). In 1999, local residents took 2 caribou, and nonlocal residents harvested 22 animals. Unsuccessful hunters comprised 1 local resident and 74 nonlocal residents and 1 nonresident in 1998. In 1999, 3 nonresidents hunted unsuccessfully, compared to 7 local and 90 nonlocal residents.

Kenai Lowlands Caribou Herd — This herd was not hunted during this reporting period.

Killey River Caribou Herd — The department issued 50 permits in 1998 and 25 in 1999 for hunt 608. Forty percent of the permittees in 1998 and 24 % in 1999 did not hunt (Table 12). Hunters harvested 26 caribou in 1998 and 14 in 1999. Hunter success rate was 87% in 1998 and 74% in 1999. Nineteen local, 6 nonlocal residents, and 1 nonresident were successful in 1998, compared to 10 local, 4 nonlocal residents, and no nonresidents in 1999 (Table 16).

Eighty permits were issued in 1999 for hunts 610 and 612, combined, resulting in the harvest of 1 bull (illegal) and 5 cows. Local residents harvested 4 caribou and nonlocals harvested 2. Hunter success rate was 25%.

Fox River Caribou Herd — The department issued 10 permits in 1998 and 1999. Six (60%) permittees hunted in 1998 and harvested 3 bulls and 1 cow. Hunter success rate was 67%. In 1999, 4 permittees hunted and harvested 1 bull and 1 cow. Hunter success was 50%. All hunters in 1998 and 1999 were local residents (Table 17).

Harvest Chronology.

Kenai Mountains Caribou Herd — The harvest chronology was similar in 1998 and 1999, showing the most effort early in the season. In both years, hunting pressure was highest during the first hunting period (Table 18). In the past 5 years (combined), hunters have harvested 62% of the take in August, 38% in September and less than 1 percent after September.

Kenai Lowlands Caribou Herd — The Kenai Lowland Caribou herd was not hunted during this reporting period.

Killey River Caribou Herd — Hunting effort in 1998 was distributed over the first three hunting periods with the highest harvest (39%) between September 1 and 15. The harvest chronology for 1999 was similar to the previous year (Table 19).

Fox River Caribou Herd — In 1998 and 1999 (combined) hunters reported harvesting 2 caribou during the last two weeks of August and 4 caribou during the first two weeks of September (Table 20).

Transport Methods.

Kenai Mountains Caribou Herd — In 1998 and 1999 most successful hunters used highway vehicles for access and then hiked into the areas they hunted (Table 21). In 1998, 13 (52%) successful hunters walked, while 6 (24%) used horses, 4 (16%) used mountain bikes and 2 (8%)

used aircraft. The following year 18 (75%) successful hunters walked, 1 (4%) relied on horses, and 5 (21%) used aircraft. Unsuccessful hunters followed a similar pattern of reliance on foot travel.

Kenai Lowlands Caribou Herd — The Kenai Lowland Caribou herd was not hunted during this reporting period.

Killey River Caribou Herd — In 1998 and 1999 hunters used 2 primary methods to access their hunting areas: boat across Tustumena Lake and walk to the hunting area or boat across the lake and use horses to pack into the hunt area. Sixty-five percent of the hunters in 1998 used horses, compared to 43% the next year. In 1998 31% of hunters used boats, compared to 57% in 1999. One successful hunter used aircraft in 1998 and none in 1999 (Table 22).

In 1999, 4 successful hunters used horses and 2 used boats to access the area they hunted in hunts DC610 and DC612.

Fox River Caribou Herd — Five of the six successful hunters used a boat and one used horses to access the hunting area in 1998 and 1999 combined**.**

HABITAT

Assessment

Biologists have not thoroughly investigated the habitat components of the Kenai Mountains herd. There are approximately 1407 km^2 (563 mi^{-2}) within the known range of the KMCH. Winter range was approximately 532 km^2 of the total identified range. The department initially discussed habitat concerns during the mid-1980s when the herd started to decline. Between 1980 and 1984 the KMCH had high calf:cow ratios and the herd was growing. Subsequent declines in the calf:cow ratios and herd size between 1985 and 1990 raised concerns over habitat adequacy. Hunting mortalities probably became additive around 1985; while hunting may have accelerated the decline, it provided some habitat protection. The herd declined to 300 animals by 1988 and remained at that size until 1990. The calf:cow ratio improved with 34:100 in fall 1990. As the herd increased, the percentage of calves observed declined from 20% in 1990 to 14% in fall 1992. A March 14, 1996 composition survey revealed the herd size had continued to increase since 1992. We observed 425 caribou and classified 403. Classification indicated the bull:cow ratio has remained relatively unchanged at about 41:100 since 1990 and the calf:cow ratio has increased slightly from 14:100 in 1992 to 17:100 in 1996. Composition surveys were not completed from 1997 to 1999, however, we did conduct surveys to determine population size. The observation of 452 caribou on 14 March 1997 indicated the herd had reached its highest number and began a downward trend. Four hundred nineteen caribou were counted on 27 February 1998, 380 on 7 January 1999 and 290 on 5 March 2000. This has been the typical pattern of the Kenai Mountains Caribou herd over the past 3 decades. The KMCH appeared more productive when stabilized around 350 to 400 caribou.

Although the Kenai Lowlands herd has increased steadily this reporting period, hunting is still not justifiable. The opportunity for viewing by locals and tourists is also increasing. Moderate calf mortality during summer and moderate adult mortality in winter were factors in the population increase. The primary predators are wolves during winter and free-ranging domestic dogs and coyotes during summer.

Although some caribou in the KLCH have been observed south and east of Kalifornsky Beach Road in Unit 15B in winter, most of the herd migrates east to winter on the Kenai National Wildlife Refuge along Moose River to the outlet of Skilak Lake and south to Brown's Lake. Unlike ranges for other herds on the Kenai Peninsula, summer and winter ranges were separate for the KLCH. The summer range was 254 km^2 (101 $mi.^2$), compared to 925 km^2 (370 $mi.^2$) for the winter. This herd occupies a large range, and habitat is not limiting the growth of the KLCH at this time.

In 1996, 1998 and 2000 female calves were captured in the Killey River and Kenai Mountains Caribou herds in March and April to compare weights as an indicator of range quality. In 1996 the Kenai Mountain mean calf weights were 127 pounds compared to a mean weight of 145 in the Killey River herd. In 1998 Kenai Mountains calves averaged 122 pounds compared to 141 recorded for the Killey River calves. In 2000 Kenai Mountains calves averaged 120 pounds compared to 130 recorded for the Killey River calves. We also recorded morphometric measurements.

A comparison of the mean weights for calves indicates Killey River calves were larger than calves from Kenai Mountains herd in all years. The estimated 325 caribou currently in the Kenai Mountains herd occupy a 1407 km^2 area, a density of 0.2 animals/km^2. The 600 Killey River caribou currently occupy about 516 km^2, a density of 1.2 animals/km^2. It is interesting to note that the Killey River herd density is over five times the density of Kenai Mountains but their calves are larger. We will assess calf weight again in April 2002.

The fact that mean calf weight of Killey River calves appears to be the highest in the known herds of the state is interesting; however, several influencing factors need to be reported to make these findings applicable to future capture efforts. Calves captured in 1996 were born following one of the most severe winters on record for the Kenai Peninsula. The severe winter of 1994–95 was also followed by one of the best growing seasons due to warm days with a record amount of rain. The winter of 1995–96 was, in contrast, one of the mildest on record. As a result, although these weights seem appropriate for the range conditions, they are probably the highest mean weights one could expect from these herds and may not represent an average calf weight following a normal summer growing season and winter. The winter of 1997/98 was normal for the Kenai. Similar environmental conditions should be noted for the Kenai Mountains herd.

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 and revised in 2001, indicated the KRCH's range (516 km^2) should sustain a herd of 400 to 500 caribou, the FRCH (85 km^2) could sustain approximately 80, and the TLCH range of 216 km^2 could support 200 animals. Calf recruitment for these herds has been moderately low, and insufficient habitat may now be limiting the growth of the Killey River, Fox River and Kenai Mountains Herds.

CONCLUSIONS AND RECOMMENDATIONS

Recent survey and harvest data indicate the department is below the KMCH post-season population objective of 350 to 400 caribou. Limited habitat, inclement weather, predation, and human harvests are plausible explanations for the herd's decline from 452 in 1996 to 290 animals in 2000. Reductions in harvests during the early 1990s allowed the herd to increase, reaching a record high of 450 caribou

before the 1996 season. Because a survey conducted after this reporting period in the fall of 2000 indicated the herd increased to 378 caribou, I suggest we not make changes to the current season and bag limit. The allowable annual harvest will be set to maintain the population between 350 and 400 (post-season) until we identify factors influencing calf recruitment.

The KLCH has slowly increased over the past 5 years from 1993 to 2000. Low calf recruitment is still the primary management concern for this herd. Department and FWS biologists suspect predation coupled with insufficient annual recruitment to offset the aging trend is limiting herd growth, rather than available range. If the herd continues to increase, I recommend not allowing harvest until the herd increases to approximately 150 animals.

The Killey River herd has increased significantly (632 counted on November 1, 2000), and it was over the projected density in 2000. Reduced annual recruitment and declining mean weight of female calves indicates this herd may now becoming habitat-limited. A secondary management objective is to allow hunting as this herd increases. I recommend the department continue harvesting caribou in this herd to decrease the herd's growth rate. In addition to drawing permits for bulls, an unlimited number of registration permits should be issued to harvest only cows in the Killey River herd. A decreased rate of growth in this herd will allow biologists time to determine the optimum density for these herds. Because of limited access few hunters are expected to take advantage of these permits, however, several years of assessing hunters' success may be necessary to properly manage annual harvests.

The Fox River caribou herd has declined in recent years probably due to increased predation by wolves and bears or emigration into the Killey River herd. Observations by staff and hunters indicate that a pack of at least 6 wolves, several brown bears and numerous black bears commonly use this small area. Although a harvest of 2 cows and 4 bulls over the past two years is not suspected to cause the current decline, if the herd declines below 60 animals, hunting should be restricted to bulls only.

The Twin Lakes caribou herd increased steadily between 1993 and 1996 and decreased its growth in 1997 and 1998. Because this herd has the habitat potential to increase to about 200 animals, I recommend we monitor the herd annually to determine if this population decline is a trend caused by unknown limiting factors or we under estimated the herd's size. I recommend we propose a limited permit hunt for this herd when its density reaches 0.5 caribou per km^2. Initiating a controlled hunt before the herd reaches its habitat potential will allow biologists time to evaluate the herd's health and still allow for growth.

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Table 1. Kenai Mountains caribou fall composition counts and estimated population size, 1995-2000.

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Small bulls (% bulls)	Medium bulls (% bulls)	Large bulls (% bulls)	Total bulls (%)	Composition sample size	Estimate[a] of herd size
1995/96[b]	41	29	17	59	--	--	--	403	450
1996/97[c]	--	--	--	--	--	--	--	452	500
1997/98[d]	--	--	--	--	--	--	--	419	475
1998/99[e]	--	--	--	--	--	--	--	380	425
1999/00[f]	--	--	--	--	--	--	--	290	325

a. Estimated herd size postseason. b. Survey date - March 14, 1996. c. Survey date – March 14, 1997. d. Survey date – February 27, 1998. e. Survey date – January 7, 1999. f. Survey date – March 5, 2000.

Table 2. Kenai Lowlands caribou composition counts and estimated population size, 1995-2000.

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Small bulls (% bulls)	Medium bulls (% bulls)	Large bulls (% bulls)	Total bulls (%)	Composition sample size	Estimate[a] of herd size
1995/96[b]	--	--	28(29)	--	--	--	--	96	100
1996/97[c]	--	--	17(17)	--	--	--	--	98	105
1997/98[d]	--	--	24(19)	--	--	--	--	124	135
1998/99[e]	--	--	29(21)	--	--	--	--	140	150
1999/00[f]	--	--	25(19)	--	--	--	--	131	140

[a] Estimated herd size in June.
[b] Survey date June 6, 96.
[c] Survey date June 8, 97.
[d] Survey date June 20, 98.
[e] Survey date June 22, 99.
[f] Survey date June 20, 00.

Table 3. Killey River caribou composition counts and estimated population size, 1995-2000.

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Small bulls (% bulls)	Medium bulls (% bulls)	Large bulls (% bulls)	Total bulls (%)	Composition sample size	Estimate[a] of herd size
1995/96[b]	--	--	--	--	--	--	--	--	261	300
1996/97[c]	--	--	--	--	--	--	--	--	376	400
1997/98[d]	--	--	--	--	--	--	--	--	340	380
1998/99[e]	36	25	77(16)	318(63)	--	--	--	114(22)	509	546
1999/00[f]	--	--	--	--	--	--	--	--	--	600

[a] Estimated fall herd size.
[b] survey date Nov. 28, 1995
[c] survey date June 11, 1997
[d] survey date January 13, 1998
[e] survey date June 23, 99.

Table 4. Fox River caribou fall composition counts and estimated population size, 1995-2000.

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Small bulls (% bulls)	Medium bulls (% bulls)	Large bulls (% bulls)	Total bulls (%)	Composition sample size	Estimate[a] of herd size
1995/96[bc]	--	--	--	--	--	--	--	--	89	90
1996/97[d]	--	--	15(19)	--	--	--	--	--	81	85
1997/98[ce]	--	--	--	--	--	--	--	--	96	100
1998/99[f]	--	--	0 (0)	--	--	--	--	67	70	
1999/00[g]	--	--	--	--	--	--	--	--	--	70

[a] Estimated herd size.
[b] Survey date April 9, 1996.
[c] Aerial survey using fixed-wing aircraft - total count only.
[d] Survey date June 3, 1997
[e] Survey date March 11, 1998.
[f] Survey date November 28, 1998.
[g] No complete survey in 1999/00

Table 5. Twin Lakes caribou fall composition counts and estimated population size, 1995-2000.

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Small bulls (% bulls)	Medium bulls (% bulls)	Large bulls (% bulls)	Total bulls (%)	Composition sample size	Estimate[a] of herd size
1995/96	--	--	--	--	--	--	--	--	48	50
1996/97[b]	--	--	14(19)	--	--	--	--	--	73	75
1997/98	--	--	--	--	--	--	--	--	66	70
1998/99[c]	16	30	11(21)	37(69)	--	--	--	6	54	65
1999/00	--	--	--	--	--	--	--	--	--	65

[a]Estimated fall herd size.
[b] Surveyed on June 11, 1997.
[c] Surveyed on June 23, 1999.

Table 6. Kenai Mountains caribou harvest and accidental death, 1995-2000.

Regulatory year	Hunter Harvest: Reported M (%)	Reported F (%)	Reported Unk.	Reported Total	Estimated Unreported	Estimated Illegal	Estimated Total	Accidental death	Grand Total
1995/96	10(56)	8(44)	0	18	--	--	--	--	18
1996/97	10(44)	13(56)	0	23	--	--	--	--	23
1997/98	12(46)	14(54)	1	27	--	--	--	--	27
1998/99	17(68)	8(32)	0	25	--	--	--	--	25
1999/00	11(46)	13(54)	0	24	--	--	--	--	24

Table 7. Kenai Lowlands caribou harvest and accidental death, 1995-2000.

Regulatory year	Hunter Harvest: Reported M (%)	F (%)	Unk.	Total	Estimated: Unreported	Illegal	Total	Accidental death[a]	Grand total
1995/96	No open season							1	1
1996/97	No open season							1	1
1997/98	No open season							1	1
1998/99	No open season							0	0
1999/00	No open season							3	3

a Caribou/highway vehicle accidents – all were adults.

Table 8. Killey River caribou harvest and accidental death, 1995-2000. Hunt number 608

Regulatory year	Hunter Harvest: Reported M (%)	F (%)	Unk.	Total	Estimated: Unreported	Illegal	Total	Accidental death	Grand Total
1995/96	8(100)	0	0	8	0	0	0	0	8
1996/97	12(100)	0	0	12	0	0	0	0	12
1997/98	23(100)	0	0	23	0	0	0	0	23
1998/99	26(100)	0	0	26	0	0	0	0	26
1999/00	13 (93)	1(7)	0	14	0	0	0	0	14

Table 9. Fox River caribou harvest and accidental death, 1996-2000.

Regulatory year	Hunter Harvest								Grand total
	Reported				Estimated				
	M (%)	F (%)	Unk.	Total	Unreported	Illegal	Total	Accidental death	
1995/96	5 (100)	0	0	5	0	0	0	0	5
1996/97	2 (100)	0	0	2	0	0	0	0	2
1997/98	2 (100)	0	0	2	0	0	0	0	2
1998/99	3 (75)	1 (25)	0	4	0	0	0	0	4
1999/00	1 (50)	1 (50)	0	2	0	0	0	0	2

Table 10. Kenai Mountains caribou harvest data by permit hunt, 1993-2000. Hunt number 001.

Hunt No. /Area	Regulatory year	Percent Permits issued	Percent did not hunt	Percent successful hunters	unsuccessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
001/07	1993/94	200	47	27	73	66	34	--	29
	1994/95	200	42	24	76	61	39	--	28
	1995/96	200	47	19	81	56	44	--	18
	1996/97	250	49	18	82	44	56	--	23
	1997/98	250	52	23	78	46	54	--	27
	1998/99	250	60	25	75	68	32	--	25
	1999/00	250	50	19	81	46	54	--	24

Table 11. Kenai Lowlands caribou harvest data by permit hunt, 1995-2000. Hunt number 506, Subunit 15A.

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
506/15A									
	1995- 2000			NO OPEN SEASON					0

Table 12. Killey River caribou harvest data by permit hunt, 1994-2000. Hunt number 608, Subunit 15B.

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsucessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
608/15B									
	1994/95[a]	25	40	73	27	10(91)	1(9)	0	11
	1995/96	25	52	67	33	8(100)	0	0	8
	1996/97	25	36	75	25	12(100)	0	0	12
	1997/98	50	46	85	13	23(100)	0	0	23
	1998/99	50	40	87	13	26(100)	0	026	
	1999/00	25	24	74	26	13(93)	1(7)	0	14

a This permit hunt was established in fall 1994.

Table 13. Killey River cow caribou harvest data by permit hunt, 1999. Hunts 610 and 612.

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsucessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
DC610& DC612[a] 15B	1999/00	80	70	25	75	1	5	0	6

[a] Drawing permit cow hunt started in fall 1999.

Table 14. Fox River caribou harvest data by permit hunt, 1995-2000. Hunt number 618, Subunit 15C.

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsucessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
618/15C[a]									
	1995/96	15	47	63	37	5 (100)	0	0	5
	1996/97	10	70	67	33	2 (100)	0	0	2
	1997/98	10	60	50	50	2 (100)	0	02	1998/99
	10	40	67	33	3 (75)	1(25)	0	4	
	1999/00	10	60	50	50	1 (50)	1(50)	02	

a This permit hunt was established in fall 1995.

Table 15. Kenai Mountains caribou annual hunter residency and success, 1995-2000.

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total[b] (%)	Local[a] resident	Nonlocal resident	Nonresident	Total[b] (%)	
1995/96	2	16	0	18 (17)	6	79	3	88 (84)	105
1996/97	2	20	1	23 (18)	16	86	3	105 (82)	128
1997/98	3	22	0	27 (23)	7	82	4	93 (78)	120
1998/99	3	20	2	25 (25)	1	74	1	76 (75)	101
1999/00	2	22	0	24 (19)	7	90	3	100 (81)	124

[a] Local resident resides in Unit 7.
[b] Total includes hunters of unknown residence.

Table 16. Killey River caribou annual hunter residency and success, 1995-2000. Hunt number 608.

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	
1995/96	7	1	0	8 (67)	3	1	0	4 (33)	12
1996/97	7	3	2	12 (75)	3	1	0	4 (25)	16
1997/98	17	5	1	23 (85)	3	1	0	4 (15)	27
1998/99	19	6	1	26 (87)	3	1	0	4 (13)	30
1999/00	10	4	0	14 (74)	4	1	0	5 (26)	19

[a] Local resident resides in Unit 7 or 15.
[b] Herd not hunted.

Table 17. Fox River caribou annual hunter residency and success, 1995-2000. Hunt DC618.

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	
1995/96	3	1	1	5 (63)	3	0	0	3 (38)	8
1996/97	1	0	1	2 (67)	1	0	0	1 (33)	3
1997/98	2	0	0	2 (50)	2	0	0	2 (50)	4
1998/99	4	0	0	4 (67)	2	0	0	2 (33)	6
1999/00	2	0	0	2 (50)	2	0	0	2 (50)	4

[a] Local resident resides in Unit 7 or 15.

Table 18. Kenai Mountains caribou annual harvest chronology percent by time period, 1995-2000.

Regulatory year	Harvest periods				
	8/10-8/31	9/01-9/30	10/01-10/31	11/01-12/31	n
1995/96	9	9	0	0	18
1996/97	18	5	0	0	23
1997/98	15	12	0	0	27
1998/99	15	10	0	0	25
1999/00	15	8	1	0	24

[a] One hunter failed to report harvest chronology.

Table 19. Killey River caribou annual harvest chronology percent by time period, 1995-2000.

Regulatory year	Harvest periods 8/10-8/15	8/16-8/31	9/1-9/15	9/16-9/30	Unk.	n
1995/96	0	2	4	2	0	8
1996/97	3	0	5	3	1	12
1997/98	3	10	9	1	0	23
1998/99	6	9	10	1	0	26
1999/00	5	1	8	1	1	15

Table 20. Fox River caribou annual harvest chronology percent by time period, 1995-2000.

Regulatory year	Harvest periods 8/10-8/15	8/16-8/31	9/1-9/15	9/16-9/30	n
1995/96	0	2	1	2	5
1996/97	0	0	2	0	2
1997/98	0	0	1	1	2
1998/99	0	1	3	0	4
1999/00	0	1	1	0	2

Table 21. Kenai Mountains caribou harvest percent by transport method, 1995-2000

Regulatory year	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	n
1995/96	6	22	0	6	0	0	67	0	18
1996/97	0	22	0	4	0	0	70	4	23
1997/98	7	22	0	0	0	0	70	0	27
1998/99	8	24	0	0	0	16	52	0	25
1999/00	21	4	0	0	0	0	75	0	24

[a] ORV includes mountain bike.

Table 22. Killey River caribou harvest percent by transport method, 1995-2000.

	Percent of harvest								
Regulatory year	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	n
1995/96	13	75	13	0	0	0	0	0	8
1996/97	0	67	25	0	0	0	0	8	12
1997/98	9	70	22	0	0	0	0	0	23
1998/99	4	65	31	0	0	0	0	0	26
1999/00	0	43	57	0	0	0	0	0	14

Table 23. Fox River caribou harvest percent by transport method, 1995-2000.

Regulatory year	Percent of harvest								n
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1995/96	0	40	60	0	0	0	0	0	5
1996/97	0	0	100	0	0	0	0	0	2
1997/98	0	0	100	0	0	0	0	0	2
1998/99	0	25	75	0	0	0	0	0	4
1999/00	0	0	100	0	0	0	0	0	2

Alaska Department of Fish and Game
Division of Wildlife Conservation
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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

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 is 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 River drainages as far inland as Innoko River and 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), remaining relatively stable throughout that decade. There were indications that the herd 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 during the early part of the 20th century to supplement the local economy and food resources. Documentation of the numbers and fate of these animals are scarce, but many local residents remember a widespread thriving 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. Local residents also suggest that 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 1000 caribou (ADF&G files 1974). The population increased to approximately 5000

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 recently. An estimated 6030 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 photocensusing to monitor the herd as it declined in size through the 1970s. Seasons and bag limits were reduced continuously during that decade. Locating caribou during surveys was a problem, 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 photocensus on 30 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 photocensus in 1996 provided a minimum estimate of 192,818 caribou in the MCH. Counts from the last aerial photocensus, in July 1999, indicated an estimated population of 175,000.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

To maintain a minimum population of 25,000 adults with a minimum bull:cow ratio of 35:100.

Additional objectives include:

- Manage the MCH for maximum opportunity to hunt caribou
- Manage the MCH in a manner that encourages range expansion west and north of the Nushagak River

METHODS

We have conducted a photocensus of the MCH during the postcalving aggregation period in late June or early July in most years from 1980–1992. In recent years, the censuses have been scheduled on alternate years, occurring in even years. The photocensus planned for 1998 did not occur because of poor weather, and a photocensus was conducted July 1999. The department coordinates censuses out of the Dillingham area office in cooperation with personnel from Togiak National Wildlife Refuge (TNWR), Yukon Delta National Wildlife Refuge (YDNWR), and Lake Clark National Park (LACL). Biologists, using fixed-wing aircraft, radiotrack and survey the herd's range, estimate the number of caribou observed, and photograph discrete groups using hand-held 35-mm cameras. Since 1994 we have photographed large aggregations with an aerial mapping camera mounted in a DeHavilland Beaver (DH-2) aircraft flown by department staff from Fairbanks. We estimate herd size by adding: 1) the number of caribou counted in photographs; 2) an estimate of caribou observed but not photographed; and, 3) the estimated number of caribou represented by radiocollared caribou not located during the census.

We conducted aerial surveys to estimate the sex and age composition of the herd with a Cessna 185 and Robinson R-44 helicopter in October. We captured and radiocollared MCH caribou in most years from 1980 to 1992. Beginning in 1992, collaring programs were scheduled for

alternating years, occurring in even years. Beginning in 1997, capture and radiocollaring efforts occurred only when funding was made available. Female calf caribou are captured using a helicopter and either net guns or drug-filled darts. These are usually cooperative efforts between the department and TNWR. During November 1998, YDNWR staff attempted to capture and radio-collar caribou when large numbers of the MCH occupied areas of Unit 18. Nine caribou were radiocollared during those efforts. In April 2000, eleven 10-month old female calves were darted and radiocollared west of Iliamna Lake.

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 they had calved.

We conducted periodic radiotracking flights throughout this reporting period to continue the demographics study that began in 1981. Supplemental funding from the Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service allowed us to schedule bi-monthly flights. Staff from BLM and USFWS enter radiotracking data from these flights into a statewide interagency GIS database.

We monitored the harvest and assisted Fish and Wildlife Protection in enforcement during late August and throughout September, when hunting pressure was most intense. Harvest data are collected from statewide harvest reports. Hunter "overlay" information prior to the 1998–99 season have not been entered into the statewide harvest information system. Beginning with the 1998-99 regulatory year, reminder letters have been sent to hunters who failed to report their caribou hunting activity.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Between 1981 and 1996, the MCH increased at an annual rate of 17%. From 1992–1994, 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 on to previously unused range, relatively low predation rates, and an estimated annual harvest rate of less than 5% of the population since the late 1970s. From 1996 though 1999 no herd size information was available. The summer 1999 photocensus indicated the herd had declined from the peak, which probably occurred in 1996.

Population Size

We conducted a photocensus of the MCH on 8 July 1999. Based on results of that survey, the population estimate for the MCH was 175,000 (Table 1). No aerial photocensus was conducted during the postcalving aggregation in June/July 2000. The MCH has probably declined as indicated by the 1999 estimate, but at the same time caribou distribution during the summers has become more widespread. It is possible that MCH caribou in other parts of southwest Alaska were not included in the 1999 census.

Population Composition

We conducted a sex and age composition survey in the middle Nushagak River drainage on October 2, 1998. In 1999, composition surveys were conducted in the headwaters of the Kanektok and Goodnews Rivers (in GMU 18) on October 12 and in the middle Nushagak River drainage (GMU 17B&C) on October 20. Composition data from the 1999 surveys were pooled. (Table 2).

The fall bull:cow ratio consistently remained greater than the minimum objective of 35:100 until 1999 (Table 2). During the fall 1999 surveys, 52.3 bulls:100 cows were counted in the sample of 1,865 caribou in GMU 18. Only 19.1 bulls:100 cows were observed in the sample of 2,866 caribou in GMU 17B&C. The 1999 survey in GMU 17 occurred on October 20, and bulls were observed separate from the large groups. It is likely that the rut was already over by then, and only a minimum count of bulls obtained. The caribou located in GMU 17 were also subject to heavier hunting pressure during fall 1999 than the caribou in GMU 18, which could have contributed to the decreased bull:cow ratio.

The fall calf:cow ratio remained consistently greater than 30:100 until 1999 (Table 2). Unlike the 1999 survey results for the bull:cow ratio, the proportion of calves in both the GMU 18 sample (16.9 calves:100 cows) and GMU 17 sample (14.1 calves:100 cows) were similar.

Productivity Surveys

Productivity surveys were flown during May 2000. A total of 23 radiocollared cow caribou that were of calf-bearing age, five 2-year old females (radioed as calves in October 1998), and nine 1-year old females (radioed as calves in April 2000) were located. Of the 23 adult cows, 16 were accompanied by calves, 5 had hard antlers but no calves, one had no antlers and no calf, and one cow was not visually observed. Presence of hard antlers during calving is generally considered evidence that the adult cow is pregnant. It appears that 21 of 22 radiocollared adult cow caribou in the MCH produced calves in May 2000.

Distribution and Movements

The MCH has continued to increase its range even after its apparent peak in population size in 1996. To follow the movements of the herd, we had 52 caribou with radio collars that were active in July 2000. These included collars deployed in the Kilbuck caribou herd range 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 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 that 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 GMU 18 southwestern GMU 19B in increasing numbers.

The MCH did not move into the above described traditional wintering areas en mass during this reporting period but scattered throughout their range and beyond into previously unused land. During the falls of 1998 and 1999, large numbers of Mulchatna caribou traveled through

northwestern GMU 17A and southwestern GMU 19B, into the Kuskokwim Mountains, and eventually into GMU 17A and GMU 18. The greatest part of the herd wintered in GMU 18, south of the Kuskokwim River. Movement into these nontraditional wintering areas has probably decreased pressure on the forage supply in the more typical wintering areas. Another 10-20,000 caribou spent most of the winter of 1999/2000 in southern GMU 9B and southeastern GMU 17B, near the traditional wintering area.

Calving Areas. The MCH has changed its calving areas 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 were also observed in the Jack Rabbit and Koktuli Hills, Mosquito River, and the Kilbuck Mountains. In 1992 only 10,000–15,000 adult female caribou were along the upper Mulchatna River, and fewer than 1000 were in the Bonanza Hills area. 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, northeast 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. Most of the calving during 1999 occurred in an area within a 50-mile radius of the village of Koliganek. Calving during spring 2000 occurred in two distinct areas. An estimated 40-50,000 caribou in the lower Nushagak River, and an additional 60-70,000 caribou in the headwaters of the South Fork of the Hoholitna River.

Seasonal Movements. In May 1998 most of the cows in the MCH had once again returned from being scattered throughout western Alaska to calve in the area drained by the King Salmon River and Klutuspak Creek. By late June, most of the herd had moved eastward through the Nushagak Hills, through the Mosquito River drainage, and northeast up the Mulchatna River to the Bonanza Hills. On July 6, 1998 almost the entire herd was in the Snipe Lake-Twin Lakes–Telaquana Lake area. From mid-July through early August 1998, most of the MCH moved from the area east of the Mulchatna River, southeast into the lower drainage of the Nushagak River. By mid-August 1998, caribou were moving northward from the lower Nushagak River area and scattering throughout GMU 17B. Large numbers of caribou had also moved westward, into GMU 18 by mid-September. During fall and winter of 1998, Mulchatna caribou were scattered throughout northern GMU 17 and in GMU 18 south of the Kuskokwim River. By mid-April 1999, Mulchatna caribou started moving toward the calving area for that year, in southern GMU 17B and northern 17C. During mid-June most of the MCH moved through the Nushagak Hills, and by early July were in the Snipe Lake-Twin Lakes–Telaquana Lake area. The summer 1999 photocensus occurred while most of the herd was northeast of Lake Clark. Similar to the previous year, most of the caribou moved down into the lower Nushagak River drainage by late July 1999, and then northward throughout August. Mulchatna caribou were widely scattered throughout northern GMU 17, southern GMU 19B, and central GMU 18 during fall 1999. Most of the herd had moved over into GMU 18 by mid-October 1999, though there were at least 50,000 south of the village of Koliganek in GMU 17B. Some caribou wintered north and west of Iliamna Lake, but the major part of the herd spent winter 1999-2000 in GMU 18 south of the Kuskokwim River and GMU 17A. During mid-April 2000, large numbers of Mulchatna caribou traveled eastward from GMU 18, through the Wood River-Tikchik Lakes system to the calving

areas in the lower Nushagak River in GMU 17C and headwaters of the South Fork of the Hoholitna River in southern GMU 19B. By mid-summer 2000, most of the herd had moved through the Nushagak Hills and were heading eastward towards the Alaska Range north of Lake Clark.

Several peripheral groups appear to be independent from the main MCH. A group of about 1300 caribou resides between Portage Creek and Etolin Point. Caribou in the Kilbuck Mountains and in Rainy Pass seem distinct from the MCH, but there is overlap during the year. Radiotelemetry data confirmed another group that resides in the upper Stuyahok and Koktuli River drainages (Van Daele and Boudreau 1992, Van Daele 1994). These subherds periodically intermingle with the main herd, but they typically remain within their traditional ranges.

MORTALITY

Harvest

Season and Bag Limit. The hunting season for caribou in the area used by the MCH is August 1 through April 15 in Units 9B, 17B, 17C (east of the Wood River and Wood River lakes), 19A (south of the Kuskokwim River), and 19B. The bag limit for resident hunters is 5 caribou; however, no more than 2 can be bulls in Units 19A and 19B, and no more than 2 can be bulls from October 1 through November 30 in Units 9B, 17B, and 17C. The bag limit for nonresidents is 2 caribou. Unit 17A, the western portion of Unit 17C, and Unit 18 south of the Yukon River may be opened by emergency order when sufficient numbers of Mulchatna caribou enter those areas. Hunters may take caribou the same day they have been airborne from January 1 through April 15 in Units 9B, 17B, and that portion of Unit 17C east of the Nushagak River.

Board of Game Actions and Emergency Orders. During their spring 1999 meeting, the Alaska Board of Game added the MCH to the list of caribou herds considered important for high levels of human consumptive use for intensive management purposes. Three Emergency Orders for hunting Mulchatna caribou were issued during the 1998-99 regulatory year. An Emergency Order effective September 5, 1998 through March 31, 1999 opened caribou hunting in GMU 18 south of the Yukon River. An Emergency Order effective November 10 through December 15, 1999 opened caribou hunting in GMU 19D (excluding the Nixon Fork drainage). An Emergency Order effective November 14, 1998 through March 31, 1999 opened caribou hunting in GMU 17A west of the Togiak River and north of Pungokepuk Creek. One Emergency Order was issued in 1999, effective September 17, 1999 through March 31, 2000 opening caribou hunting in GMU 17A west of the Togiak River and north of Pungokepuk Creek, and in GMU 18 south of the Yukon River.

Hunter Harvest. The reported harvest from the MCH was 4,770 caribou during the 1998/99 hunting season and 4,467 during 1999/00 (Table 3). These totals and the number of hunters reporting hunting Mulchatna caribou increased from the previous several years, however 1998/99 was the first year reminder letters were sent to caribou hunters who had not returned harvest report cards. Distribution of the caribou during falls of 1998 and 1999 made hunting more difficult than in previous years. Several air taxi operations reported they informed hunters that caribou were not readily accessible from their base of operations and returned deposits. As in previous years, males composed most of the harvest each year (82% and 76%).

The unreported harvest for each year during this reporting period was estimated at an additional 5,000. This number should be viewed with some caution though. While reminder letters were sent to caribou hunters these years, caribou distribution likely resulted in increased hunting effort by village residents of GMU 18, who might be less likely to use harvest cards.

Most of the unreported harvest was attributed to local and other Alaska residents. Subsistence Division household surveys conducted in local villages from 1983 to 1989 indicated an estimated annual harvest of 1318 caribou (P. Coiley, ADFG-Subsistence, Dillingham). The number of caribou harvested by local residents has undoubtedly increased since the subsistence surveys because of increases in the range of the herd and number of people living in the surrounding villages. Unreported harvest by other Alaska residents is more difficult to quantify.

From the early 1980s through 1995, there was a steady increase in the number of caribou hunters in the range of the MCH during the fall season, 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-1990s, unpredictable caribou distribution caused decreased hunting effort in the areas traditionally considered used by the MCH. Increased reported hunting effort during this reporting period is probably the result of better reporting by hunters as well as an actual increase in hunting activity due to public knowledge of the size of the herd and widespread distribution.

Hunter Residency and Success. Nonresidents made up 56% of the reporting hunters during the 1998/99 season and 56% of the reporting hunters during 1999/00. Nonlocal Alaska residents accounted for 36% and local residents 8% of the hunters who returned harvest reports for 1998/99. In 1999/00 nonlocal Alaska residents accounted for 36%, and local residents 7% of hunters who returned harvest reports. Of the reporting hunters, 78% successfully harvested at least 1 caribou in 1998/99, and in 1999/00 72% were successful (Table 4).

Harvest Chronology. Most (80%) of the reported harvest in 1998/99 occurred during August and September, as did 76% in 1999/00. March was also an important month for harvesting caribou, accounting for 7% in 1998/99 and 8% in 1999/00 of the reported harvest and a large portion of the local unreported harvest. These data are comparable to the harvest chronology reported for previous years (Table 5).

Transport Methods. Aircraft were the most common means of hunter transport during the 1998/99 (82%) and 1999/00 (85%) hunting seasons (Table 6). Boats and snowmachines were other important means of transportation and were the main transportation methods for local hunters. These transport methods were probably underreported in our harvest data.

Other Mortality

There were several observations and reports of wolf and brown bear predation on caribou during this reporting period. Predation rates on MCH have traditionally been low, but are probably increasing. Many local residents report increasing wolf numbers. A growing number of hunters along the Nushagak and Mulchatna Rivers reported having encounters with brown bears, including bears on fresh kills, on hunter-killed carcasses, and on raids in hunting camps. It appeared that individual bears were learning to capitalize on a newly abundant autumn food source. During fall 1998, reports of limping and dead caribou in the Mulchatna River drainage were received. Four caribou were collected and samples submitted for laboratory analysis. The

Washington State University Veterinary Pathology Lab was able to culture *Fusobacterium necrophorum* from tissue submitted. This bacterium causes *necrobacillosis*, or foot rot. An unknown number of caribou undoubtedly died during this short-lived outbreak of footrot, but the overall effect on the herd was probably negligible. No similar outbreak was reported the following year. The reason for the marked decline in the fall 1999 calf:cow ratio is unknown. A subjective estimate during June 1999 indicated calf numbers and proportions similar to previous years. The survey conducted in October 1999 resulted in the lowest calf:cow ratio observed in this herd to date.

HABITAT

Assessment

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

Portions of the range are showing overt signs of heavy use. Extensive trailing is evident along migration routes. Some of the summer/fall range near the Tikchik Lakes is trampled and heavily grazed. Traditional winter range on the north and west sides of Iliamna Lake is also showing signs of heavy use. Many of the areas that the MCH is moving into have not been used by caribou for over 100 years, or reindeer for over 50 years. These areas appear to have vast quantities of essentially virgin lichen communities.

CONCLUSIONS AND RECOMMENDATIONS

The minimum postcalving population estimates increased from 18,599 in 1981 to 192,818 in 1996, and declined to 175,000 in 1999. In 1994 the herd surpassed the Porcupine caribou herd in size, making the MCH the second largest caribou herd in the state. Distribution of this herd continued to expand throughout this period. Fall composition counts in 1998 indicated good calf production, while counts in fall 1999 indicated poor calf production or survival.

The total reported harvest and the number of hunters afield steadily increased through 1995, while annual harvests remained at less than 5% of the population. Decreases in the reported number of hunters during the preceding reporting period indicated an even smaller percent harvest. Increased reported hunting effort during this reporting period indicates that harvests remained at less than 6% of the herd. However, a better assessment of unreported harvest would be important if the herd begins to decline substantially. The MCH is 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, has made this herd increasingly popular with hunters. However, the mobility of the herd and the inaccessibility of much of its range to hunters make hunting logistics challenging.

During the past 15 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. Their range now encompasses more than 60,000 mi.^{2}, and large portions of the herd are pioneering new winter and summer ranges in good to excellent caribou habitat. There is

some evidence of localized overuse of habitat in some portions of the range, but most of the areas used by the MCH seem to be in good condition.

The tremendous growth rate of this herd continued to at least 1996, then the population experienced an apparent decline. Sign of stress in this herd might include the outbreak of footrot in 1998 and/or the decreased calf:cow ratios in fall 1999. Caribou in the adjacent NAPCH had a high incidence of lungworms in 1995 and 1996. We should continue to monitor the herd closely to watch for indications of continued population decline. Hunting regulations in most of the MCH range should remain liberal to take advantage of the meat resource available from this herd. The department should continue to assist hunters and air taxi operators by providing up-to-date information on the herd dynamics and distributing educational materials on caring for caribou meat while in the field.

Increased harvest pressure on the MCH is also affecting other big game populations in the area. Moose populations near villages are experiencing less pressure, and illegal moose harvests may be decreasing as local hunters increase their use of caribou meat. However, the increased number of caribou has also attracted more nonlocal hunters interested in "combination hunts." Consequently, the overall moose harvest in Unit 17 has doubled in the past 10 years. The Board of Game addressed this issue by imposing stricter bag limits on moose hunters in Unit 17 in an effort to divert hunting pressure away from the moose and onto caribou.

The MCH presents new management challenges as its size and range change. Since the main portion of the herd is migratory, using areas from the western slopes of the Alaska Range to the Kuskokwim and Yukon Rivers, it seasonally occupies ranges used by smaller resident caribou herds. These subherds, 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 larger, more established herds as they move into the southern fringes of the Western Arctic caribou herd range and the northern portion of the NAPCH range. We should strive to recognize the impacts on these potentially unique demographic components when setting management objectives and proposing regulatory formulas.

Recommended management actions for the next few years include:

1 Conduct a biannual photocensus of the MCH during postcalving aggregations;

2 Conduct composition surveys annually during October. Sample sizes should be at least 5% of the estimated herd size and at least 2 distinct areas should be sampled;

3 Collect a sample of at least 10 yearling female caribou from the main winter range of the MCH each October or April to investigate body condition;

4 Conduct calving surveys in May of each year;

5 Monitor the movements of the MCH by locating radiocollared caribou at least 6 times each year;

6 Maintain at least 1 active radio collar per 2000 caribou in the MCH;

7 Develop an improved method of collecting harvest data, including unreported harvest;

8 Continue to work with other land and resource management agencies and landowners on MCH management activities and directions; and,

9 Work with local advisory committees and the state and federal boards to coordinate MCH hunting regulations with those for adjacent herds and develop contingency plans for managing the herd when the population begins to decline to low levels.

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Table 1 Mulchatna caribou herd estimated population size, 1991/92–1999/00

Regulatory year	Date	Preliminary estimate[a]	Minimum estimate[b]	Extrapolated estimate[c]
1991/92	July 2, 1991	60,851	--	90,000
1992/93	July 7/8, 1992	90,550	110,073	115,000
1993/94	--	--	--	150,000
1994/95[d]	June 28/29, 1994	150,000	168,351	180,000
1995/96	--	--	--	190,000
1996/97	June 28 - July 3, 1996	200,000	192,818	200,000
1997/98	--	--	--	--
1998/99	--	--	--	--
1999/00	July 8, 1999	160-180,000	147,012	175,000

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

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

[c] Estimate based on observations during census and a subjective estimate of the number of caribou in areas not surveyed.

[d] Although this survey was actually conducted in the 1993/94 regulatory year, it should be considered a 1994/95 estimate.

Table 2 Mulchatna caribou fall composition counts and estimated population size, 1991/92–1999/00

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Small bulls (% of bulls)	Medium bulls (% of bulls)	Large bulls (% of bulls)	Total bulls (%)	Composition sample size	Estimate of herd size[a]
1991/92	---	---	---	---	---	---	---	---	---	90,000
1992/93	---	---	---	---	---	---	---	---	---	115,000
1993/94	42.1	44.1	23.7%	53.7%	---	---	---	22.6%	5,907	150,000
1994/95	---	---	---	---	---	---	---	---	---	180,000
1995/96	---	---	---	---	---	---	---	---	---	190,000
1996/97	42.4	34.4	19.5	56.6	49.8	28.5	21.7	24.0	1,727	200,000
1997/98	---	---	---	---	---	---	---	---	---	--
1998/99	40.6	33.6	19.3	57.4	27.8	43.7	28.5	23.3	3,086	--
1999/00	30.3	14.1	9.8	69.3	59.8	26.3	13.8	21.0	4,731	175,000

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

Table 3 Mulchatna caribou harvest and accidental death, 1991/92–1999/00

	Hunter Harvest								
Regulatory	Reported				Estimated				Total
year	M (%)	F(%)	Unk.	Total[a]	Unreported	Illegal	Total	Accidental death	caribou
1991/92	86%	13%	1.1%	1,573	1,700	--	1,700	--	3,273
1992/93	74%	9%	17%	1,602	1,800	--	1,800	--	3,402
1993/94	80%	20%	0.4%	2,804	2,000	--	2,000	--	4,804
1994/95	78%	21%	0.7%	3,301	2,700	--	2,700	--	6,001
1995/96	75%	24%	0.6%	4,449	2,800	--	2,800	--	7,249
1996/97	78%	21%	1.0%	2,366	2,200	--	2,200	--	4,566
1997/98	84%	15%	0.6%	2,704	2,400	--	2,400	--	5,104
1998/99[b]	82%	17%	1.0%	4,770	5,000[c]	--	5,000	--	9,770
1999/00	76%	23%	1.0%	4,467	5,000[c]	--	5,000	--	9,467

[a] Includes only reported harvest from harvest cards

[b] First year that reminder letters were sent to caribou hunters

[c] Also includes minimum suspected unreported harvest from GMU 18

Table 4 Mulchatna caribou annual hunter residency and success, 1991/92–1999/00

Regulatory year	Successful				Unsuccessful				Total hunters[a]
	Local resident	Nonlocal resident	Nonresident	Total (%)	Local resident	Nonlocal resident	Nonresident	Total (%)	
1991/92	89[c]	562	599	85%	9	136	69	15%	1,464
1992/93	82[c]	542	651	91%	12	82	26	9%	1,391
1993/94	47[c]	718	725	86%	5	171	77	14%	2,394
1994/95	61[b]	812	896	85%	11	227	124	15%	2,954
1995/96	52[c]	1,035	928	87%	15	188	86	13%	3,127
1996/97	56[c]	647	824	85%	25	139	101	15%	1,822
1997/98	85[c]	564	1,277	84%	33	178	152	16%	2,301
1998/99	178[c]	1,130	1,877	78%	142	320	414	22%	4,131
1999/00	174[c]	1,024	1,697	72%	120	453	553	28%	4,140

[a] Includes hunters of unknown residency, and hunters who reported harvesting more than one caribou.

[b] Includes residents of Game Management Unit 17.

[c] Includes residents of communities within the range of the Mulchatna Caribou Herd.

Table 5 Mulchatna caribou annual harvest chronology percent by month, 1991/92–1999/00

Regulatory year	Harvest Periods									
	August	September	October	November	December	January	February	March	April	Total[a]
1991/92	29%	43%	6%	0.4%	2%	1%	4%	12%	0%	1,573
1992/93	30%	54%	5%	1%	0.3%	0.2%	1%	8%	0%	1,602
1993/94	36%	50%	5%	0.4%	1%	1%	1%	5%	2%	2,804
1994/95	35%	50%	5%	0.4%	1%	1%	1%	5%	2%	3,301
1995/96	33%	50%	6%	1%	2%	1%	1%	5%	2%	4,449
1996/97	25%	52%	5%	1%	1%	1%	2%	11%	2%	2,366
1997/98	33%	53%	4%	0.3%	0.4%	1%	3%	4%	0.3%	2,704
1998/99	25%	55%	6%	0.6%	0.6%	2%	2%	7%	1%	4,770
1999/00	24%	52%	5%	0.5%	1%	3%	5%	8%	2%	4,467

[a] Includes unknown harvest date

Table 6 Mulchatna caribou harvest percent by transport method, 1991/92–1999/00

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%	1,573
1992/93	88%	0.2%	8%	3%	3%	0.1%	0.1%	0%	1,602
1993/94	86%	1%	10%	1%	2%	0.3%	1%	0%	2,804
1994/95	85%	0.2%	12%	1%	2%	--	0.2%	0.2%	3,301
1995/96	88%	0.2%	9%	1%	2%	0.1%	0.1%	--	4,449
1996/97	82%	0.4%	10%	2%	3%	0.3%	0.7%	1%	2,366
1997/98	86%	0.4%	8%	1%	2%	0.1%	0.2%	2%	2,704
1998/99	82%	0.1%	10%	2%	3%	0.1%	1%	1%	4,770
1999/00	85%	0.3%	6%	2%	5%	0.2%	0.7%	1%	4,467

[a] Includes harvest by unknown transport method

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

Herd: Northern Alaska Peninsula

GEOGRAPHIC DESCRIPTION: Alaska Peninsula

BACKGROUND

The Northern Alaska Peninsula caribou herd (NAPCH) ranges throughout Subunits 9C and 9E. Historically, the size of this population has fluctuated widely, reaching peaks at the turn of this century and again in the early 1940s (i.e., 20,000 caribou). The last population low was during the late 1940s (i.e., 2000 caribou), by 1963 the herd had increased to over 10,000 animals (Skoog 1968). The first radiotelemetry-aided census in 1981 estimated 16,000 caribou; by 1984 the herd had increased to 20,000.

During the next several years, indicators such as the noticeable depletion of lichens and movements across the Naknek River were evidence that the traditional wintering area was overgrazed. In 1986 significant numbers of NAPCH 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 NAPCH 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 both herds intermingled near Naknek and King Salmon, winter hunting pressure along the road system grew rapidly, and it became impossible to apportion the reported harvest between the 2 herds. 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 NAPCH should be maintained at the lower end of the management objective (i.e., 15,000). During 1992–93 and 1993–94, harvests along the King Salmon road and trail system peaked, and many local residents complained about problems (wounded animals, gut piles, etc.) associated with a multiple bag limit hunt on the road system. Despite these problems, we viewed the large harvests as beneficial to reduce the NAPCH herd to 15,000 and to utilize the Mulchatna animals in the area. During 1993–94, the record harvest of 1345 caribou and natural mortality estimated at >30% combined to reduce the NAPCH to 12,500 by June 1994. The herd has continued to decline through this reporting period.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Based on the history of this herd and the long-term objective of trying to maintain the NAPCH at a relatively stable level, we recommend reducing the midsummer population objective of 15,000–20,000 caribou to 10,000–12,000 with an October sex ratio of at least 25 bulls: 100 cows.

METHODS

POPULATION SIZE

In late June 1997, 1998, and 1999 we used an R-22 helicopter and fixed-winged aircraft to conduct radiotelemetry-aided aerial photocensuses on postcalving concentrations. We took oblique 35mm photos of large groups to allow accurate enumeration. In addition, the Fish and Wildlife Service (FWS) surveyed peripheral areas along the Aleutian Mountains and Pacific coast. We determined the percent calves by direct enumeration or close-up photos of larger herds taken from the helicopter. We weighted the results by herd size to estimate total productivity.

POPULATION COMPOSITION

We conducted sex and age composition surveys with a helicopter in October and classified caribou throughout their entire distribution between the Naknek River and Port Moller. Caribou were classified as calves, cows, small bulls, medium bulls, and large bulls.

PARTURITION SURVEYS

During 31 May–1 June 1997 and 1998 and 3–5 June 1999, we used an R-22 or R-44 helicopter to classify caribou on the calving grounds as parturient cow (with calf, hard antlers or distended utter), nonparturient cow, yearling, or bull (Whitten 1995). We also observed radiocollared females to document their age-specific pregnancy rate. During 29 May–30 June 1998, we conducted a study on natality and early calf mortality (Sellers et al. 1998*a*).

RADIOTELEMETRY DATA

We scheduled capture operations to maintain 25–30 functioning radio collars in the NAPCH. In April 1997 we used an R-22 helicopter to dart 14 female calves and 4 female yearlings. In October 1998, in a cooperative project with the FWS, we fitted 19 female calves and 2 female yearlings with standard radio collars (Sellers et al. 1998*b*). We also captured 6 adult females just north of Port Moller and fitted them with satellite collars. In October 1999 we captured 11 female calves (10 were fitted with standard radio collars) and 1 adult female (fitted with a satellite collar). We recorded standardized measurements, took blood samples, and radiocollared the calves. We periodically conducted radiotelemetry flights to monitor herd movement and survival rates of collared caribou.

HERD CONDITION

In addition to weights and measurements of captured caribou, we collected 10 female calves in October 1996, 1997, and 1998 to obtain measurements and samples to assess body condition (Valkenburg et al. 1996, Valkenburg et al. in press). We noticed “pinhead” hemoragic lesions on a majority of lungs, so we collected several samples for submittal to a veterinary pathology lab. In late June 1998, we found and dispatched 2 debilitated calves in the Ilnik calving area and found 1 other that had recently died. All 3 were sent to the Washington Animal Disease Diagnostic Laboratory at Washington State University for necropsy.

MORTALITY

The harvest was monitored by harvest ticket reports through 1998/99 and by Tier II permits during 1999/00. A cooperative (FWS; ADF&G, Subsistence Division; and Bristol Bay Native Association) harvest survey was conducted in villages in 9C and 9E for the 1994/95 through 1996/97 hunting seasons.

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 photocensuses 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 actual postcalving count dropped from a minimum of 16,500 in 1992 to 15,000 in 1993. The 1994 postcalving count, which involved extended coverage of fringe areas, only tallied 12,000 caribou. The herd began a decline in 1992, although at first the decline was not viewed with alarm because the herd was at the desired level. We anticipated that harvest pressure would decline due to liberalized regulations for the growing Mulchatna herd and closure of the King Salmon Air Force Base. Despite a series of hunting restrictions implemented starting in 1994 which did significantly reduce harvests, the herd has continued a gradual decline.

Population Size

Over the past 14 years, the size of the NAPCH has been reported in 2 ways: the actual number of caribou counted during the postcalving photocensus, rounded to the nearest 100, and an estimated total herd size which included 1000 to 1500 "uncounted" caribou believed to be in fringe areas. Since 1995, staff of the Alaska Peninsula/Becharof Refuge have 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 obtained from photocensuses in previous years. The same cooperative counts were conducted in 1997, 1998, 1999, and 2000, with total estimates of 10,000, 9,200, 8,600, and 7,200 (Table 1), respectively.

Population Composition

During 1970–80 when the NAPCH was growing, the average fall ratio was 50 calves:100 cows (range = 45–56). During 1981–94, the fall ratio varied from 27 to 52 calves:100 cows and averaged 39. During 1995-98 the ratio averaged 30 (range = 24–38) calves:100 cows. During 1999 and 2000 we only counted 21 and 18 calves:100 cows (Table 1).

From 1990 to 1997, the bull:cow ratio averaged 42:100 (range 34–38); but since 1998 the ratio has dropped to an average of 36 bulls:100 cows (Table 1).

Distribution and Movements

The NAPCH's primary calving grounds are in the Bering Sea flats between the Cinder and Bear Rivers. Traditionally, this herd wintered between the Ugashik and Naknek Rivers. Beginning in 1986 many caribou wintered between the Naknek River and the Alagnak River. They even went as far north as Big Mountain and upper Kaskanak Creek on both sides of Lake Iliamna, where they have intermingled with a portion of the Mulchatna herd. During the 1999–2000 winter, a substantial number of the NAPCH wintered north of the Naknek River, but few Mulchatna animals moved into the Naknek drainage.

MORTALITY

Harvest

Season and Bag Limits. The 1996–97 and 1997–98 resident seasons in Unit 9C were 10 August to 31 March with a bag limit of 4 caribou, not to include more than 1 cow. Seasonal limits were not more than 2 from 10–31 August, 1 during September–November and only by a hunter who had not previously taken a caribou, and after November 30 not more than 1 caribou could be taken per calendar month. In Unit 9E the resident bag limit was also 4 caribou, not to include more than 1 cow. Within the Pacific drainages of 9E southwest of Seal Cape, which opened on July 1, the bag limit was 2 bulls until August 10, after which either sex could be taken. In all of 9E the bag limit was 1 caribou during September–November. From 1–30 April the limit was 2 caribou. The 1996–97 and 1997–98 nonresident seasons in both 9C and 9E were 10 August to 31 October with a 1 bull limit.

Board of Game Actions and Emergency Orders. In response to the results of the 1998 post-calving census that indicated a continuing decline in the NAPCH, the department and the Naknek/Kvichak Fish and Game Advisory Committee requested an emergency meeting of the Board of Game in August. Other communities in 9E soon joined the call for reductions in the upcoming season. During a teleconference meeting on 11 August 1998, the Board curtailed the seasons and bag limits as follows: The resident bag limit was reduced to bulls only in both 9C and 9E. The nonresident season was closed in both 9C and 9E during 5–20 September, and in 9E the nonresident season was closed during October.

In March 1999 the Board of Game reviewed the status of the NAPCH and, with considerable public involvement, decided to institute a Tier II hunt with a 1 bull bag limit for the Naknek drainage portion of 9C and all of 9E. The Tier II hunt dates were August 10–September 20 and November 15–February 28 (in the Naknek Drainage) and November 1–April 30 in 9E.

Hunter Harvest. The 1998–99 reported harvest was 490 caribou, comprising 94% males, despite the bull-only bag limit. We believe that the emergency action by the Board of Game to reduce the nonresident harvest (see below) and the extra effort to apprise village residents of the herd's decline has increased the level of reporting by all hunters. If correct, this change in reporting compliance makes extrapolating the total harvest problematic. Based on the lower availability of caribou to villages and reduced effort by nonlocal hunters, the harvest probably did not exceed 1000 caribou. During the 1999/2000 season, Tier II hunters reported killing 147 males and 8 illegal females (Table 2).

Hunter Residency and Success. The Board of Game's emergency action curtailing the nonresident season in 1998 created a major change in distribution of reported harvest among users for 1998–99 compared to previous years. Nonresidents and nonlocal residents only accounted for 29% and 28% of the reported harvest (Table 3). When unreported harvest is factored in, it is likely that local residents accounted for 70% of the harvest. Under the Tier II hunt in 1999–2000, 68% of those that reported hunting were successful, and local hunters took 97% of the reported harvest.

Harvest Chronology. September has historically been the most important month, especially for nonresidents, because of the combination of relatively good weather conditions, the best chance to harvest a trophy bull, and relatively easy access by boat and aircraft. The subsistence harvest has been primarily opportunistic, and chronology of harvests varies between villages depending upon caribou availability.

In 1998–99 a higher percentage of the harvest was taken during winter due to restrictions in the fall nonresident season and favorable travel conditions during that winter (Table 4). Under the 1999–2000 Tier II permit hunt, September still accounted for the highest harvest, but by a far smaller margin than in previous years.

Transportation Methods. Prior to 1999 airplanes were the most important method of transportation reported from harvest tickets (Table 5). The emergency curtailment of the fall 1998 season reduced the proportion of reported harvest attributed to aircraft transportation. Under the Tier II hunt in 1999, the importance aircraft dropped dramatically. The level of snowmachine use varies annually depending on snow conditions.

Other Mortality

The radio collars placed on the NAPCH cows were designed to facilitate annual postcalving photocensuses, so mortality censors were not used in some transmitters. Telemetry flights were sporadic. These 2 factors 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 in recent years. From October 1980 through March 1984, the average annual mortality rate was approximately 7%. During the next 4 years the annual mortality rate averaged 18%. Annual mortality rates, using modified Kaplan–Meier procedures, from 1992 to 1998 were 29%, 35%, 20%, 19%, 20%, and 24%, respectively. In October 1998, 19 calves and 2 yearlings were collared throughout the range of the NAPCH, and by June 1999 71% were dead. Because radio collars were not retrieved until June 1999, evidence of the cause of death was scant, but most deaths from the NAPCH were on winter range, ruling out bear predation in most cases. Evidence of wolf activity was

present at several carcasses, but we could not confirm whether predation or merely scavenging occurred. Seven of 8 (87%) calves collared in October 1999 died during the following year. Only 2 of 9 (22%) collared caribou older than calves died during the same period.

We reported the results of a calf mortality study conducted during June 1998 in Sellers et al. 1998*a*. During the first month of life, 35% of radiocollared calves (n = 37) died. 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.

HABITAT AND ANIMAL CONDITION

Assessment

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 receives minimal use by caribou (R. Squibb, FWS, King Salmon pers commun).

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

Weights of neonate calves captured in 1998 and 1999 averaged 8.4 and 7.2 kg for males and females, respectively. These weights are intermediate compared to other herds in the state.

During 1995–98 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 are also intermediate, but a high percentage of these caribou showed lesions from lungworms. In October 1999 11 captured female calves weighted an average of 114.2pounds.

Age-specific productivity has also been monitored since 1997. This work has been reported by Valkenburg et al. (1996 and in press) and Sellers et al. (1998*a*, 1998*b*, 1999 and 2000). Overall, this work demonstrates that the NAPCH is under moderate nutritional stress. No 2-year-old females have produced calves (n = 25) and only 33% of 3-year-olds (n = 18) have been pregnant. Overall pregnancy rates are relatively low at less than 80%.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

A panel of caribou biologists chose this herd for experimental management because the NAPCH has been relatively stable for the past 30 years at a moderately high density and because of its importance to a variety of hunters. The panel proposed maintaining the population at 15,000–

20,000 indefinitely and closely monitoring the herd, including population composition, distribution, and animal condition.

Recent advances in monitoring the condition of caribou herds (P. Valkenburg, memo dated 4 January 1995) include collecting or radiocollaring only female calves. The rationale for handling female calves is that they better reflect range quality and weather stress because their body condition is more sensitive and is not influenced by maternal status as are adult cows. Additionally, collared female calves will provide data on age at first parturition, which has proven to be a good indicator of nutritional status. In conjunction with determining the age of first reproduction for radiocollared calves, parturition surveys conducted just before peak calving (K. R. Whitten, memo dated 3 January 1995) provide a measure of natality rate. These procedures were implemented for the NAPCH in 1995 and will be followed in the future.

During routine postcalving counts in 1995 and 1996, several recently dead calves were located and necropsied. Pneumonia, as evidenced by purulent abscesses in the lungs, was the apparent cause of death and was confirmed as bacterial bronchopneumonia by a diagnostic lab (R. Zarnke, pers commun). When we collected calves in October 1995–98, most calves exhibited numerous small pinhead hemorrhagic spots on the lungs. A veterinary pathology lab identified these as consistent with lungworm-induced pneumonia.

Given the potential for marginal nutrition and possible linkage to disease, it will be important to monitor the condition of NAPCH animals. Any indication of declining productivity should be detected immediately.

CONCLUSIONS AND RECOMMENDATIONS

The NAPCH has continued to decline below the population objectives, and further significant declines are an ongoing concern. Harvests and population parameters need to be monitored closely. The NAPCH has been designated a population important for high levels of human consumption. Governed by the state's Intensive Management law, a review of intensive management options was triggered in March 1999 when the Board of Game significantly reduced harvest under a Tier II permit hunt. This review occurred in October of 1999. A new long-term population objective of 12,000 to 15,000 animals has been recommended to the Board of Game. To minimize the ongoing decline of this herd, harvests, particularly of cows, must be reduced. The number of Tier II permits was reduced from 600 in 1999 to 400 in 2000. Additional cuts in the number of these permits may be necessary depending on estimates of herd size, productivity and the bull:cow ratio.

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Table 1 NAP caribou fall composition counts and estimated population size, 1985–1999.

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
1970	48	46	23							
1975	33	45	25							10,340
1978	48	55	25							
1980	53	56	27							
1981	34	39	23							
1982	43	52	26					22	1,392	18,000
1983	39	27	16		51	25	24	24	1,410	19,000
1984	39	39	22		67	16	17	22	1,087	20,000
1986	51	34	18	54				27	2,540	17,000
1987	54	51	25	49	51	32	17	26	1,536	17,000
1988	49	48	26	51	46	34	20	25	1,156	20,000
1989[a]			20						2,934	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	17	24	1,083	7,200

[a] Composition survey from fixed-wing aircraft

Table 2 NAPCH harvest, 1995–99

Regulatory YEAR	Hunter harvest: Reported M (%) TOTAL[A]	F (%)	UNK.	TOTAL	Estimated UNREPORTED	Estimated
1995/96	486 (91%)	47 (9%)	0	533	1,000-1,100	1,500-1,600
1996/97	438 (91%)	43 (9%)	0	481	1,100-1,300	1,600-1,700
1997/98	446 (92%)	36 (8%)	0	482	900-1,000	1,300-1,400
1998/99	453 (94%)	31 (6%)	6	490	500	1,000
1999/00	147 (95%)	8 (5%)	0	155	45	200

[a] Estimated total is rounded off.

Table 3 NAP caribou annual hunter residency and success, 1995–99

Regulatory year	Successful: Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Unsuccessful: Local resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
1995/96	28	167	263	458 (76%)	13	74	58	145 (24%)	603
1996/97	55	131	222	408 (83%)	13	38	34	85 (17%)	493
1997/98	49	112	277	438 (78%)	14	57	56	127 (22%)	565
1998/99	145	136	140	421 (68%)	53	75	66	194 (32%)	624
1999/00	151	5	0	156 (68%)	72	3	0	75 (32%)	231

[a] Local residents are residents of Subunits 9A, 9B, 9C and 9E.

Table 4 NAP caribou annual harvest chronology percent by month 1995–99

Regulatory year	Harvest periods									
	August	September	October	November	December	January	February	March	April	*n*
1995/96	18	43	23	4	4	2	1	1	0	533
1996/97	19	36	21	4	5	6	3	4	0	477
1997/98	11	50	23	1	5	4	4	2	0	454
1998/99	16	31	12	6	8	8	8	6	1	490
1999/00	14	23	0	8	13	19	16	6	0	124

Table 5 NAP caribou harvest percent by transport method, 1995–99

Regulatory year	Percent of harvest						
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle
1995/96	57	0	19	13	0	1	9
1996/97	46	0	22	16	3	3	10
1997/98	53	0	21	15	4	2	5
1998/99	33	0	21	25	10	1	9
1999/00	3	0	15	52	19	2	10

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNITS: 9D and 10 (Unimak Island) (6,435 mi^2)

HERD: Southern Alaska Peninsula

GEOGRAPHIC DESCRIPTION: Southern Alaska Peninsula and Unimak Island

BACKGROUND

The range of the Southern Alaska Peninsula caribou herd (SAPCH) includes the Alaska Peninsula southwest of Port Moller and Unimak Island. There have been numerous reports of caribou moving between Unimak Island and the mainland, including what may have been a substantial emigration in 1976. Historically, the size of the SAPCH has varied widely, ranging from 500 to over 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 1975 to 1983 and decline from 1983 to 1996. Numbers of caribou on Unimak Island have also varied substantially, ranging from 5000 in 1975 to 300 during the 1980s.

Harvest of the SAPCH was fairly high from 1980–1985, probably exceeding 1000 in several years. Starting in 1986 restrictive regulations reduced harvests as the herd continued to decline. By 1993 the herd was below 2500 and all hunting was closed. Poor nutrition appears to have played a major role in the decline of the SAPCH. Predation by wolves and brown bears and human harvest may also have contributed to the decline (Pitcher et al. 1990).

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

A cooperative, interagency (the Department and the U.S. Fish and Wildlife Service [FWS]) management plan was adopted in April 1994. This plan sets the following population and management objectives:

1 Sustain a total population of 4000–5000 animals

2 Maintain a fall bull:cow ratio of 20–40:100

3 Discontinue harvest when the herd is below 2500 animals

4 Provide limited harvest of bulls when the herd exceeds 2500 animals as long as there are at least 20 bulls:100 cows

5 Phase in cow harvests when the population reaches 3500. If the population reaches 4000, harvests will be increased to prevent further growth.

METHODS

In most years since 1984, we conducted a postcalving aerial radiotelemetry survey in late June or early July. We periodically conduct fall sex and age composition surveys with a helicopter in October. Occasional radiotracking flights are used to monitor herd distribution. Staff of the Izembek National Wildlife Refuge (INWR) periodically conduct winter aerial counts along systematic transects. A study of causes of low calf recruitment in the SAPCH was completed during 1989–1990 (Pitcher et al. 1990), and range conditions were studied in 1991 and 1992 (Post and Klein 1999). We began parturition surveys in June 1997. In April 1997 and October 1998, in cooperative projects with the FWS, we captured and radiocollared females calves. In October 1998 we also captured 8 adult females in northeastern 9D and fitted them with satellite radio collars. During 1999, with substantial funding from the FWS, we conducted a study of caribou productivity and calf survival (Sellers et al. 1999).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Following a peak of over 10,000 caribou in 1983, the SAPCH began a precipitous decline. By 1993 the herd was below the 2500 threshold for which a cooperative department and FWS management plan specified all hunting was to be closed. The population appeared to stabilize during the mid 1990s, and then began to grow slowly through 1999.

Population Size

In February 1998 the FWS counted 3127 caribou within the core area in Unit 9D. No postcalving count was attempted in summer 1998. During 26–29 June 1999 I completed an expanded postcalving photo count of the SAPCH and counted 3612 caribou in Unit 9D. During 27–28 June 2000 I only counted 2,857 caribou despite locating all the functioning radiocollars.

On January 17, 1997 the FWS counted 603 caribou on Unimak Island. This has been the only comprehensive survey of Unimak Island in over 2 decades. On May 22, 2000 Rod Schuh, a registered guide who has hunter on Unimak for several years, counted 983 caribou on the north and west sides of Unimak Island. That count and the number classified during the October 2000 fall composition surveys suggest that there are over 1000 caribou on Unimak.

Population Composition

During the June 1997 postcalving count, approximately 15% of the 1844 caribou were calves. The fall helicopter survey in 1997 showed 12% (n = 686) calves (Table 1). Ratios were 42 bulls

and 19 calves per 100 cows. During June 1998 the FWS classified 518 caribou from a single herd estimated at 900 caribou at Black Hill and found 21% were calves. Considering that typically the caribou using the Caribou River Flats (CRF) are more productive than those near Black Hill/Trader Mountain (BHTM) (Pitcher et. al 1990, Sellers 1993, 1995), calf production in 1998 was higher than in most recent years. This was confirmed in October 1998 when a sample of 987 caribou was classified with ratios of 35 calves and 32 bulls per 100 cows.

Calves composed 26% of all caribou seen during the 1999 postcalving count. In June 2000, calves composed 28% of caribou seen on the Caribou River Flats (n = 1077) and 22% of 1780 caribou found elsewhere.

Fall composition surveys in 1999 showed a ratio of 25 claves:100 cows in 9D (Table 1). Productivity was higher on Unimak Island (46 calves:100 cows), but we only classified 126 caribou.

Distribution and Movements

Data from radiotracking surveys conducted by staff from both INWR and the department indicate that the SAPCH calves were in 2 main subgroups in separate areas (Pitcher et al. 1990). Approximately 25% of the herd calves on the CRF. 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 BHTM area and winters around Cold Bay. Further radiotelemetry studies will be needed to clarify the discreteness of the 2 major calving components of this population. Additionally, a few caribou calve in the mountains east of the CRF.

Since the early 1980s, caribou in Unit 9D have been presumed to be part of the SAPCH, and all caribou in Unit 9E have been counted as part of the Northern Alaska Peninsula caribou herd (NAPCH). During recent deliberations over whether a special federal subsistence hunt should be granted, local residents were skeptical about the fate of the SAPCH. Two general opinions, not withstanding the obvious contradiction, were voiced about why both our postcalving counts and the INWR winter surveys show a steady decline. Some members of the public contended that the herd had not declined at all and that the caribou were now using numerous valleys on the Pacific side of the Peninsula. The distribution of radiocollared cows does not support that claim. Conversely, other local residents claimed that the “missing” caribou simply migrated north into the range of the NAPCH. This theory does not explain how the NAPCH could have absorbed a significant number of SAPCH animals during a period when the NAPCH was declining. No radiocollared SAPCH animals have been located north of Unit 9D, but empirical evidence of this distinction has been scant because of the difficulty in collaring and following caribou in this remote part of the Alaska Peninsula.

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. As of June 2000, none of these caribou has moved from the unit where captured. Further tracking of these caribou is planned. Genetic testing for interbreeding among caribou in 9E, 9D, and Unimak Island is planned. 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 or Unimak Island during 1993–98. In 1999 a state hunt was resumed in 9D with a resident season from 1–20 September and 15 November–31 March, with a 1 caribou limit. A registration permit hunt was set for nonresident during 5–25 September, with a quota of 50 bulls.

Board of Game Actions and Emergency Orders. The Board of Game took no action during 1995–98. At the spring 1999 meeting, they reinstituted a state hunt for the 1999–00 season.

Federal Subsistence Board Actions. In 1997, following the FWS count of 3243 caribou in Unit 9D and 603 on Unimak Island, the Federal Subsistence Board (FSB) approved a special action request from the Kodiak–Aleutian Federal Regional Subsistence Advisory Council. They established a federal registration permit hunt for bull caribou, with a total of 100 permits distributed among villages in 9D (35 permits to King Cove, 35 to Sand Point, 15 to Cold Bay, and 15 to Nelson Lagoon) and 60 permits available in False Pass on Unimak Island. The 1997 season dates were set as 10 August to 31 March on Unimak Island and 10 November to 31 March in 9D. The department supported the hunt on Unimak but opposed the hunt in 9D because of continued low productivity, high natural mortality, the inexplicable jump in counts from 1995 and 1996 to the April 1997 survey, and the discrepancy between the April survey and 2 summer counts in 1997. The hunt proceeded, but due to poor weather and other factors, harvests by some villages were low. On 31 March 1998, King Cove made a Special Action Request to extend the season by an additional month. The FSB approved this request with no objection from the department.

During summer 1998, the FSB again considered and approved a Special Action Request to expand the federal subsistence hunt in 9D and on Unimak Island from 1 August through 31 March. The number of available permits was expanded for 9D and Unimak to 235.

Following the Board of Game's action in March 1999 to establish a general resident state season, the FSB dropped the federal subsistence hunt in 9D and later opened federal lands to nonlocal hunters.

Hunter Harvest. The reported harvests from the 1997-98 and 1998-99 federal subsistence registration hunts were 32 and 23, respectively, but the reporting rate averaged 60% for both years. No data is available for the number of caribou taken on Unimak Island under federal hunts during 1997-99. In 1999 under state regulations for 9D, 17 nonresidents obtained registration permits and killed 12 bulls. Local residents reported killing 28 caribou, including 24 bulls, and nonlocal hunters took 15 bulls and 4 cows in 9D.

Other Mortality

Annual survivorship of radiocollared adult females from the SAPCH was estimated at 0.61 from 1987–90, which was extremely low compared to other Alaska caribou herds (Pitcher et al. 1990). Causes of death were not determined, although predation by wolves and bears was suspected. Both predators were relatively abundant on the SAPCH range. During 1990–94 average annual survival rate of radiocollared caribou increased to approximately 0.86. This apparent reduction in

mortality may have reflected a younger average age of the collared caribou and reduced abundance of wolves after the 1990 rabies outbreak. Annual survival rates were 0.71 from June 1994 through May 1995 and 0.87 from June 1995 through May 1996. The survival rate for 13 calves and 1 yearling from October 1998 through June 1999 was 93%.

During June–August 1999, 66% of 49 radiocollared calves died of natural causes (Sellers et al. 1999). Wolves (*Canis lupus*) and brown bears (*Ursus arctos*) killed most of the calves for which the cause of death was determined.

HABITAT

Assessment

Observations before 1990 indicated that lichens were scarce throughout the range of the SAPCH and that spring phenology was later in Unit 9D than within the calving areas of the NAPCH in Unit 9E.

A preliminary analysis of fecal pellets showed very high use of mosses (Pitcher et al. 1990), possibly indicating poor range condition. Pitcher et al. (1990) reported that adult female caribou from the SAPCH were smaller and weighed less than cows from either the NAPCH or Mulchatna herds.

Caribou productivity appears higher on the Caribou River flats than within the Black Hills. Post and Klein (1999) rejected the hypothesis that this difference in productivity was related to winter range because caribou wintering on the Caribou River flats had similar diets to those caribou wintering nearer to Cold Bay. They concluded that earlier spring green-up and more abundant grasses, sedges, and forbs accounted for the higher calf production.

Female calves captured in October 1998 weighed about the same (117.8 lbs, SD = 9.2, n = 13) as calves from the NAPCH (115.8, SD = 12.2, n = 19). During June 1999 we weighed 54 neonatal calves from the SAPCH and 44 from the NAPCH. Male calves from the NAPCH sample were slightly heavier than males from the SAPCH (P = 0.09), but there was no difference for females (P = 0.36). Weights of calves from the SAPCH were significantly heavier (P = 0.09 for males and 0.01 for females) in 1999 than recorded in 1989 (Pitcher et al. 1990). There was no difference in average weights of SAPCH males or females from the CRF and the BHTM calving areas (P = 0.19 for males and 0.47 for females).

During early June 1989, 1997, and 1999, we conducted parturition surveys of the SAPCH. In all 3 years there was no difference in pregnancy rates between caribou located on the CRF and the BHTM areas. However, peak of calving occurred earlier on the CRF, where 30% of the parturient cows were accompanied by calves on 4 June, compared to 21% with calves on the BHTM area. Pregnancy rates were slightly higher in 1997 and 1999 than in 1989 when the herd was declining (Table 2).

Three-year-old radiocollared cows from the SAPCH were significantly more productive in 1999 (11 of 12 were pregnant and 9 were accompanied by calves) than were 3-year-olds from the NAPCH in 1998 and 1999. The high proportion of 3-year-olds in the SAPCH now producing

calves is consistent with other indications of better body condition, probably as a result of improving range.

CONCLUSIONS AND RECOMMENDATIONS

The rapid decline of the SAPCH is neither unusual in terms of the history of this herd nor is it inexplicable. The range of the SAPCH has probably never been exceptionally good, and the period of record high numbers of caribou during the late 1970s and early 1980s undoubtedly depleted the preferred forage species. Nutritional stress was manifested in poor body condition of caribou, resulting in low reproduction and survival. Given adult female mortality rates averaging 25% per year and fall ratios averaging about 20 calves:100 cows, the herd could not possibly have sustained itself.

Based on evidence of improved body condition, higher productivity, and better survival rates of radiocollared females, it appears the SAPCH is beginning a period of recovery. However, high mortality of neonatal calves documented in 1999 indicates herd growth may be somewhat sporadic. Nevertheless, past experience of overpopulation indicates that management actions should ensure that this herd does not exceed 5000 animals.

Close cooperation between the department and the INWR staff is essential for effective management and research. Expanded survey and research efforts made possible from recent cooperative projects have provided essential information on the current condition of this herd. Genetic testing should be used to evaluate the distinctness of the NAPCH, SAPCH, and Unimak Island herds. A sample of radiocollared females should be maintained to monitor movements and survival rates. Following the new protocol for caribou management, we recommend that future collaring efforts be directed at yearling calves. Given the high incidence of lungworm detected in 1995-98 in the NAPCH, it might be worth collecting 5–10 calves during fall composition surveys.

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Table 1 Southern Alaska Peninsula caribou composition and survey results, 1983–96

Regulatory year	% Calves		Fall composition							Postcalving	
			Bulls:	Calves:	Cows	Small bulls	Medium bulls	Large bulls	sample	survey	INWR[a]
	Summer	Fall	100 cows	100 cows	(%)	(% bulls)	(% bulls)	(% bulls)	size	results	counts
1983		15[a]									10,203
1984	17[a]	15[a]									7,500
1985	6[a]	9[a]									4,044
1986	17	13	32	20	66	59	28	13	2,307		4,543
1987	12	16	36	26	62	54	25	21	1,769	4,067	6,401
1988	16	12	41	19	59	61	37	4	886	3,407	
1989	17	5							1,718[b]	3,386	3,957
1990	14	9	19	12	76				1,051	3,375	
1991	18	13	28	19	68	53	33	14	883	2,287	2,830
1992	15	15	22	22	70	46	32	21	746	2,380	
1993	16	16	30	24	65	59	24	17	745	1,495	1,929
1994	21	18	29	28	64	46	27	27	531	2,137	1,806
1995	11									1,434	
1996	10										1,403
1997	15	12	42	19	62	36	36	27	546	1,844	3,243
1998		21	32	35	60	42	23	36	987		3,127
1999	26	15	51	25	57	48	30	22	1.049	3,612	

[a] Counts by Izembek National Wildlife Refuge staff
[b] Count from Super Cub

Table 2. Parturition rates for caribou in the Black Hill/Trader Mountain (BHTM), Caribou River Flats (CRF), and Unimak areas of the Southern Alaska Peninsula caribou herd, 1989-99.

Year	Area (date)	Pregnancy indicator			Percent parturient	Not pregnant (%)	Yearlings
		With Calf	Distended utter	Hard antlers			
1989[a]	BHTM (9 Jun)	32	152		73	69 (27)	
	CRF (8 Jun)	38	20		73	21 (27)	
1997	BHTM (1 Jun)	30	44	156	78	65 (22)	48
	CRF (1 Jun)	110	39	76	82	49 (18)	59
1999	BHTM	40	20	129	96	7 (4)	57
	CRF	39	20	70	88	17 (12)	65
	Unimak	17	3	8	67	14 (33)	39

[a] Pitcher et al. 1990

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

HERD: Chisana

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

BACKGROUND

Historically, the Chisana caribou herd (CCH) has been small and nonmigratory. Skoog (1968) estimated the CCH was about 3000 animals in the early 1960s. By the mid- to late 1970s, the herd declined to an estimated 1000 caribou. Similar declining trends were reported in other Interior caribou herds. During the 1980s, environmental conditions were favorable, and the herd increased to about 1900 caribou.

Since 1988 the herd has steadily declined. Weather and predation have been the primary causes for the decline. Harvest by humans has had a minor effect on population fluctuations since the 1950s. Between 1979 and 1994 the bag limit was 1 bull caribou, and harvest was limited to 1–2% of the population. By 1991 declining bull numbers became a concern, and harvest was reduced through voluntary compliance by guides and local hunters. In 1994 the bull population declined to a level below the management objective and all hunting of Chisana caribou was stopped. By fall 2000 the herd numbered about 425 caribou. Hunting will remain closed until the bull:cow ratio exceeds 30 bulls:100 cows for 2 years.

During the early 1900s the CCH was an important food source for residents of the Athabascan villages at Cross Creek and Cooper Creek and for gold seekers. Between 1913 and 1929, the Chisana Gold Rush occurred, and 8000–10,000 people lived in the area. 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).

In the Chisana area, guided hunting became common 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 the Yukon. Few Alaska residents fly into the area to hunt and

Native people now living at Northway and Tetlin rarely hunt in the CCH range. Use of the area by tourists is also minimal.

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 the National Park Service (NPS) to preserve healthy populations and also to allow for consumptive uses of the herd. Chisana caribou management became more complex because the Alaska Department of Fish and Game (ADF&G) and the NPS have different mandates and approaches to meeting management objectives.

To meet the increasing management needs, we initiated a cooperative study with the NPS and the Yukon Department of Renewable Resources (YDRR) in October 1987. Initially, 15 adult female caribou were radiocollared to monitor movements and to facilitate spring and fall censuses and composition surveys. Subsequently, between 1990 and 2000 47 adult females and 33 5-month-old female calves were radiocollared. Radiocollaring and herd monitoring costs are shared between ADF&G, NPS, and YDRR.

MANAGEMENT DIRECTION

A cooperative Chisana Caribou Management Plan is being developed to provide management direction that considers the different mandates and philosophies of ADF&G, NPS, and YDRR. In 1999 an informal Monitoring Plan was cooperatively developed outlining the monitoring duties for the 3 agencies. As of December 2000 the monitoring schedules were being followed.

Following are the current Chisana caribou management goals and objectives. I have recommended a revised objective pertaining to the management plan in the Conclusions and Recommendations section of this report.

MANAGEMENT GOAL

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

MANAGEMENT OBJECTIVE

- Develop a management plan that recommends management and harvest strategies designed to meet the management goal by January 2000.

METHODS

Since 1986 we have collected annual fall sex and age composition data between late September and early October. A Bellanca Scout was used to locate most of the herd by radiotracking collared animals. Since 1993 we have used a Robinson-22 helicopter to classify

each caribou as either a cow, calf, or bull. Bulls were further classified based on antler size as either small, medium, or large (Eagan 1993). We attempted to classify >90% of the herd.

We conducted surveys to estimate population size during late June 1992, 1993, 1995, 1997, and 1999. During these surveys we located caribou by visually searching the herd's summer range and by locating radiocollared caribou. We used 1–2 search aircraft (Piper Super Cub and a Bellanca Scout) with a pilot and 1 observer in each. All caribou found were counted by the observation team, and all groups larger than 25 caribou were also photographed using a 35-mm camera. Prints were then enlarged and the caribou were counted with the aid of a magnifying glass. We also estimated population size and trend by using a population model designed by P Valkenburg and D Reed (ADF&G). Sex and age composition, recruitment, and mortality data were the primary components of the model.

We captured and radiocollared Chisana caribou since 1991 to 1) improve the efficiency of the census and composition surveys; 2) monitor seasonal distribution and movement patterns; 3) determine pregnancy and natality rates and median calving date; 4) evaluate herd condition; 5) estimate annual mortality rates; and 6) obtain blood samples to determine pregnancy rates, herd genetics, and incidence of disease. The number of active collars operating during the report period was 16–32.

We used several indices to evaluate herd condition and range quality. Since 1993 we have estimated annual herd pregnancy rate by monitoring radiocollared cows during late May and by determining the presence of hard antlers, distended udders, or the presence of a calf. In 1994, 1995, and 2000 we captured 30, 20, and 28 adult cows, respectively, and collected blood to determine pregnancy using a serum progesterone assay testing technique. We also assessed body condition and tooth wear. During fall 1998, 1999, and 2000, we also radiocollared 3–9 female calves to monitor calf weight, size, and condition. During 1993 and 1994 we determined median calving date, which is the date by which 50% of the pregnant radiocollared cows had given birth. We assessed range condition by evaluating the percent lichen versus moss in the herd's winter diet during 1994 and 1995. We collected samples in spring 2000 but have not received the results from the lab.

Hunting seasons are based on a regulatory year (RY = 1 Jul through 30 Jun; e.g., RY99 = 1 Jul 1999 through 30 Jun 2000). Beginning in RY93, we monitored the CCH harvest using information from registration permit reports. We implemented a registration permit hunt because the harvest quota was low and we needed the flexibility to require a short report period to prevent overharvest. Since RY94 the hunting season was technically open under registration permit, but no registration permits were issued because the population was declining and bull numbers were low.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The CCH increased through the 1980s and reached its peak in 1988 at about 1900 caribou. Since 1988 the herd has declined by an average of 11.8% annually, and by fall 2000 it

numbered about 425 caribou (Table 1). The primary cause of the herd's decline was poor calf recruitment (0–14 calves/100 cows). Many of the small mountain herds in Interior and Southcentral Alaska and western Yukon experienced low calf survival during the 1990s. However, none was as low as the CCH. By 2000, after 11 years of poor recruitment, the herd was composed of an estimated 71% old-age (teeth worn to gum line) animals (ADF&G, unpublished data). It is now highly vulnerable to a rapid decline because the longevity of female caribou is not likely to exceed 14 years.

The genetic relationship of the CCH and other Yukon and Alaska caribou herds have been examined by DNA fingerprinting (Zittlau et al. 2000). Analyses showed that the CCH was distinct from all herds tested including the adjacent Kluane and Mentasta Herds. Future tests will be done to determine whether or not reduced bull numbers in the herd cause a decline in heterozygosity due to increased inbreeding. The bull:cow ratio in the CCH during 1998–2000 was the lowest of all Alaskan and Yukon herds.

Population Composition

Since 1990 the calf:cow ratio in the CCH has been 0–14 ($\bar{x}$ = 5.9/100, s = 4.48) and as a result, the bull:cow ratio declined (Table 1). Modeling demonstrated that the herd's declining bull:cow ratio was primarily a function of low calf recruitment during the past 11 years. Bulls are aging and their mortality rate appears to be increasing. Unless calves are recruited, the bull:cow ratio will decline further.

Pregnancy and Natality Rates

Pregnancy rates and number of calves on 31 May (estimated by calf:cow ratio) have been inconsistent since 1993. Annual pregnancy rate had little effect on the number of calves by 31 May. Also, the number of calves on 31 May had little effect on the number of calves that were alive by 21 June (Table 2). Most calves were dead by 21 June.

Estimated numbers of calves on 31 May were low (<40:100) in 1993, 1996, 1998, 1999, and 2000. In 1993 a low number of calves was expected because only 50% of the cows were pregnant in March. On 31 May 1993 the calf:cow ratio was 38:100, but declined to 19:100 by 13 June 1993. In 1994 the pregnancy rate increased to about 86%, and on 30 May the estimated calf:cow ratio was 73:100. However, by 17 June 1994, the calf:cow ratio had declined to about 11:100. In 1995 and 1996 pregnancy rates increased to >93%, and calf:cow ratios on 30 May were 52:100 in 1995 but only 38:100 in 1996. By 20 June calf:cow ratios were 7:100 in both years. In 1997 the estimated minimum herd pregnancy rate was 82%. The 30 May calf:cow ratio of 64:100 declined to 14:100 by 1 October. Herd pregnancy rate was not estimated in 1998, but the late May calf:cow ratio was 14:100. We do not know if the low number of calves was due to a reduced pregnancy rate or to high early calf mortality. In 1999 and 2000, pregnancy rates were >92%. Calf:cow ratios in 1999 were 25:100 on 29 May, 9:100 on 26 June, and 7:100 on 1 October. In 2000 the 31 May calf:cow ratio was 29:100 but declined to 6:100 by 1 October. Fall composition data demonstrated that pregnancy rate and the number of calves alive on 31 May had no influence on fall calf:cow ratios, indicating June calf mortality is the factor that most influences recruitment (Table 1).

Distribution and Movements

Based on radiotelemetry data collected since 1981, the Chisana Herd's range is relatively small (5100 mi^2) and encompasses the Nutzotin and northern Wrangell Mountains between the Nabesna and Generc Rivers. Seasonal movements are normally short (<50 mi). Between 1991 and 1996, most of the herd wintered in the eastern end of its range in Canada within the spruce forests along the Beaver Creek drainage. In 1992 snowfall was very early (11 Sep) and deep. The herd moved further north and wintered in the forested habitats near Wellesley Lake. Before 1991 in years of average snow, most of the herd remained on sedge-grass range primarily in Alaska and only used the eastern portion of its range during deep snow winters. During 1997 most of the herd wintered in Alaska along Beaver Creek and in the Ptarmigan Lake area. In 2000 snowfall was deeper than average (USDA 1999) and the herd wintered in the spruce forest along the White River. During the past 5 years, the herd has primarily formed its postcalving aggregations from Flat Creek west to the Chisana Glacier.

The CCH does not have a core calving area, but instead spreads out across most of its range. Calving was limited to higher elevations (4800 and 6600 ft) in 1993 but occurred in spruce to alpine habitats (3400–6600 ft) during 1994–2000. In 1993 and 1994 we monitored calving behavior and found that parturient Chisana cows sequestered themselves and selected high elevation habitats that offered escape from predators, even though food is scarce there. During 1995 and 1996, more cows calved beneath the trees (30–38%) than in previous years (0–10%); however, they still calved apart. In 1997 and 1998–2000, 25% and <10% of the calving took place below tree line. The largest calving groups observed during 1993 and 1994, after a minimum of 10 days of monitoring, consisted of 3 and 4 cows with calves. Between 1996 and 2000, radiotracking surveys conducted 3–5 days after peak calving found only 5% of the calving cows were in a group >4 caribou.

MORTALITY

Harvest

Season and Bag Limit.

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

Board of Game Actions and Emergency Orders. During spring 1993 the Board of Game created a registration permit hunt for Chisana caribou. To ensure against an overharvest, the board stipulated a 5-day report period and a harvest quota of up to 20 bull caribou. The board gave ADF&G the authority to determine the annual quota and to temporarily close areas. Because of the current trend of the CCH, we decided on a harvest quota of zero and have issued no permits since RY94.

Human-induced Mortality. There has been no legal harvest of Chisana caribou in Alaska or Yukon since RY94 (Table 3). Reports from local residents indicated an illegal harvest in Alaska of 0–3 caribou annually. In the Yukon, First Nation band members can hunt Chisana caribou but have said they would stop until the herd recovers. However, between 1996 and 1999, 3–20 Chisana caribou were taken during the winter along the Alaska Highway in the Yukon. Because the herd is inaccessible most of the year in Alaska, illegal or incidental harvest is not a concern. During years that the herd winters along the Alaska Highway in the Yukon, harvest can affect herd population trend. Most of the harvest comprises cows, and in 1998 we estimated harvest to be 20 animals (4% of the herd). The regional biologist and protection officer in Haines Junction, Yukon are working to eliminate this harvest.

Other Mortality

During 1996–2000 the annual mortality rate for radiocollared adult females was 8–30%. Since 1994 causes of death have been determined for 17 radiocollared females; predators killed 16 and 1 died in an avalanche. Adult mortality rate is expected to increase due to the increasing age structure in the herd.

Based on percent cows in the herd and on annual herd pregnancy rates, we estimated 300–550 calves were born annually between 1994 and 2000. By 1 October, 83–95% of the calves died each year. Most calf mortality occurred between the end of May and 26 June. Predation was the primary cause of death, based on timing of the mortality and on results from caribou calf mortality studies of adjacent herds (Boertje and Gardner 1999; Valkenburg et al. 1999).

Wolf predation was the primary cause of calf mortality in the nearby Aishihik Herd, which is a small mountain caribou herd with behavior similar to the CCH (Hayes et al., in press). Spence (1998) estimated that each wolf killed about 8 calves/summer and were the primary limiting factor to Aishihik Herd growth. There were at least 5 wolf packs (35–40 wolves) within the CCH's summer ranges, so it is likely wolves were the primary causes of calf mortality. Grizzly bears could also be important predators. Each year since 1993, we have witnessed grizzly bears and golden eagles killing calves and have observed wolves near cows with calves and postcalving aggregations. Based on calf mortality studies in Denali National Park (Adams et al. 1995), Unit 20A (Valkenburg et al. 1999), and in eastern Interior Alaska (Boertje and Gardner 1999), golden eagles are effective during the first few days of the calves' lives and are overall a minor predator. Based on incidental sightings, coyotes can be important predators when their numbers are high. Between 1990 and 1992 coyotes were abundant within the Chisana range. During those years, coyotes were observed killing calves. The coyote population in the Chisana area increased in 1998 coinciding with the snowshoe hare high. Coyote numbers are expected to decline during 2001 due to a decline in snowshoe hare numbers.

Using calf mortality data from other small herds in a predictive model, Spence (1998) hypothesized that reducing wolf pack size on the calving grounds would significantly increase calf survival. It may be possible that selective wolf trapping by private citizens could benefit the Chisana Herd if they could reduce the 5 primary packs in the herd's summer range to 2 wolves/pack. Trapping is legal throughout the herd's range under state, federal subsistence, or territorial regulations.

During the Chisana Herd's 11-year decline, we were able to estimate overwinter calf mortality only twice due to the lack of an adequate calf sample. During winter 1990–1991, 64% of radiocollared female calves died between October 1990 and June 1991. Of the 9 collared caribou that died during this period, all were apparently killed by either bears or wolves, based on the evidence of a violent death (blood on collar) and sign at the death site. At least 3 of these deaths can directly be attributed to wolves based on the timing of death (midwinter). During winter 1999–2000, 2 of 8 (25%) radiocollared calves died, both due to wolf predation.

Preliminary data indicates calf survival during winter 2000–2001 will be high. As of 1 January 2001, (100%) 8 radiocollared calves were still alive. Survival data indicated that overwinter calf survival was similar to or better than that of adult cows during 1998–2000.

Summers were warm and slightly dry during 1989–1995, and winters 1991, 1992, and 1999 were severe in terms of snow depth and late spring snows. Lenart (1997) found that short-term variations in climate would affect nutrient quality in aboveground biomass of caribou forage and possibly adversely affect caribou by increasing insect harassment and decreasing nitrogen content in their forage. A record low number of snow-free days and drought conditions during summer 1992 caused reduced pregnancy rate in 1993 (50%). Similar conditions possibly prevailed in 1991, 1992, and 1998 as pregnancy rates during these years appeared low but unfortunately were not measured. However, even in years with >90% pregnancy, no additional calves survived until fall. Favorable weather conditions (normal rainfall, low snowfall) persisted during 1995, 1996, and 1997. Pregnancy rates were high but calf survival continued to be very low (4–5:100 cows), indicating that predation was the primary limiting factor. The CCH grew during the 1980s when climate conditions were favorable and predation levels were comparable to current levels.

The CCH initially declined due to adverse weather and then, predation. Currently, predators are the primary factor causing the herd to decline. Even though calving cows sequester themselves during calving, during June most of the herd forms postcalving aggregations in traditional areas. This is the period most of the predation mortality occurs. Cows that have the greatest success in raising their calves to 5-months-old, do not join these groups but remain somewhat sequestered in less optimal forage range.

Considering the herd's age structure and the high rates of mortality, it is conceivable the CCH can become extinct. However, its situation is not unique. Other small herds are in danger of disappearing. The common themes between these areas are the presence of alternate prey and the lack of wolf control or regulation of wolf numbers. It is possible that the only reason why these small herds existed or increased was defacto wolf control by land-and-shoot wolf hunters. Historically, the Chisana Herd has shown the ability to increase after reaching low

numbers, but it will require substantial reductions in predation mortality. Modeling indicates 1–2 good calf cohorts (>25:100 cows) could stabilize the decline and allow the herd to recover.

HABITAT

Assessment

Before the 1990s the most frequently used range of the CCH for both winter and summer was predominantly grass-sedge habitat with few lichens. During 1991, 1993–1996, and 2000 the herd wintered in timbered habitats along the White River and Beaver Creek drainages in the eastern portion of the herd's range. Fecal samples collected in 1994, 1995, and 2000 showed a sharp contrast in lichen distribution among the herd's winter ranges. During 1994, in the vicinity of Wellesley Lake, lichen availability was low (21% lichen and 75% moss and evergreen shrub fragments in fecal samples). In the remaining portion of the winter range, lichen availability was moderate to high (50–80%) of discerned plant fragments in fecal samples. During 2000 most of the herd wintered along the White River. Lichen availability was low (22.6% lichen, 55.1% moss, and 11.3% evergreen in fecal samples). Boertje (1984) found that fecal samples containing high proportions of mosses and evergreen shrubs indicate the range was overgrazed or suboptimal. Nutritionally stressed caribou are presumably more vulnerable to predators, which may explain the higher winter mortality (18%) the CCH experienced during those years.

Summer range quality determines body size and body condition in the fall. If cow caribou do not reach optimum condition, pregnancy rates decline. Pregnancy rates were very low in 1993 and possibly in 1991, 1992, and 1998. Adverse weather conditions also prevailed during those years. In most years pregnancy rates were high, indicating summer range is adequate except during periods of unfavorable weather.

Enhancement

The entire range of the CCH is located in the Wrangell–St Elias National Park and Preserve or within Yukon, Canada. It is against NPS policy to conduct wildlife habitat improvement projects. Therefore, no habitat improvement projects are being considered. Habitat enhancement will depend on the near-natural occurrence of wildland fires under terms of the Alaska Interagency Fire Management Plan (US Bureau of Land Management 1984) or on any wildfires that may occur within its range in the Yukon.

CONCLUSIONS AND RECOMMENDATIONS

The CCH declined by 78% since 1988 due primarily to poor calf recruitment and, since 1992, due to high adult mortality. Since 1990, recruitment averaged <6 calves:100 cows. Causes of low calf numbers are not completely known, but primary factors were low natality rates in 1993 and 1998 and possibly in 1991 and 1992, caused by adverse weather conditions. Predation was also important during 1989 through 2000. Predation was the cause of 96% of the mortality among radiocollared cows ≥5 months old in 1991 and 100% of the mortality in 1998 and 1999. Hunting during the herd's decline was restricted to bulls and removed about 2% or less of the population annually. Even this level of harvest slightly accelerated the

declining bull:cow ratio. Legal hunting did not limit the herd's ability to grow, but illegal harvest along the Alaska Highway in Yukon may have had some limiting effect during some years. Winter range quality in the eastern portion of the herd's range is below average compared with other Interior herds and probably contributed to higher overwinter adult mortality between 1994 and 1996. For the herd to stabilize, the calf recruitment rate must increase to 25 calves:100 cows while maintaining the cow and bull mortality rates at 12–15% and 21–25%, respectively. In order for calf survival to increase, pregnancy and natality rates must remain high and mortality caused by predators must decline.

The extremely low recruitment rates experienced by the CCH over the past 11 years have never been documented in any other wild caribou herd. Sufficient funding to determine pregnancy and natality rates, fall composition counts, and winter range use and mortality should be continued. The Yukon Department of Renewable Resources has allocated money to purchase radio collars and continue supporting the genetics study. The National Park Service has allocated money to supply fuel for field projects and conduct 2 radiotracking flights.

When hunting was allowed, the primary users of the Chisana Herd were nonresidents. Since 1990, 43% of the hunters participating in the Chisana caribou hunt were nonresidents who took 58% of the harvest. Local subsistence users harvested 8 (9% of the harvest) caribou during this time. Once the herd recovers and hunting is allowed, harvest regulations should provide for guided nonresidents.

The Alaska Department of Fish and Game, NPS, and YDRR are still developing a Chisana caribou management plan. We held an interagency meeting in Tok in July 1999 and discussed herd trend, management needs and options, and possible research and recovery efforts. A monitoring schedule was designed and implemented. The completed plan will recommend management and harvest strategies for the Chisana Herd that will meet the mandates of ADF&G and NPS. We were not able to meet the management objective of a completed management plan by January 2000. Rick Farnell (YDRR) and I are working on the management plan and expect to have it completed by January 2003.

Therefore I recommend the management objective be changed to:

- Develop a management plan that recommends management and harvest strategies designed to meet the management goal by January 2003.

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Publications Technician II

Table 1 Chisana caribou fall composition counts and estimated population size, 1987–2000

Date	Bulls: 100 Cows	Calves: 100 Cows	% Calves	% Cows	% Small bulls (% of bulls)	% Medium bulls (% of bulls	% Large bulls (% bulls)	% Bulls	Composition sample size	Estimated herd size[a]
10/9/87	39	28	17	60	53	26	21	23	760	1800
9/27/88	36	31	19	60	28	46	26	21	979	1882
10/16–17/89[b]			9						625	1802
10/4–5/90	36	11	7	68	37	44	19	25	855	1680
9/29/91	40	1	1	71	45	42	13	28	855	1488
9/27/92	31	0	0[c]	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

[a] Based on population modeling.

[b] Classification accomplished from fixed-wing aircraft rather than from a helicopter.

[c] Only 1 calf was seen in this survey.

Table 2 Chisana caribou postcalving composition counts, 1989–1997

Date	% Calves (*n*)	% Adults (*n*)	Composition sample size
6/21/89	10 (160)	90 (1380)	1540
6/20/90	12 (147)	88 (1032)	1179
6/20/91	2 (21)	98 (1264)	1285
6/22/92	1 (10)	99 (1224)	1234
6/24/93	6 (39)	94 (612)	651
6/17/94	8 (37)	92 (449)	486
6/22/95	5 (34)	95 (689)	723
6/20/96	2 (9)	98 (533)	542
7/10/97[a]	8 (13)	92 (153)	166

[a] Herd was scattered and composition count results are suspect.

Table 3 Chisana caribou harvest and accidental death, regulatory years 1989–1999

Regulatory year	Alaska harvest							Yukon harvest		
	Reported				Estimated					
	M	F	Unk	Total	Unreported	Illegal	Total	Reported	Unreported	Total
1989–1990	34	0		34	0	0	0	18	5–20	57–72
1990–1991	34	0	0	34	0	0	0	11	5–20	50–65
1991–1992	21	0	0	21	0	0	0	0	5–20	26–41
1992–1993	16	0	0	16	0	0	0	0	5–20	21–36
1993–1994	19	6	0	19	0	0	0	0	5–20	24–39
1994–1995	0	0	0	0	0	0	0	0	5–20	5–20
1995–1996	0	0	0	0	0	3	7	0	1–3	4–6
1996–1997	0	0	0	0	0	3	3	0	7	10
1997–1998	0	0	0	0	0	3	3	0	3–5	6–8
1998–1999	0	0	0	0	0	3	3	0	20	23
1999–2000	0	0	0	0	0	3	3	0	3–5	6–8

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

HERD: Macomb

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

BACKGROUND

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

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

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

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

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

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

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

On 29 June 1988, we estimated 800 caribou in the MCH. Historical information from local residents had indicated more caribou between the Robertson and Delta Rivers than we estimated. Therefore, a population objective was established to increase MCH size to 1000 caribou by 1993.

For the 1990–1991 hunting season, the hunt was changed from a drawing permit hunt to a registration permit hunt. This change was enacted because customary and traditional use determinations precluded conducting the hunt as a drawing permit hunt.

The hunting season was closed from 1992–1993 through 1996–1997 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 Alaska Board of Game adopted a Wolf Predation Control Implementation Plan (5 AAC 92.125) for Unit 20D. It established a new objective to reverse the decline of the MCH and increase the fall population to 600–800 caribou with a harvest of 30–50 caribou annually by the year 2002.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVE

- Increase the fall population to 600–800 caribou with a sustainable harvest of 30–50 caribou by the year 2002.

METHODS

We used a Robinson R-22 helicopter in late September or early October to count total numbers and classify caribou sex and age. A fixed-wing aircraft accompanied the helicopter to help find radiocollared caribou and groups without radios and to help count total numbers. Caribou were classified according to criteria specified by Eagan (1995).

We radiocollared 4 four-month-old calves on 12 October 1999. These caribou were immobilized using 1 mg carfentanil citrate (Wildnil®, Wildlife Pharmaceuticals, Fort Collins, Colorado, USA)

and 65 mg of xylazine hydrochloride (AnaSed®, Lloyd Laboratories, Shenandoah, Iowa, USA). Caribou were weighed, measured, and subjectively rated for body condition.

Hunting was conducted by registration permit. Hunters were required to report hunt status, kill date and location, transportation mode and commercial services. Harvest data were summarized by regulatory year (RY = 1 Jul–30 Jun, e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

During this reporting period, the MCH did not meet the herd size objective in RY98, but did meet the objective during RY99 and RY00.

RY98. We conducted a census on 30 September 1998 and counted 472 caribou. Survey conditions were poor, and caribou were widely scattered and difficult to see because most were below the snow line. Observers felt that an additional 50–100 caribou may have been missed. Therefore, we estimated herd size was 522–572 (Table 1).

RY99. We conducted a census on 15 October 1999 and counted 640 caribou (Table 1).

RY00. We conducted a census on 2 October 2000 and counted 605 caribou. However, an additional group of 45–50 caribou was located in timber and could not be counted accurately. Therefore, we estimated total herd size was 650 (Table 1).

Population Composition

RY98. Composition data was collected from 472 caribou during the 30 September 1998 MCH census. The bull:cow ratio of 50:100 was the highest recorded since at least 1982 (Table 1). The bull segment of the population consisted of 32% small bulls, 46% medium bulls, and 22% large bulls. The calf:cow ratio of 25:100 was higher than the 18:100 of the previous year.

RY99. Composition data was collected from 606 caribou during the MCH census on 15 October 1999. The bull:cow ratio of 57:100 was the highest since at least 1982, but similar to the 50:100 estimated in 1998 (Table 1). The bull segment of the population consisted of 49% small bulls, 21% medium bulls, and 30% large bulls. Calf survival to fall decreased slightly to 22 calves:100 cows.

RY00. Composition data was collected from 605 caribou during the 2 October 2000 MCH census. The bull:cow ratio was 45:100 with 43% small bulls, 29% medium bulls, and 29% large bulls. Calf survival to fall decreased to a relatively low 11 calves:100 cows (Table 1).

Distribution and Movements

The MCH occupies the mountains of the eastern Alaska Range from the Delta River to the Mentasta Highway. Their core range is in Unit 20D between the Robertson River and the

Richardson Highway, and the primary calving grounds are on the Macomb Plateau. The MCH also uses the lowlands of the Tanana River valley as winter range.

RY98. During the MCH fall 1998 census, several groups were located west of the Gerstle River, but most caribou were located on the Macomb Plateau and in the Berry Creek drainage. One mortality was located near Dot Lake.

RY99. During the MCH fall 1999 census, large groups of caribou were distributed in the Macomb Plateau area including the Berry Creek-Plateau Lake area, upper Bear Creek, and west of the Johnson River in the Sheep Creek drainage.

RY00. During the MCH fall 2000 census, caribou were aggregated primarily on the Macomb Plateau, in the Bear Creek, Berry Creek, and Dry Creek drainages.

For 5 years, as many as about 600 caribou from the Delta Herd have wintered in the Jarvis Creek/McCumber Creek drainages and the vicinity of Donnelly Dome in southwestern Unit 20D (P Valkenburg, ADF&G, personal communication). Most of these caribou migrate back to Unit 20A in April, however, some bulls may remain in Unit 20D until later in the year. During late summer 2000, a few small groups of caribou were consistently seen along the Richardson Highway in the vicinity of Donnelly Dome. Prior to the 2000 hunting season, I conducted a radiotracking flight to determine if these caribou were from the Macomb or Delta Herds. During the flight, I saw approximately 150 caribou in small, scattered groups, and 2 radiocollared Macomb caribou were located in the area. No Delta caribou were located, however, I did not listen for all Delta Herd radio frequencies. On a 27 September 2000 radiotracking flight, P Valkenburg (ADF&G, personal communication) listened for Delta caribou frequencies in Unit 20D but found none. Therefore, my conclusion is that no Delta caribou were in Unit 20D during the hunting season.

MORTALITY

Harvest

Season and Bag Limit.

RY98 — The RY98 hunting season was conducted as registration permit hunt RC835 (Table 2) from 10–20 September with a harvest quota of 25 bulls. The hunt opening date was 10 September to reduce incidental caribou harvest by moose hunters in the area and to make large, mature bulls more accessible to hunters. This was an attempt to make harvest more compensatory rather than additive.

RY99 — The RY99 hunting season was canceled (Table 2) because the RY98 harvest had exceeded the quota, and it was not clear whether the herd would be above or below the population goal in fall 1999. In retrospect, a registration hunt with a small harvest quota would have been possible.

RY00 — The RY00 hunting season was conducted as registration permit hunt RC835 (Table 2) from 10–20 September with a harvest quota of 25 bulls.

Board of Game Actions and Emergency Orders. During RY98, we issued an EO to close registration hunt RC835 on 16 September, in anticipation that the harvest quota would be met before the scheduled closing date of 20 September.

During RY00, we issued an EO to correct an error in the 2000–2001 hunting regulation book which listed no open season in Unit 12 for hunting the MCH during registration permit hunt RC835. The EO clarified that hunting in Unit 12 for RC835 was open during 10–20 September for that portion west of the Glenn Highway (Tok Cutoff) and south of the Alaska Highway, excluding the Tok River drainage.

Also during RY00 we issued an EO to close the hunting season for RC835 on 15 September because we expected the harvest quota would be met by that date.

Hunter Harvest.

During this reporting period, the RY98 harvest inadvertently met the harvest objective. The harvest objective was not met during RY99 or RY00.

Permit Hunts.

RY98 — Macomb caribou were hunted under registration permit hunt RC835 (Table 2). Permits were issued to 167 hunters (Table 2), and 114 (68%) hunters actually hunted (Table 3), killing 32 caribou (Table 4).

RY99 — The hunting season was cancelled and no hunt was conducted (Table 2).

RY00 — Registration permit hunt RC835 was held during the RY00 hunting season. Permits were issued to 274 hunters (Table 2) and 186 permittees (68%) actually hunted (Table 3), killing 22 caribou (Table 4).

The substantial increase in the number of registration permits issued during RY00, compared to the previous 2 seasons, was due to several factors. There is increasing interest in RC835 as a road-accessible hunt, and a number of caribou were seen along the Richardson Highway in southern Unit 20D prior to the hunting season, which peaked hunters' interest. Also, hunting for Nelchina and Fortymile caribou was significantly restricted during the RY00 hunting season, making the RC835 hunt more appealing to hunters.

Hunter Residency and Success.

RY98 — Most hunters (54%) were local residents of Unit 20D (Table 3). Local hunters had a 36% success rate compared to nonlocal hunters who had a 19% success rate. All hunters had a 28% success rate that was similar to the previous year (Table 3).

RY99 — The hunting season was cancelled, and no caribou were harvested (Table 3).

RY00 — Most hunters (54%) were local residents of Unit 20D (Table 3). Local hunters had a slightly lower success rate of 11%, than nonlocal hunters who had a 13% success rate. All hunters had a 12% success rate – substantially lower than the success rate during the last 2 years

the season was open. Success was lower during the RY00 hunting season because weather was very poor, making hunting difficult.

Harvest Chronology.

RY98 — On opening day, 10 September, 13 caribou were killed, equaling 52% of the 25 caribou harvest quota (Table 5). After the first 3 days of the season, 23 caribou had been reported killed and an EO was issued to close the season at 12:01 A.M. on 16 September. Seven caribou were killed after the season closed.

RY99 — The hunting season was cancelled, and no caribou were harvested (Table 5).

RY00 — Nine caribou were killed on opening day, 10 September, equaling 36% of the 25 caribou harvest quota (Table 5). Fifty percent of the quota had been taken by the third day of the season, and an EO was issued to close the season at 12:01 AM on 15 September. One caribou was killed after the season closed.

The MCH registration permit hunt resumed in RY97 after a 5-year hiatus, but in RY98 and RY99 the season was closed by EO. The year it was not closed by EO, RY97, was the first year it was open after the 5-year closure, and I believe hunters were not accustomed to the hunt, thus hunting pressure and rate of harvest was less than in the next two years.

Harvest Location.

RY98 — Most caribou (50%) were taken in the Jarvis Creek drainage, which is an increase from RY97 when 36% were taken there (Table 6). Nine caribou (28%) were taken within the Macomb Plateau Controlled Use Area (MPCUA).

RY99 — The hunting season was cancelled and no caribou were harvested (Table 6).

RY00 — Harvest increased substantially within the Jarvis Creek drainage with 82% of caribou taken there (Table 6). No caribou were taken within the MPCUA. Harvest has increased in the Jarvis Creek drainage for several reasons: 1) more caribou have been in the area during the fall hunting season than in previous years; 2) the area has unrestricted access from the Alaska and Richardson Highways, with numerous trails; and 3) weather and hunting conditions within the MPCUA were poor during fall 2000 because of early snowfall.

Transport Methods.

RY98 — The most commonly used modes of transportation for successful hunters were 3- or 4-wheelers, other off-road vehicles, and highway vehicles (Table 7).

RY99 — The hunting season was cancelled, and no caribou were harvested (Table 7).

RY00 — The most commonly used modes of transportation for successful hunters were 3- or 4-wheeler, other off-road vehicles, and highway vehicles (Table 7). No horses were used this year because of deep snow within the MPCUA, where most horses are used.

Other Mortality

No other mortality was recorded for the MCH during this reporting period.

HABITAT

Assessment and Enhancement

Mean weights of MCH calves have increased since the early 1990s, when they were chronically low throughout the Interior (Table 8). The relatively high mean calf weights during fall 1998 and 1999 indicate that the herd was not nutritionally stressed, but the traditional range is small and carrying capacity is unlikely to be greater than 1000 caribou.

CONCLUSIONS AND RECOMMENDATIONS

The MCH size objective of 600–800 was met during RY99 and RY00. The MCH was hunted 2 of 3 years during this reporting period, but the permit hunt harvest quota of 25 caribou each year was below the minimum harvest objective of 30 caribou. However, the harvest objective was unintentionally met during the RY98 hunting season when 32 caribou were killed. Hunting will be continued in the future if harvest does not compromise maintaining the herd size goal and the bull:cow ratio does not decline below 30:100. The most significant factor required to maintain population size and achieve the harvest objective will be adequate calf survival. Intensive management efforts will continue in the area in an attempt to meet established objectives.

Conducting the MCH hunt as a registration hunt with a small harvest quota is proving difficult and frustrating for hunters because the season has been closed by EO. Changes in hunt administration will be considered during the next reporting period. Options that will be explored are shortening the hunting season from its current 10 days to approximately 3–5 days and conducting the hunt every other year with a larger harvest quota.

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Table 1 Macomb caribou fall composition counts and estimated population size, 1982–2001

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	600[d]

[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.

[d] Estimated.

Table 2 Macomb caribou harvest data by permit hunt, regulatory years 1985–1986 through 2000–2001

Hunt	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Harvest			Total harvest
						Bulls (%)	Cows (%)	Unk	
530[a]	1985–1986	140	61	22	78	12 (100)	0 (0)	0 (0)	12
	1986–1987	100	62	26	74	10 (100)	0 (0)	0 (0)	10
570[b]	1986–1987	15	53	14	86	1 (100)	0 (0)	0 (0)	1
530[a]	1987–1988	150	53	76	24	53 (100)	0 (0)	0 (0)	53[c]
	1988–1989	150	57	55	45	36 (100)	0 (0)	0 (0)	36[d]
	1989–1990	150	47	55	45	44 (100)	0 (0)	0 (0)	44[d]
535[e]	1990–1991	351	42	21	79	42 (100)	0 (0)	0 (0)	42
	1991–1992	317	33	16	50	48 (96)	0 (0)	2 (4)	50
	1992–1993[f]	0							0
	1993–1994[f]	0							0
	1994–1995[f]	0							0
	1995–1996[f]	0							0
	1996–1997[f]	0							0
RC835[e]	1997–1998[g]	143	34	15	50	22 (100)	0 (0)	0 (0)	22
	1998–1999	167	32	19	49	32 (100)	0 (0)	0 (0)	32
	1999–2000[f]	0							0
	2000–2001[g]	274	31	8	60	22 (100)	0 (0)	0 (0)	22
Totals for all permit hunts	1985–1986	140	61	22	78	12 (100)	0 (0)	0 (0)	12
	1986–1987	115	61	24	76	11 (100)	0 (0)	0 (0)	11
	1987–1988	150	53	76	24	53 (100)	0 (0)	0 (0)	53[a]
	1988–1989	150	57	55	45	36 (100)	0 (0)	0 (0)	36[b]
	1989–1990	150	47	53	48	44 (100)	0 (0)	0 (0)	44[b]
	1990–1991	351	42	23	77	42 (100)	0 (0)	0 (0)	42
	1991–1992	317	33	16	50	48 (96)	0 (0)	2 (4)	50
	1992–1993[f]	0							0
	1993–1994[f]	0							0
	1994–1995[f]	0							0
	1995–1996[f]	0							0
	1996–1997[f]	0							0
	1997–1998[g]	143	34	15	50	22 (100)	0 (0)	0 (0)	22
	1998–1999	167	32	19	49	32 (100)	0 (0)	0 (0)	32

Hunt	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Harvest			Total harvest
						Bulls (%)	Cows (%)	Unk	
	1999–2000[f]	0							0
	2000–2001[g]	274	31	8	60	22 (100)	0 (0)	0 (0)	22

[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 2000–2001

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	18	0	33 (54)	4	22	0	28 (46)	61
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[d]									
1993–1994[d]									
1994–1995[d]									
1995–1996[d]									
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

[a] Resident of Unit 20D.

[b] Hunt by drawing permit.

[c] Hunt by registration permit.

[d] Hunt canceled.

Table 4 Macomb caribou harvest[a] and accidental death, regulatory years 1985–1986 through 2000–2001

Regulatory year	Hunter harvest							Accidental death	Total
	Reported				Estimated				
	M	F	Unk	Total	Unreported	Illegal	Total		
1985–1986	12	0	0	12	0	2	2	0	14
1986–1987	10	0	0	10	0	2	2	0	12
1987–1988	57	0	0	57	0	2	2	0	59
1988–1989	42	0	0	42	0	2	2	0	44
1989–1990	44	0	0	44	0	2	2	3	49
1990–1991	42	0	0	42	0	2	2	0	44
1991–1992	48	0	2	50	0	2	2	0	52
1992–1993[b]	0	0	0	0	0	2	2	0	2
1993–1994[b]	0	0	0	0	0	2	2	0	2
1994–1995[b]	0	0	0	0	0	2	2	0	2
1995–1996[b]	0	0	0	0	0	2	2	0	2
1996–1997[b]	0	0	0	0	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	0	0	0	0
2000–2001	22	0	0	22	0	0	0	0	22

[a] Includes permit hunt harvest.

[b] Hunt canceled.

Table 5 Macomb caribou harvest by date during permit hunt RC835 with a 10–20 September hunting season, regulatory years 1997–1998 through 2000–2001

Regulatory	September harvest date											
year	10	11	12	13	14	15	16	17	18	19	20	*n*
1997–1998	8	1	3	4	3	2	0	0	0	0	1	22
1998–1999	13	6	4	0	0	2	7	0	0	0	0	32
1999–2000[a]												
2000–2001	9	3	1	3	5	0	0	0	1	0	0	22

[a] Hunt cancelled.

Table 6 Macomb caribou harvest location during permit hunt RC835, regulatory years 1997–1998 through 2000–2001

Harvest location/drainage	Regulatory year			
	1997–1998	1998–1999	1999–2000[a]	2000–2001
Jarvis Creek	8	16		18
Little Gerstle River	3	2		2
Granite Mountains	0	1		0
Dry Creek	9	9		0
Berry/Bear Creek	0	0		0
Robertson River	0	3		0
Unknown	1	1		2

[a] Hunt cancelled.

Table 7 Macomb caribou harvest percent by transport method, regulatory years 1986–1987 through 2000–2001

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[c]										
1993–1994[c]										
1994–1995[c]										
1995–1996[c]										
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

[a] Includes permit hunt harvest.

[b] Walking was not listed as a transportation type from 1986–1987 to 1989–1990.

[c] Hunt canceled.

Table 8 Macomb caribou female calf weights, 1988–1999

Date	$\bar{x}$ Weight (lb)	*n*
Spring 1988	116.8	4
Spring 1990	107.3	12
Fall 1994	118.8	10
Fall 1996	128.3	8
Fall 1998	132.8	12
Fall 1999	128.2	4

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

HERD: Nelchina Caribou Herd

GEOGRAPHIC DESCRIPTION: Nelchina Basin

BACKGROUND

The Nelchina caribou herd (NCH) contained 5,000–15,000 caribou in the late 1940. 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 numbered between 7,000 and 10,000 caribou in 1972. During 1973–74, the NCH began to increase and continued to grow through the mid-1990s, peaking at an estimated 50,000 animals in 1995. Herd size has steadily declined since 1996.

The NCH has been important to hunters because of its accessibility and proximity to Anchorage and Fairbanks. The Board of Game (BOG) increased bag limits and extended seasons when the NCH began to increase in the late 1950s. Annual harvests from 1955 through 1971 ranged from 2500 to more than 10,000 caribou. After the herd declined, the bag limit was reduced to one caribou in 1972 and seasons were dramatically curtailed. In 1976 the season was closed by emergency order after hunters killed 800 caribou in only 5 days. It became apparent that a general open season with unlimited participation was no longer possible for the NCH. Since 1977 Nelchina caribou have been hunted by permit only. Between 1977 and 1990 most permits issued were random drawing permits under sport hunting regulations. Unit residents took a few caribou under a subsistence registration permit hunt. Beginning in 1990 Nelchina permits were only issued for state and federal subsistence hunts, except for a very limited drawing hunt in Unit 14. Both the number of permits and the allowable harvest have fluctuated, depending on herd status. During the last 10 years (1989–99) there have been nearly 38,000 caribou harvested from the NCH.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

- Provide for an annual harvest of between 3000–6000 caribou.

METHODS

Biologists conduct yearly censuses and sex and age composition counts. The censuses involve aerial counts of caribou observed during June in postcalving aggregations and are followed immediately by sex and age composition surveys. Count technique includes either a fixed-wing photocensus using aerial photography techniques or a traditional census using hand-held cameras and direct field estimates made from aircraft. Aggregation of caribou and weather conditions determine the census technique; loosely aggregated caribou cannot be photographed effectively. Composition data is collected via helicopter immediately after the census in June to determine productivity and again in October during the rut to determine the bull:cow ratio and calf survival until fall. Extrapolated fall posthunt population estimates are then calculated from the spring counts and fall composition data. Population data are modeled to determine future population trends and allowable yearly harvest rates.

Radiocollared caribou are located seasonally to delineate herd distribution, determine seasonal range use and mortality rates. Between 40 and 60 radiocollared cow caribou are maintained in the herd each year. Collars are also placed on female calves to obtain survival and parturition data for known age females. All radiocollared cows are followed every other day during the calving period to determine pregnancy rates and the mean calving date.

Female calves are collected during the fall and spring to obtain body condition indices. Neonatal calves are captured to obtain estimates of birth weights. Biologists use permit reports, radio-telemetry flights, and hunter field checks to monitor hunt conditions and harvests.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The NCH fall population estimate declined 17% from 35,552 caribou in 1998 to 29,601 in 2000 (Table 1). The estimated density was 0.7 caribou/km^2 in 2000 based on an approximate range of 44,200 km^2 (Lieb et al. 1988).

Population Composition

Herd productivity was low in 2000 with only 31 calves:100 cows observed during the spring postcalving survey (Table 1). This was the second consecutive year with below average productivity, 32 calves:100 cows were observed in 1999. These ratios are 38% below the 10-year average spring ratio of 52:100 reported between 1985 and 1996. The drop in calf production was

attributed to a decline in physical condition of the cows that resulted in a delay in age of first reproduction and a reproductive pause in adult cows. Lactating cow caribou that are nutritionally stressed because of poor forage conditions during dry summers often skip a breeding season to regain body condition (Whitten 1995). Calf mortality is monitored by comparing changes in calf:cow ratios between summer and fall and has increased in recent years. The 1999 and 2000 fall ratios were 23 and 20 calves:100 cows, respectively, and were also among the lowest ever observed. Fall calf ratios historically ranged from 38 to 48 calves:100 cows.

The bull:cow ratio during the 2000 fall composition count was 25:100 and 30:100 in 1999. Fall bull ratios have been relatively stable the last 4 years. Bull:cow ratios during the 1980s when the herd was increasing were often in the range of 50–60 bulls:100 cows. This reduction in the bull:cow ratio was caused by increased bull harvests. Subsistence permittees select for large bulls. As more subsistence permits were issued, not only has the number of bulls declined, the age structure of the bull population has been skewed toward younger animals. Composition data from fall 2000 included 64% small bulls, 25% medium bulls, and only 11% large bulls. In prior years when the bull:cow ratio was higher, the age classes for bulls were more evenly represented.

Distribution and Movements

Calving takes place in the eastern Talkeetna Mountains from Fog Lakes southeast to the Little Nelchina River. The core calving area centers around 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 distribution extends from the upper Denali Highway near Butte Lake on the west, across the Lake Louise Flats, and as far east as the Gulkana River. Much of this summer range is relatively inaccessible compared to other portions of Unit 13. In 1999 and 2000 the rut occurred in the eastern portion of 13B from the Alphabet Hills to the Tangle Lakes. Caribou remained in Unit 13 until late October or early November when 90% of the herd migrated east into Units 12 and 20E. There has been little use of traditional wintering areas in Unit 13 since 1995, with the exception of 1999-00 when approximately 3000 caribou wintered around the Tangle Lakes. In recent years, spring migration back to the calving grounds has occurred during late April or early May.

MORTALITY

HARVEST

Season and Bag Limit. The 1999-2000 season dates for the state Tier II (TC566) subsistence hunt in Unit 13 were 10 August to 20 September and 21 October to 31 March. The bag limit was one bull. There was no state registration subsistence hunt (RC 460) for NCH in Unit 12 during the 1999-2000 season. A state drawing hunt (DC 590) for any caribou with season dates of 10 August to 20 September was held in Subunit 14B. The Unit 13 federal subsistence seasons (RC 513) during 1999–2000 were 10 August to 30 September and 21 October to 31 March. The federal bag limit was 2 caribou. The Unit 13 federal subsistence hunt was a registration hunt administered by the Bureau of Land Management; only residents of Units 11, 13, or 12 along the Nabesna Road were eligible, until 1998 when Unit 20 residents from Delta Junction also became eligible. A Unit 12 federal subsistence hunt (RC 512) was opened by emergency order when the NCH migrated through Tetlin during November 1999.

Board of Game Actions and Emergency Orders. Sport hunting for NCH was eliminated in 1989 after the McDowell Decision by the Alaska Supreme Court resulted in all Alaskans being eligible for a Nelchina subsistence permit, not just rural residents. Only Tier II subsistence hunting was allowed between 1990 and 1995. In 1996 the Board of Game created a Tier I subsistence registration hunt for all state residents, with no limit on the number of permits issued. This action was taken to increase the harvest of cows, thus reducing the herd size in order to meet management objectives. This Tier I hunt lasted only two years, beginning in 1998 all state subsistence hunting was again by Tier II permit only. The 1998-99 Tier II hunt was for bulls only, and the season was closed on 20 November by emergency order. The State registration hunt in Tok was opened by emergency order for cows only between 3 and 7 November 1998. The 1999–2000 Tier II hunt for cows was closed by emergency order on 8 September and the bull hunt was closed on 20 September by EO after harvest quotas were met.

Hunter Harvest. The reported harvest in 1999–2000 for the combined state and federal hunts was 2418 caribou, down 27% from the 1998–99 take of 3306 (Table 2). Caribou harvests peaked in 1996 with a combined harvest of 5601 caribou

Illegal and unreported harvests of Nelchina caribou are an additional source of mortality. The estimated illegal and unreported take (Table 3) was reduced in 1998 because of the large decrease in hunting pressure after closure of the Tier I registration hunt. 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 citing them for taking additional caribou on the same permit. Individuals also transfer permits to family members or friends.

Wounding loss is probably quite high because caribou are a herd animal; a caribou is often shot near other caribou 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 other caribou shot until one eventually drops.

Permit Hunts. Nelchina caribou were harvested by 5 separate permit hunts. Harvest data are presented in Table 2.

A State Tier II subsistence hunt (TC566) is the primary way of allocating harvests from the NCH and, with the exception of the Tier I hunt in 1996 and 1997, and has accounted for 90% of the harvest. All Alaska residents may apply for this hunt, and permits are scored according to certain subsistence criteria and are issued based on an applicant's rank. This is one of the most popular hunts in the state with over 17,000 applicants for up to 10,000 permits that may be issued. The hunt takes place entirely in Unit 13 with both fall and winter seasons. The bag limit is usually any caribou, but has been changed to bulls only in years when harvests need to be reduced. In 1999-2000, 8000 permits were issued and hunters reported a harvest of 589 cows and 1422 bulls (Table 2).

A State Tier I registration hunt (RC567) for cows and small bulls (6 or fewer points on 1 side) was established in 1996 to increase the cow harvest. This hunt lasted two years, then was closed in 1998 because a decline in calf production coupled with the increase in harvests brought the size of the NCH to with in the management objectives. During the two seasons this hunt was held, 4,856 caribou were reported taken with cows comprising 76% (N = 3,670) of the harvest (Table 2). Overall harvests under this hunt were not much higher than reported in the prior two seasons and were well below the expected kill. The observed impact this hunt had on the population dynamics of the NCH was to bring about only a slight reduction in herd size and productivity.

The Unit 13 federal hunt (RC513) is a registration hunt for residents of Units 13, 11, and 12 along the Nabesna Road and Delta Junction in Unit 20. The number of participants and the harvest have increased the last two years with harvests of 416 and 389 caribou in 1998 and 1999 respectively. The highest reported harvest under this hunt was 647 caribou that occurred in 1991 when this hunt first opened. Hunting opportunity is limited because of the reduction in available federal lands for hunting following state land selections. The state selected most of the federal lands in Units 13B and 13E along the Denali Highway that were previously open to caribou hunting. Under federal regulations, state-selected lands are currently not open to federal subsistence hunting. However, the potential for a high harvest under this hunt still exists because the fall caribou migration route between Paxson and Sourdough along the Richardson Highway is still on federal land that is open to federal subsistence hunting. Ideal access along the Richardson provides hunters an easy opportunity to kill caribou should large numbers of animals use this area during the open season.

The state RC 460 registration hunt in Unit 12 is opened when the NCH migrates into Unit 12 but is not yet mixed with Mentasta Caribou Herd. This hunt allows Alaskan residents, especially Unit 12 residents, the opportunity to harvest a caribou when these animals are available. Season dates and bag limits are controlled by emergency order. Harvests are low and have fluctuated between 155 and 361 bulls and, in one year, 380 cows (Table 2); however, the hunt is very popular and has the potential for a high harvest if allowed.

The Unit 12 federal hunt, Hunt 512, is a local subsistence hunt for residents of Northway and Tetlin. This hunt is held by emergency order when a sufficient number of Nelchina caribou migrate into the hunt area. The U.S. Fish and Wildlife Service administer this hunt at the Tetlin National Wildlife Refuge. The hunt has was held in 1998 and 1999 and the harvest was very low with only 11 and 38 bulls reported taken (Table 2).

The state DC590 drawing permit hunt is for any caribou and is held in Unit 14B. It is the only NCH hunt that is not a subsistence hunt and is open to both residents and nonresidents. Up to 100 permits are issued and bulls predominate in the harvest, but the overall take has been very low, varying from 7–22 animals during this reporting period (Table 2).

Hunter Residency and Success. Only Alaska residents are allowed to hunt Nelchina caribou in Units 13 and 12. Nonresident hunters are allowed to hunt the NCH only in 14B under a drawing permit hunt, but there were no successful nonresident applicants during this report period. Table 4 lists hunter residency for local (Unit 13) or nonlocal hunters and their success for the state Tier

II hunt only. Most of the Tier II permits were issued to non-local Alaska residents. Local hunters comprised 7% of the total Tier II hunters and took 4% of the total harvest. Both federal hunts are open only to residents of defined subsistence zones thus only local rural residents harvest caribou from these federal hunts.

Hunter effort varies somewhat between years, depending on caribou distribution and migration patterns in relation to the road system and hunter access points. Over the last 5 years, successful Tier II hunters spent between 5 and 8 days hunting to get a caribou, while unsuccessful hunters averaged 6 to 10 days in the field. Federal subsistence hunters in GMU 13 reported approximately the same hunting effort.

Hunter success for all hunts declined from 43% in 1995–96 to 22% in 1999–2000. The decline in hunter success was primarily attributable to movement of the caribou during the fall season and closure of winter hunts after the decline in herd size. Another factor that affects hunter success in the Tier II hunt is the way permits are issued to the same high scoring individuals every year. Because of this, a Nelchina permit is not the valued prize it was under the old drawing system when an individual was fortunate to get drawn for a permit every 3 or 4 years.

Harvest Chronology. The early fall caribou season occurs in August and September and is the most popular time to hunt caribou. Sixty to 90 percent of the yearly harvest occurred in August and September during this reporting period (Table 5). Harvests are higher in September because of the onset of the rut, when bulls are more vulnerable. Hunting pressure also increases during moose season by hunters on combination hunts. Historically, late fall and winter seasons have been important, with high harvests in those years when caribou remain in Unit 13. The winter season was closed in 1999-2000 because the entire harvest quota was taken during the fall hunt.

Transport Methods. For successful Tier II subsistence hunters during this reporting period, 4-wheelers were the predominant method of transportation, followed by highway vehicles, boats, and snowmachines (Table 6). During the early 1990s, highway vehicles were the most important method of transportation, but in 1993 success rates for hunters using 4-wheelers began to climb. The use of snowmachines has fluctuated widely and is dependent on the availability of caribou during the winter hunt. Highway vehicles have been the most important transportation method in the federal subsistence hunt (RC513) and the Unit 12 state registration hunt (RC460), with 60–80% of successful hunters reporting their use. Aircraft were the most important transportation method in the Unit 14B drawing hunt, with 57–92% of successful hunters using aircraft to access the field.

OTHER MORTALITY

The mortality rate during 1999–2000 for radiocollared adult cows was estimated at 18%, up appreciably from the 5%–10% historical mortality rate. The high mortality rate may be attributable to increased predation because of high wolf numbers and greater prey vulnerability in deep snow conditions.

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 Unit 13 wolves preyed on caribou

whenever they were available. During the early to mid 1980s, the number of wolves occupying both the core Nelchina caribou range and winter range was relatively low because of high human harvests. Since 1988 wolves have increased over most of the Nelchina caribou range, especially in Subunit 13A where wolf numbers were the highest observed in over 25 years on the core calving grounds. A wolf census in 1998 resulted in a density estimate of 12 wolves/1000 km^2 (Testa, ADF&G files) in 13A and numbers remain high. Increased wolf predation on caribou calves is supported by the observed decline in fall calf:cow ratios in recent years.

An important factor limiting winter predation on caribou by wolves in Unit 13 is the migratory pattern of the NCH. A large percentage of the caribou in the NCH leave Unit 13 in October and do not return from wintering areas in Units 12 and 20 until April, and thus are unavailable to Unit 13 wolves. Wolf predation on caribou when they winter out of the unit is documented by monitoring mortality rates on radiocollared caribou. Over winter mortality during 1999–2000 was high and contributed to the 18% yearly rate. Wolves were abundant in Units 12 and 20E and caribou were considered the major prey on the winter range (C. Gardner, pers. commun.). 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.

Winter snow accumulations were above average in Units 13, 12, and 20E during the winter of 1999–2000. Deep snow conditions that restrict foraging and movement negatively impact prey vulnerability and future productivity.

HABITAT

Assessment

Between 1955 and 1962 the department established 39 range stations, including exclosures, throughout much of the Nelchina caribou range. Biologists examined these stations at approximately 5- to 6-year intervals from 1957 through 1989. A complete description of the Nelchina caribou range, range station locations, and results of long-term monitoring is 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 to 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. In this area caribou have shifted from a diet of lichen to one comprised primarily of vascular plants. Lichen standing crops are expected to improve now that there has been a reduction in herd size.

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 the Mulchatna Caribou Herds (Pitcher 1991). Since 1992, female calves

have been captured and radiocollared or collected to assess body condition and age specific productivity data. Fall and spring weights of female calves have ranged between 103 and 126 lbs. These represent the lightest and most variable weights for the interior herds (Valkenburg, ADF&G Files 1998). The lowest weights were recorded in 1996 when summer drought limited forage and resulted in a reduced level of nutrition and again in 2000 following a severe winter and cold spring. The NCH has the genetic potential to produce heavier cows provided adequate nutrition is available. Female calves from the Kenai that are progeny of NCH animals translocated in 1986 and 1987 weighed up to 145 lbs. and were among the heaviest in the state (T. Spraker, pers. commun.). Analysis of body condition since 1992 leads to the conclusion that the NCH is more nutritionally stressed than other interior herds due to overstocking of the range for a number of years.

Neonatal calf weights were obtained on the calving grounds in Unit 13A during the peak of calving beginning in 1996. Weights have fluctuated slightly between years and are 1–2 lbs. less than those from the adjacent Mentasta herd, but additional data are needed before comparisons and conclusions concerning neonatal calf weights are possible.

Herd productivity was assessed by monitoring age of first reproduction among radiocollared cows that were captured as calves. Since 1992, no two-year old cows have produced a calf. In years with conditions favorable to good forage production and availability, 33% of the three-year old cows had calves but during years with drought or deep snow conditions, no three-year old cows calved. Overall pregnancy rates the last two years have only been 45%–50%. Productivity data suggests that the NCH is experiencing nutritional stress typically found at higher stocking densities.

Enhancement

Short-term caribou habitat enhancement is dependent upon reducing the number of animals utilizing the range. Because of this need, the current herd objective is to maintain 35–40,000 caribou on the range and monitor the results. Because this herd reduction only occurred in the last two years, more time is needed to fully evaluate the impact of herd reduction on range condition and forage production.

Long-term caribou habitat enhancement is dependent on the occurrence of wildfire or controlled burns. The Copper River Basin Fire Management Plan, an interagency plan, designates areas in Unit 13 where wildfires will not necessarily be suppressed. The plan provides for a natural fire regime to benefit wildlife habitat. Wildfire may play a role in the recovery of depleted or decadent stands of forage lichens important for over wintering caribou. In addition, wildfire likely enhances summer range conditions that currently limit productivity of the Nelchina herd. Thus, long-term fire suppression can be detrimental to caribou range. It may take caribou forage lichens five or more decades after an intense fire to become abundant; therefore, small, periodic wildfires ensure the availability of both winter and summer caribou range and a constant lichen supply. Effective 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 capability for caribou.

In spite of the plan and the benefits of wild fire, recent wildfire starts in Unit 13 have not been allowed to burn, regardless of the suppression category of the land. In fact, Unit 13 has not had a large fire since 1950. Planning is also underway for a controlled burn in the Alphabet Hills and Lake Louise flats to improve moose and caribou habitat.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Current management needs include: (1) Monitoring range condition. The immediate repair and reading of the existing Nelchina range stations is needed if they are to remain a useful tool for evaluating range condition and trend. Additional stations should be added in important habitats such as the Eastern Talkeetna Mountains and wintering grounds in eastern Unit 13 and Units 11 and 12. (2) Continued monitoring of body condition parameters. (3) Monitoring sources and rates of natural mortality. (4) Minimizing land use activities that adversely affect the Nelchina range. The use of ORVS in GMU 13 has increased and may be disrupting normal caribou behavior patterns. I recommend we evaluate the potential impacts of ORV and snowmobile use in Unit 13 and develop a plan for future use of these vehicles. This should entail a joint planning process with landowners, other regulatory agencies, and the public.

CONCLUSIONS AND RECOMMENDATIONS

The fall 2000 NCH herd estimate of 29,601 caribou indicates the size of the herd has declined below the population management objective of 35,000–40,000 caribou. High human harvests were allowed in 1996 and 97 to bring the herd down from an estimated 50,000 animals. The initial observed decline in herd size was a result of the increased harvest of cows under the Tier I hunt. However, the Tier I hunt was canceled in 1998 before the largest declines in herd size and productivity occurred. Declines subsequent to cutbacks in the human harvest are attributed to both lower productivity and increased wolf predation. In order to stabilize the decline and allow the herd to increase back to within management guidelines, human harvest levels have been greatly reduced. Modeling of current population data suggests that if productivity and predation remains the same as in 1999–2000, the herd will continue to decline even if all hunting is stopped.

Calf production in the NCH was the lowest ever observed in the herd during this reporting period. Declines in herd productivity occur and are often attributed to lower pregnancy rates due to reduced forage production or availability because of severe winter conditions, summer droughts, or cold summers with late spring and early fall snow conditions. Cameron and Ver Hoeff (1994) found that when body condition of cows declined, caribou skipped a calving interval until body condition improved. A prolonged decline in herd productivity, especially during periods with favorable weather, is most likely attributable to over utilization of the range (Messier et al. 1988). In the case of the NCH the conclusion that the range was over utilized when the herd exceeded 40,000 animals is supported by observed declines in body weights of female calves, delayed age for first pregnancy and reduced pregnancy rates in adult cows.

The current bull:cow ratio is well below the management objective of 40 bulls:100 cows in the NCH. Composition data for the bull segment of the population show most of the decline has occurred in the large bull category, with large bulls comprising only 10% of the bulls. Heavy harvest on the bull segment during the fall seasons by subsistence hunters is the reason for the

decline in the bull:cow ratio and the number of large bulls. Subsistence hunters select for older, larger bulls when they are available. Bull:cow ratios should be increased, to allow more adult bulls in the population to participate in the rut. While young bulls are capable of breeding, large bulls are considered essential for an efficient and timely rut. Cows are stimulated and estrus induced by bull physiology and behavior. Synchrony of the rut is important to achieve synchrony in parturition, which provides a survival advantage for calves.

Caribou harvests need to be kept low until the population is again within the management objective of 35,000–40,000 caribou. Harvest objectives should be established for the Tier II hunt annually. Individual yearly harvest objectives for cows and bulls should be based on the annual recruitment and bull:cow ratios as well as the population trend. Harvest objectives for the NCH can be successfully attained by adjusting the number of Tier II permits issued and closing the season for bulls and cows by emergency order when the management goal for each has been reached.

Another important issue is the proliferation of 4-wheelers and snowmachines. The increased use of these vehicles raises questions of animal disturbance. The short-term impact of vehicle disturbance is increased energy expenditure and reduced time foraging while long-term impacts may include range abandonment. Effects of vehicles on NCH caribou need to be considered in future land use planning activities by BLM and DNR for federal and state lands used by the herd.

The NCH is the only large 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. Because of this, limiting the herd's size to 35,000–40,000 animals is considered a management experiment. The management objective of having hunters control herd size at a level that is below prior peak herd numbers over a prolonged number of years has never been accomplished on a large herd. A major benefit of this management strategy is to provide a more stable and predictable harvest of caribou from the herd over the long term. Historic harvest for 20 years when the NCH peaked in the 1960s and crashed in the 1970s averaged about 3,600 caribou a year (range 360–10,100). If the herd could be stabilized at 35,000–40,000, and wolf predation limited to 10% or less, the projected annual harvest would be 3,000 – 4,000 caribou each year thus eliminating the peak or bust cycle. Also, a consistently moderate sized herd may provide a more stable prey supply for wolves and somewhat reduce the predation pressure on moose.

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Table 1 Nelchina caribou fall composition counts and estimated herd size, 1995–2000

Regulatory year	Total bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Total bulls (%)	Composition sample size	Total adults	Estimate of herd size	Postcalving[a] count
1995/96	34	38	22	64	20	5,086	39,172	50,281	49,808
1996/97	34	38	22	64	20	3,086	34,492	44,273	48,666
1997/98	26	26	17	66	17	3,553	26,438	31,893	34,894
1998/99	21	38	24	63	13	2,394	29,338	38,552	44,192
1999/00	30	23	15	65	20	3,000	26,650	31,365	33,125
2000/01	25	20	14	69	17	3,017	25,518	29,601	33,795

[a] Spring census.

Table 2 Nelchina caribou harvest data by permit hunt, 1995–2000

Hunt No. /Area	Regulatory year	Permits Issued	Percent did not hunt	Percent Successful Hunters	Percent Unsuccessful hunters	Bulls	(%)	Cows	(%)	Unk.	Total Harvest
TC566[a]	1995/96	12,000	20	47	53	2,633	(59)	1,802	(41)	22	4,457
	1996/97	9,980	31	27	73	1,722	(100)	0	(0)	6	1,728
	1997/98	10,000	27	31	69	2,078	(100)	2	(0)	17	2,097
	1998/99	10,020	53	58	18	2,454	(99)	14	(1)	6	2,474
	1999/00	8,000	30	65	40	1,422	(71)	589	(29)	6	2,017
RC567[b]	1996/97	36,601	62	32	68	726	(22)	2,519	(78)	10	3,255
	1997/98	25,376	71	30	70	438	(28)	1,151	(72)	12	1,601
RC513[c]	1995/96	1,659	22	20	80	117	(53)	105	(47)	5	227
	1996/97	1,639	29	21	79	167	(61)	108	(39)	2	277
	1997/98	1,618	22	10	90	105	(65)	58	(35)	1	164
	1998/99	2,427	30	12	46	230	(55)	183	(44)	3	416
	1999/00	2,651	N/A	N/A	N/A	207	(53)	181	(47)	1	389
RC460[d]	1995/96	1,086	12	27	73	243	(98)	3	(1)	1	247
	1996/97	2,044	12	21	79	347	(97)	11	(3)	3	361
	1997/98	632	14	29	71	150	(98)	3	(2)	2	155
	1998/99	920	10	43	47	16	(4)	380	(96)	1	397
	1999/00	No hunt									
RC512[e]	1993/94	34	44	58	42	11	(100)	--	--	--	11
	1994/95	97	35	38	62	24	(100)	--	--	--	24
	1995/96	No hunt									
	1996/97	No hunt									
	1997/98	No hunt									
	1998/99	47	34	23	43	11	(100)	--	--	--	11
	1999/00	208	40	18	42	38	(100)	--	--	--	38

Table 2 Continued

Hunt No.	Regulatory	Permits	Percent did not	Percent Successful	Percent Unsuccessful						Total

/Area	year	Issued	hunt	Hunters	hunters	Bulls	(%)	Cows	(%)	Unk.	Harvest
DC590[f]	1995/96	100	46	41	59	13	(59)	9	(41)	0	22
	1996/97	100	63	19	81	5	(71)	2	(29)	0	7
	1997/98	100	57	26	74	7	(70)	3	(30)	0	10
	1998/99	100	42	35	65	13	(68)	6	(32)	0	19
	1999/00	100	56	30	70	6	(50)	6	(50)	0	12
Totals for	1995/96	14,748	22	43	57	2,986	(61)	1,907	(39)	23	4,916
all permit	1996/97	50,349	52	29	71	2,944	(53)	2,639	(47)	18	5,601
hunts	1997/98	37,730	56	30	70	2,778	(70)	1,217	(30)	32	4,027
	1998/99	13,467	46	24	25	2,713	(82)	583	(18)	10	3,306
	1999/00	10,751	N/A	22	N/A	1,635	(68)	776	(32)	7	2,418

[a] Tier II subsistence drawing permit.
[b] Tier I subsistence registration permit.
[c] Subsistence registration for local residents, administered by BLM as federal hunt RC513 in 1990, and includes 20D residents in hunt 514.
[d] A winter registration hunt for residents of Alaska in GMU 12.
[e] Subsistence registration for Unit 12 residents, administered by Fish and Wildlife Service as Federal Hunt RC512.
[f] A drawing sport hunt.

Table 3 Nelchina caribou harvest and accidental death, 1995–2000

Regulatory	Reported						Estimated			Accidental	Grand
Year	M	(%)	F	(%)	Unk.	Total	Unreported	Illegal	Total	death	total
1995/96	2,986	(61)	1,907	(39)	23	4,916	200	100	300	200	5,416
1996/97	2,944	(53)	2,639	(47)	18	5,601	500	300	800	200	6,601
1997/98	2,778	(70)	1,217	(30)	32	4,027	500	300	800	200	5,027
1998/99	2,713	(82)	583	(18)	10	3,306	200	100	300	200	3,806
1999/00	1,635	(68)	776	(12)	7	2,418	200	100	300	200	2,918

Table 4 Nelchina caribou Hunt TC566 annual hunter residency and success, 1995–2000

	Successful				Unsuccessful				
Regulatory	Local[a]	Nonlocal			Local[a]	Nonlocal			Total
year	resident	resident	Nonresident	Total	resident	resident	Nonresident	Total	hunters
1995/96	259	4,198	--	4,457	413	4,563	--	4,976	9,433
1996/97	110	1,618	--	1,728	348	4,313	--	4,662	6,390
1997/98	105	1,992	--	2,097	368	4,393	--	4,761	6,858
1998/99	129	2,345	--	2,474	52	892	--	944	3,418
1999/00	75	1,942	--	2,017	291	2,889	--	3,180	5,197

[a] Local resident is a resident of Units 13, 11, or 12 along the Nabesna Road.
[b] Tier I and II combined.

Table 5 Nelchina caribou Hunt TC566 annual harvest chronology percent by harvest period, 1995–2000

	Harvest Periods														
	Weeks (fall)								Months (winter)						
Regulatory year	1	2	3	4	5	6	7	8	Oct.	Nov.	Dec.	Jan.	Feb	Mar.	n
1995/96	6	9	10	7	10	11	10	--	--	5	6	4	5	17	4,396
1996/97	6	12	12	9	9	13	16	15	3	2	1	1	1	1	1,673
1997/98	4	5	5	8	9	9	12	10	10	24	2	1	0	1	2,052
1998/99	6	7	9	10	9	16	13	11	11	8	--	--	--	--	2434
1999/00	6	16	16	12	23	15	12	--	--	--	--	--	--	--	2002

Table 6. Nelchina caribou Hunt TC566 harvest percent by transport method, 1995–2000.

	Percent of harvest									
Regulatory year	Airplane	Horse	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Airboat	Unk.	n
1995/96	6	1	10	31	19	8	23	0	1	4,457
1996/97	9	1	13	41	5	11	18	0	2	1,728
1997/98	9	1	10	28	22	9	19	0	1	2,097
1998/99	7	1	11	39	3	11	26	1	1	2,478
1999/00	8	1	17	41	0	15	15	1	1	2,017

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

HERDS: Kilbuck Mountain and Mulchatna

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 few caribou were in the lowlands of the Delta. Before 1994, only 1 small herd, the Kilbuck Caribou Herd (KCH) or Qavilnguut Herd, was resident in Unit 18. This herd was located in the Kilbuck and Kuskokwim mountains southeast of Bethel. Kilbuck caribou calved on high ridges in the western portion of the Kuskokwim Mountains, summered in alpine meadows, and wintered in valleys and on wind-blown slopes further west and south. Their range included the eastern portion of Unit 18, encompassing the edge of the lowlands of the Delta and the montane western border of Units 19B and 17B. Conservative management techniques were used to protect this small, discrete, resident herd. Since 1994 and through this reporting period, large numbers of caribou from the Mulchatna Herd (MCH) have seasonally invaded the entire range of the KCH. The mixing of Kilbuck and Mulchatna caribou has severely restricted data collection for the KCH and has increased the complexity of caribou management in Unit 18.

Since 1985, the Department and Fish and Wildlife Service (FWS) have cooperated to study the KCH and more recently the MCH in Unit 18. We deployed radiocollars and completed numerous aerial surveys and radiotelemetry flights during this study.

We initiated cooperative management planning for the KCH in 1990. The department joined with local residents and FWS to develop the Kilbuck Caribou Herd Cooperative Management Plan. The Cooperative Planning Group continues to provide an instrumental forum to discuss caribou management with local residents in Unit 18.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

The caribou management goals for Unit 18 are:

- Increase the numbers caribou
- Identify the status and size of the KCH
- Improve compliance with caribou hunting regulations
- Better understand the interaction between the KCH and the MCH

Management Objectives

Specific management objectives outlined in the Qavilnguut (Kilbuck) Caribou Herd Cooperative Management Plan include the following actions:

1. Change the harvest in response to population size of the KCH as follows:
   - No harvest allowed when the population is <1000 animals.
   - Allow a 5% harvest when the population ranges between 1000–3000 animals.
   - Allow a 7.5% harvest when the population ranges between 3000–5000 animals.
   - Reevaluate the harvest and strategy when the population exceeds 5000 animals.
2. Gather accurate harvest information for the KCH.
3. Increase compliance with caribou hunting regulations.

We are no longer following these KCH harvest guidelines. The presence of overwhelming numbers of Mulchatna caribou within the range of the KCH in Unit 18 has changed our management focus. We now leave the season closed until sufficient numbers of Mulchatna caribou arrive to dilute the harvest of Kilbuck caribou.

METHODS

We met with representatives from local villages and other agencies from December 1990 through November 1999. We described the need to determine the status of the KCH during the most recent meeting and received local support for maintaining 20 radiocollared Kilbuck caribou. We have maintained formal and informal contact with meeting participants throughout this reporting period.

We continued the cooperative KCH study. During the first week of June 2000, Department and FWS staff deployed 9 radiocollars on yearling female caribou that were associated with calving groups in traditional KCH calving areas (7 of these remain active). We completed multiple radiotracking flights using fixed-wing aircraft. Near the end of this reporting period, we monitored 30 radiocollars in both the Kilbuck and Mulchatna herds. We mapped radiocollar locations using Global Positioning System (GPS) equipment. Detailed methodology for the Kilbuck caribou study is available in Hinkes (1989) and Ernst (1993).

We conducted composition counts in the Kilbuck Mountains during October 1999 and October 2000 after large numbers of Mulchatna caribou had arrived. Two observers and a pilot used an R44 helicopter to sample caribou for composition. A fixed wing Cessna 185 aircraft equipped with radiotelemetry equipment assisted by locating groups of caribou throughout the area.

In recent years harvest reporting for the KCH has been minimal and deficient. In 1999–2000, we began an incentive program to increase compliance with harvest reporting requirements by offering drawing prizes to hunters who properly filled out their harvest reports as entry into the prize drawing program. To encourage hunter participation in the drawing program, several local businesses donated up to $200 worth of prizes and the department also purchased prizes. The total prize value was approximately $2000 and over 50 hunters received awards.

We did not direct any effort toward caribou north of the Yukon River.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Before 1994, the KCH was small but growing and was expanding its range when approximately 35,000 Mulchatna caribou overran it in September/October 1994. A second influx of approximately 36,000 Mulchatna caribou occurred during the fall of 1995. There have been annual influxes of approximately 15,000 to 40,000 Mulchatna caribou since 1995.

We estimated that less than 150 adult cow caribou calved in the Kilbuck Mountains during early June 2000. Only one calving group was discovered during an intensive search. If this group represents the entire KCH, we estimate the herd is smaller than 500.

Population Composition

We conducted composition counts of caribou in the Kilbuck Mountains during October of 1999 and 2000 (Table 1). The overwhelming majority of these caribou were from the MCH. These data will be reported in the MCH caribou management report.

Distribution and Movements

Since 1994 and continuing through this reporting period, approximately 15,000 to 40,000 Mulchatna caribou entered Unit 18 from the east, generally during mid-August to mid-September. They wintered throughout lower Kuskokwim River drainages, extending from the Whitefish Lake area near Aniak to the Goodnews River drainage in southernmost Unit 18. They shared ranges with the KCH until late March when they moved westward into Units 17A, 17B, and 19B.

The routes used by Mulchatna caribou to leave Unit 18 in late winter are obvious from trails. Former calving areas such as those near Kisaralik Lake and others have major trails through them. We could not find any calving caribou in June 2000 in any of the former KCH calving areas that had major trails nearby. We found only one group of calving caribou near Heart Lake.

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 (WACH) occasionally use portions of Unit 18 north of the Yukon River. The number of WACH caribou using this area is small relative to the size of the entire herd. Unit 18 is on the periphery of the WACH's range and use of this area is occasional and intermittent.

MORTALITY

Harvest

Season and Bag Limit

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18, north of the Yukon River.		
RESIDENT AND NONRESIDENT HUNTERS:		
1 caribou per day		
Bulls	16 May–30 Jun	16 May–30 Jun
Any Caribou	1 Jul–15 May	1 Jul–15 May
Unit 18, south of the Yukon River.		
RESIDENT HUNTERS:		
Up to 5 caribou	Season to be announced by emergency order	
NONRESIDENT HUNTERS:		No open season.

Board of Game Actions and Emergency Orders. To minimize the harvest of Kilbuck caribou, we open the season by emergency order only when enough Mulchatna caribou are present in Unit 18 to overwhelm the Kilbuck herd. The 1998–1999 season was open from 5 September–31 March and the 1999–2000 season was open from 17 September–31 March. The bag limit was 5 caribou during both seasons. We coordinated with federal managers when we announced these openings and federal and state seasons and bag limits were aligned.

Hunter Harvest. In 1998–1999, 116 hunters reported killing 214 caribou including 177 bulls and 37 cows. In 1999–2000, 208 hunters reported killing 368 caribou including 238 bulls and 130 cows.

Harvest reporting improved between 1998–1999 and 1999–2000. This may be due to the initiation of the harvest report prize drawing incentive. However, the value of these data is still limited. Coffing, *et al* (2000) report that residents of the village of Akiachak (population of 560) harvested 374 caribou during the 1998 calendar year. If we apply a similar harvest rate to approximately 10,000 residents having similar access to caribou in Unit 18 (4792 people in 13

villages and 5449 people in Bethel), we can clearly see the harvest of caribou is grossly under-reported.

Hunter Residency and Success. All caribou hunters in Unit 18 are residents since there is no open season for nonresidents. In 1998–1999, 84% of the hunters who reported were successful taking at least one caribou. In 1999–2000, 77% reported taking at least one caribou.

Harvest Chronology. Harvest occurs throughout the season. During 1998–1999 and 1999–2000, most of the reported harvest occurred during February and March.

Harvest is largely dependant on travel conditions and accessibility of caribou. During November 1998, travel conditions were poor and only 6 caribou were reported harvested. During November 1999, travel conditions were good and 65 caribou were reported harvested.

Transport Methods. During September and October of this reporting period, most hunters used boats to access hunting areas. Airplanes were only used during September by a small number of hunters. The large majority of hunters used snowmachines after snow conditions improved enough to permit safe travel. Other transportation methods are rarely 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 probably increased in recent years. The reported wolf harvest has increased more than tenfold in the last decade. Further, most of the wolves harvested in Unit 18 are taken opportunistically by caribou hunters.

Another source of mortality is predation by brown bears. We found evidence that brown bears killed two radiocollared caribou. However, we do not have an estimate of predation rates on caribou in Unit 18.

HABITAT

Assessment

The lichen ranges in the Kilbuck and southern Kuskokwim Mountains 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 for over 65 years (Calista Professional Services and Orutsararmuit Native Council, 1984). The tundra areas between the Yukon and Kuskokwim Rivers have not been grazed by caribou for over 100 years, and not by reindeer for over 60 years. We believe the range in Unit 18 could support many more caribou.

Enhancement

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

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

COOPERATIVE MANAGEMENT PLAN

The KCH Cooperative Management Plan was developed and finalized in 1994, after extensive agency and public input over a 5-year period. It was revised in 1995 and again in 1997. The plan provides guidelines for management of the KCH. Even though the distinctiveness of the KCH has become uncertain as it mixes with Mulchatna caribou in Unit 18, the Cooperative Planning Group provides a forum for discussion of caribou management within the unit.

CONCLUSIONS AND RECOMMENDATIONS

Since 1986 the FWS and the Department have cooperatively studied the KCH. Estimated at a minimum of 4220 animals in 1994, the KCH comprised a distinct herd resident in the Kilbuck and southern Kuskokwim Mountains. We observed these caribou calving for 12 consecutive years on high ridges near Kisaralik Lake, east and north of Greenstone Ridge, ridge tops on the southern edge of the Kilbuck Mountains, and the southwest edge of the Kuskokwim Mountains. The herd continued to grow and extend its range until it was engulfed by large numbers of Mulchatna caribou beginning in late October 1994. By June 2000, the area around Heart Lake was the only area where we could find any groups of caribou calving in the Kilbuck Mountains. Radiocollar locations of Kilbuck caribou and heavy trailing through former calving areas show that Kilbuck caribou mix with Mulchatna caribou and Kilbuck caribou have regularly left their 'traditional' range.

The integrity of the KCH is still being investigated. Prior to 1994, radiocollars deployed on Unit 18 caribou were certainly deployed on Kilbuck caribou. Radiocollars deployed after that we deployed on Kilbuck and Mulchatna caribou. Until these caribou returned to calve, it was uncertain which herd was represented. In June 2000 we were reasonably confident that we deployed radiocollars on Kilbuck caribou. Tracking the movements of these recently collared Kilbuck caribou should remain a priority.

We should continue to gather composition information on Mulchatna caribou in Unit 18. The number of Mulchatna caribou using Unit 18 is not only large, but represents a large proportion of the MCH. Any measure of MCH composition should include data from Unit 18.

We need to improve harvest reporting. The harvest report prize drawing incentive has increased interest and reporting has improved. This incentive should be continued for several more years and then it should be reevaluated.

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Table 1 Composition of caribou from the Mulchatna Caribou herd (MCH) in Unit 18, 1999-2000.

			Bulls			
Year	Cows	Calves	Small	Medium	Large	Total
1999	3277	462	594	261	137	4731
2000	1439	350	329	168	140	2426

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 19 (A, B, C, and D) and 21 (A and E) (60,523 mi^2)

HERDS: Beaver Mountains, Big River–Farewell, Rainy Pass, Sunshine Mountains, and Tonzona (McGrath area herds)

GEOGRAPHIC DESCRIPTION: Drainages of the Kuskokwim River upstream from the village of Lower Kalskag; Yukon River drainage from Paimiut upstream to, but not including, the Blackburn Creek drainage; the entire Innoko River drainage; and the Nowitna River drainage upstream from the confluence of the Little Mud and Nowitna Rivers

BACKGROUND

Historically, caribou have played an important role in this area. Although documentation is poor, discussions with village elders and reports of early explorers (Hemming 1970) support the idea that caribou sporadically existed in far greater numbers and over a greater range during the 1800s than presently. I suspect the Mulchatna caribou herd once roamed throughout the Kuskokwim Basin, but as numbers dwindled, they retreated to the better range to the south (Whitman 1997). As the Mulchatna Herd continued to increase during the 1990s (the 1996 summer estimate was over 200,000 animals), it increased its winter range northward and began using portions of Unit 19.

In the Kuskokwim Mountains, which divide Unit 19 from Unit 21, small caribou bands have apparently existed since at least the turn of the twentieth century. Reindeer herders from the Yukon River villages of Holy Cross and Shageluk traditionally herded their animals to summer range in these mountains. As in other areas where reindeer were herded, it was common for herders to occasionally lose them. Some people believe that the *Rangifer* herds in the Kuskokwim Mountains today are descendants of feral reindeer or reindeer/caribou hybrids. The only supporting evidence for this theory is the fact that the Beaver Mountains caribou herd calves much earlier than many caribou herds (early to mid-May), but this may be due to the great abundance of food in the area rather than the influence of reindeer genes.

Caribou herds in the Kuskokwim Mountains north of the Kuskokwim River were described in previous reports as the Kuskokwim Mountains Herd/Herds or the Beaver Mountains Herd and Sunshine (Sunshine/Nixon) Mountain Herd (Shepherd 1981; Pegau 1986). In the early 1980s

Pegau (1986) radiocollared caribou in the Beaver Mountains and Sunshine Mountains. During the course of his 4-year study, no range overlap was documented. Radiocollared caribou from the Beaver Mountains ranged south almost to Horn Mountain. Caribou in that portion of the Kuskokwim Mountains (near Horn Mountain) were previously called the Kuskokwim Mountains Herd. Based on Pegau's work, there are only 2 groups of caribou in the Kuskokwim Mountains that warrant herd status: Beaver Mountains and Sunshine Mountains.

Herds presently recognized south of the Kuskokwim River include the Tonzona, Big River–Farewell (previously called Big River), Rainy Pass, and Mulchatna Herds. Radiocollaring confirmed the separate identity of the Tonzona Herd, although there is some interaction between this herd and the Denali Herd (Del Vecchio et al. 1995). Pegau (1986) collared caribou in the Big River–Farewell Herd near Farewell in the early 1980s. During the first year of the study, the collared caribou remained in the Farewell area. However, some of these collared caribou eventually moved near the Swift River during the following year and did not return for at least 2 years. These observations raised as many questions as they answered, and the discreteness and extent of the range of the Big River–Farewell Herd is still poorly understood.

The Rainy Pass area and the drainages at the head of the South Fork Kuskokwim River and surrounding area are inhabited by resident caribou. These caribou constitute the Rainy Pass Herd. This herd is perhaps the least studied and least understood in the state. Major questions remain about herd size, discreteness, and interactions/relationship to Mulchatna Herd caribou.

Caribou occupying ranges south of the Kuskokwim River have been little used by Native hunters in recent times, except that residents of Nikolai and Telida have occasionally had opportunities to hunt Tonzona and Big River–Farewell caribou. Mulchatna caribou have increasingly been hunted along the Holitna and Hoholitna Rivers. Recent expansion into more northerly areas by the Mulchatna caribou herd has increased its availability to village hunters in all Kuskokwim River villages downstream from Nikolai, including hunters from major population centers of McGrath and Aniak. The Big River–Farewell, Tonzona, and Rainy Pass Herds have generally been harvested by hunters who fly into the area primarily for sheep, moose, and bison hunting. Harvest from the Beaver Mountains and Sunshine Mountains Herds has totaled less than 15 caribou per year since winter seasons were suspended.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Big River-Farwell 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 reviewed hunter harvest reports and entered and tabulated harvest data annually. Harvest data were summarized by regulatory year (RY = 1 Jul–30 Jun; e.g., RY00 = 1 Jul 2000 through 30 Jun 2001) and do not include Mulchatna Herd animals taken in Unit 19.

Incidental observations of caribou numbers and calving areas were made from small, fixed-wing aircraft. Composition surveys were conducted using a Robinson R-44 helicopter. Caribou were classified by sex, age, and for bulls, by the size of antlers.

Caribou were fitted with radio collars in the Rainy Pass Herd during October 1999 and October 2000. Female 5-month-old calves were fitted with radiocollars. These caribou were captured using the helicopter darting technique as described in Valkenburg (1997). Radio collars were deployed to facilitate the composition counts and general monitoring. Composition counts were also conducted during the 1999 and 2000 October capture operations.

Starting in RY98 the harvest ticket reporting system was changed. Previous to 1998–1999 harvest tickets were issued to hunters, however the overlays were not processed and reminders were not sent to hunters. This resulted in lower reporting rates. Since 1998–1999, ADF&G's Information Management Section began to input the harvest ticket overlays and then send out reminders for hunters failing to report their harvests. While this is a positive step to gathering more precise caribou harvest data, there must be a precautionary note that the data with a higher reporting rate must be interpreted as such, and not necessarily perceived as increases in the actual harvests. It also must be considered that in the case of this area there appears to be a certain percentage of returned harvest tickets that are more difficult to code to specific location. Therefore, the more ambiguous to their location, the more difficulty there is discerning in which herd the harvest took place, especially in Unit 19C where there are 3 different herds.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

We did not complete any systematic population surveys during this reporting period. However, we did conduct a single aircraft search of the Beaver Mountains Herd's range during July 1999. Composition counts were conducted on the Rainy Pass caribou herd during October 1999 and 2000.

Population Size

The Beaver Mountains Herd has declined since the early 1960s. In 1963 Skoog (1963) estimated 3000 animals. In 1986, Pegau (1986) estimated 1600. In 1992 Whitman (1995) estimated 865 caribou were present, and in 1994 he felt that only 536 remained (Whitman 1997). During early summer 1995, Whitman counted only about 400 animals when the herd was concentrated on its

calving area. Boudreau searched the normal herd range in July 1999 and observed 129 caribou in a single group, no other caribou were observed.

The Sunshine Mountains caribou herd has also declined in recent years. Whitman estimated the population was 700 animals in 1994, but in 1995 he estimated only 500 animals. Based on Whitman's observations, the dynamics of this herd seem to mirror those of the Beaver Mountains Herd (and some other small, mountain herds like the Chisana and Mentasta), with predators probably having a major impact on calf survival (Jenkins 1996; Whitman 1997; Mech et al. 1998).

The Rainy Pass Herd probably numbers 2100–2600 caribou. In July 1996, 1093 caribou were counted in Unit 16 incidental to sheep surveys. Whitman (ADF&G, personal communication) suspected that 1000–1500 more caribou of the Rainy Pass Herd were located in Unit 19 and were not counted at that time. Whitman (1997) estimated the Big River–Farewell Herd was 1000–2000 animals.

In 1991, National Park Service staff estimated 1300 caribou in the Tonzona Herd. This estimate was done as a comparison to the nearby Denali Herd that inhabits the national park.

The Mulchatna Herd is 175,000 animals and has extended its range into the Kuskokwim drainage. The ranges of the Beaver Mountains, Sunshine Mountains, and Big River–Farewell Herds currently overlap with the dynamic winter range of the Mulchatna Herd.

Composition

Herd composition counts were conducted on the Rainy Pass caribou herd during October 1999 and October 2000 (Table 1). During the October 1999 survey a sample of 441 caribou were classified and a large part of the suspected winter range was searched for animals. Calf:cow ratios were low at 8 calves:100 cows, bull:cow ratios were 28:100. During the October 2000 survey, 152 caribou were classified and only half of the area was searched that had been searched in 1999, because of weather. During this survey the calf:cow ratio was 12:100 and the bull:cow ratio was 115:100 (Table 1). The sample for the October 2000 composition counts appeared to have a skewed bull:cow ratio. The are 2 possible explanations for the skewed results. The first is classification error. This would account for the disproportionate number of small bulls observed, which drastically skewed the bull: cow ratio. The second explanation, however less plausible, is that because the sample size is small and the search area was limited a disproportionate number of males were found, thus skewing the results. A fall 2001 composition survey was planned to further evaluate the questionable results of the 2000 survey. The fall 2001 survey was not conducted so a fall 2002 was planned.

Distribution and Movements

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

Sunshine Mountains. The range of the Sunshine Herd is predominantly in the drainages of the Nixon Fork from Cloudy Mountain to Von Frank Mountain and in the headwaters of the Susulatna River, including Fossil Mountain and the Cripple Creek Mountains. Calving occurs throughout the range, but most occurs on the Nixon Flats. Other than the Kenai Lowlands Herd, the Sunshine Mountains Herd is the only herd in Alaska that calves in muskeg and low-lying areas. Wintering areas are mostly in the drainages of the Nixon Fork. In midsummer caribou are predominately in the Sunshine Mountains, and some small groups were observed during summer 2001 in the Nixon Fork flats.

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

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

Rainy Pass. The Rainy Pass Herd's range 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 the summer in both Units 16B and 19C. Wintering areas are largely unknown.

MORTALITY

Harvest

Season and Bag Limit.

Unit/Bag limit	Resident open seasons	Nonresident open seasons
Unit 19A, Lime Village Management Area.		
RESIDENT HUNTERS: 4 caribou.	10 Aug–31 Mar	
4 bulls or 4 cows w/o calves.	1 Apr–9 Aug	
NONRESIDENT HUNTERS: 1 caribou.		10 Aug–31 Mar
Remainder of Unit 19A and all of Unit 19B.		
RESIDENT HUNTERS: 5 caribou, no more than 2 may be bulls.	1 Aug–15 Apr	
NONRESIDENT HUNTERS: 2 caribou.		1 Aug–15 Apr
Unit 19C		
RESIDENT AND NONRESIDENT HUNTERS:	10 Aug–20 Sep	10 Aug–20 Sep

Unit/Bag limit	Resident open seasons	Nonresident open seasons
1 bull.		
Unit 19D, drainage of the Nixon Fork.		
RESIDENT AND NONRESIDENT HUNTERS: 1 caribou.	10 Aug–30 Sep	10 Aug–30 Sep
Unit 19D, remainder.		
RESIDENT HUNTERS: 1 caribou.	10 Aug–30 Sep 1 Nov–31 Jan	
or 5 caribou.	Season to be announced.	
NONRESIDENT HUNTERS: 1 caribou.		10 Aug–30 Sep
Unit 21A		
RESIDENT AND NONRESIDENT HUNTERS: 1 caribou.	10 Aug–30 Sep 10 Dec–20 Dec	10 Aug–30 Sep 10 Dec–20 Dec
Unit 21E		
RESIDENT HUNTERS: 1 caribou and 2 additional caribou during winter if season announced.	10 Aug–30 Sep	
NONRESIDENT HUNTERS: 1 caribou.		10 Aug–30 Sep

Board of Game Actions and Emergency Orders. The Board of Game adopted a regulation at their March 2000 meeting to change the hunting season in Unit 19C. It was shortened from closing on 10 October to 20 September. This was proposed by the department and was based on information on low recruitment collected on the Rainy Pass Herd. Assuming the same situation in the 2 other herds in Unit 19C (Big River–Farewell, Tonzona), the proposal covered the entire subunit. This season change also aligns the season with the other small Interior Alaska caribou herd seasons.

The only actions resulting from the March 2002 Board of Game in regard to caribou was a regulation that creates a corridor 4 miles wide that extends along most of the waterways, except the Stony River, in Unit 19A and is closed to caribou hunting for all nonresidents. The other action was that the Aniak River was added into the Holitna/Hoholitna Management Area, which requires big game taken in Unit 19B by hunters accessing the area by airplane to have all meat be flown out of Unit 19B. These regulations were proposed and adopted to influence the moose hunting pressure in areas where local residents are currently hunting and to restrict floating from Unit 19B all the way into Unit 19A, which has been blamed for some meat spoilage observed in Aniak.

Hunter Harvest. The use of local caribou herds by hunters was stable in Unit 19. During RY90 through RY97, the average reported harvest of caribou was 142. Harvest declined between RY94 and RY95. These declines in harvest can be attributed to the Rainy Pass, Big River–Farewell, and Tonzona Herds (Table 2). Harvests have remained relatively stable since RY95. During this reporting period, the average reported harvest was 103 caribou (Table 3). During this reporting period, females composed <1% of the Unit 19 caribou harvest (Table 3).

Hunter Residency and Success. During RY98, migration patterns of the Mulchatna Herd enabled local hunters (Unit 19 residents) to increase their harvest of caribou. The Mulchatna Herd was the only herd readily accessible, and harvest from McGrath area herds by local hunters was low (Table 4). During RY89 through RY97, local hunters took <4% of the reported harvest of local caribou herds. During this reporting period, local hunters took <4% of the reported harvest of the local caribou herds. It should be stressed, however, that local users are less inclined to report their hunting activities than are nonlocal and nonresident hunters. During this reporting period, Alaskans who were not local residents harvested about 25%, and nonresidents of the state harvested the remaining 70% of harvested animals. Historically (RY89 through RY97) nonlocal Alaskans took 45% of the total harvest. Most harvest data came from hunters hunting the Big River–Farewell, Rainy Pass, and Tonzona Herds. Primarily guided and nonlocal hunters used these herds.

Harvest Chronology. Most caribou that were not part of the Mulchatna Herd were taken during August and September. During this reporting period, about 29% of the harvest was during August, 63% was in September, and 3% was during October. This harvest chronology did not change significantly in the past 5 regulatory years (Table 5).

Transport Methods. Aircraft were the most common means of hunter transportation to access the small Kuskokwim herds. During this reporting period 74% of caribou hunters used aircraft, 15% of the hunters used 3- or 4-wheelers, <4% used horses, 3% used boats, <4% of caribou hunters used snowmachines, and zero percent of caribou hunters used highway vehicles (Table 6).

Other Mortality

No specific data were collected concerning natural mortality rates or factors during this reporting period. However, I suspect wolf predation is relatively high within most of the McGrath area herds. The low percentage of calves (<1%) and the early calving dates found during survey flights in the Beaver Mountains indicate the Beaver Mountains Herd is highly productive but suffers from high neonatal mortality. The Sunshine Mountains Herd probably also suffers high predation mortality. Winter mortality during RY94 was probably substantial based on the drop in harvest from RY94 to RY95. Winter 1994–1995 was the most severe winter based on snow-depth data collected in McGrath by the National Weather Service. Since RY94 the winter snow conditions have been average based on these same data.

HABITAT

Biologists have not investigated caribou range conditions in Units 19 and 21 in recent years, but range is probably not limiting. Lichens seem abundant on winter ranges, and these areas supported 4–5 times as many caribou during the 1960s. Body size of adults was also relatively

large when radio collars were deployed in the 1980s. Early calving is another indicator that body condition is good.

CONCLUSIONS AND RECOMMENDATIONS

We are currently meeting our management objectives for all of the caribou herds in the McGrath Area. The objective for the Big River–Farewell Herd is to provide for a harvest of up to 100 bull caribou. The average reported harvest during this reporting period was 47. The objective for the Rainy Pass Herd is to provide for a harvest of up to 75 bull caribou. The average reported harvest during this reporting period was 26. The objective for the Sunshine and Beaver Mountains Herds is to provide for a combined harvest of up to 25 caribou. The average reported harvest during this reporting period was 4 caribou. The objective for the Tonzona Herd is to provide for a harvest of up to 50 caribou. The average reported harvest during this reporting period was 12.

All the herds in the McGrath area are small in number. These small herds exhibit special challenges in trying to develop a cost-effective and efficient survey–inventory program. Progress to implement some changes to enhance the program were implemented during this reporting period and future plans are being to developed to enable better monitoring of the herds. Hopefully research projects directed at caribou management applications will develop better and more efficient techniques for better management.

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Table 1 Composition counts for the Rainy Pass caribou, Unit 19C, 1999–2000

Date	Bulls:100 Cows	Calves:100 Cows	Calves	Cows	Bulls	Total
10/28/99	28	8	25	323	93	441
10/13/00	115[a]	12	8	67	77	152

[a] Bull:cow ratio calculated for 2000 is suspected to be biased due to classification errors or small sample size.

Table 2 McGrath[a] area caribou harvest by herd, regulatory years 1989–1990 through 1999–2000

Regulatory year	Successful Hunters						
	Beaver Mtns	Sunshine Mtns	Farewell–Big River	Rainy Pass	Tonzona	Unspecified	Total
1989–1990	12	2	49	84	12	9	168
1990–1991	5	2	72	115	15	2	211
1991–1992	13	0	65	101	37	1	217
1992–1993	4	2	51	62	5	2	126
1993–1994	3	1	61	35	15	19	134
1994–1995	2	0	82	57	25	6	172
1995–1996	1	0	55	30	13	3	101
1996–1997	5	0	35	42	12	1	95
1997–1998	0	0	44	24	11	2	81
1998–1999	5	0	35	28	13	21	102
1999–2000	3	0	41	24	11	26	105

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

Table 3 McGrath[a] area caribou harvest by sex, regulatory years 1989–1990 through 1999–2000

Regulatory year	Males	(%)	Females	(%)	Unspecified	Total
1989–1990	153	(92)	13	(8)	2	168
1990–1991	188	(90)	22	(10)	1	211
1991–1992	186	(86)	30	(14)	1	217
1992–1993	109	(87)	16	(13)	1	126
1993–1994	131	(98)	3	(2)	0	134
1994–1995	172	(100)	0	(0)	0	172
1995–1996	99	(97)	3	(3)	0	102
1996–1997	94	(100)	0		1	95
1997–1998	79	(99)	1	(1)	1	81
1998–1999	97	(97)	3	(3)	1	101
1999–2000	101	(98)	2	(2)	2	105

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

Table 4 McGrath[a] area caribou harvest by location of residence, regulatory years 1989–1990 through 1999–2000

Regulatory year	Local resident[b]	Nonlocal resident	Alien and Nonresident	Total	Percent nonresident
1989–1990	9	129	120	261	47
1990–1991	6	125	160	297	55
1991–1992	12	177	140	332	43
1992–1993	5	86	80	172	47
1993–1994	10	104	98	214	46
1994–1995	3	115	146	264	55
1995–1996	10	72	90	174	52
1996–1997	3	20	68	91	75
1997–1998	2	16	58	81	72
1998–1999	0	21	74	95	78
1999–2000	1	39	65	105	62

[a] Excludes Mulchatna caribou herd animals taken in Unit 19.
[b] Local resident is any resident of Unit 19.

Table 5 McGrath[a] area caribou harvest by month, regulatory years 1989–1990 through 1999–2000

Regulatory Year	Harvest by month									
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Unk	*n*
1989–1990	0	47	104	14	0	0	2	1	1	169
1990–1991	0	47	150	8	0	2	0	0	4	211
1991–1992	0	80	122	11	2	0	0	0	2	217
1992–1993	0	41	80	4	0	1	0	0	0	126
1993–1994	0	53	73	0	2	3	1	0	2	134
1994–1995	0	60	103	9	0	0	0	0	2	174
1995–1996	0	32	69	1	0	0	0	0	0	102
1996–1997	0	34	58	0	1	0	0	0	2	95
1997–1998	0	27	52	1	0	0	0	0	1	81
1998–1999	0	24	70	2	0	0	0	0	0	96
1999–2000	0	30	66	8	0	1	0	0	0	105

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

Table 6 McGrath[a] area caribou harvest by transport method, regulatory years 1989–1990 through 1999–2000

Regulatory year	Harvest by transport method								
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unk	*n*
1989–1990	213	9	14	7	4	3	10	3	263
1990–1991	268	10	5	6	0	2	4	2	297
1991–1992	253	21	7	22	2	7	18	2	332
1992–1993	143	11	5	10	1	2	0	0	172
1993–1994	160	20	9	10	5	7	3	0	214
1994–1995	219	10	5	33	0	5	0	2	274
1995–1996	132	5	6	23	0	4	0	4	174
1996–1997	78	8	0	6	1	2	0	0	95
1997–1998	65	0	0	15	0	1	0	0	81
1998–1999	71	5	1	25	0	0	0	0	102
1999–2000	77	6	3	16	1	2	0	0	105

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

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

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

HERD: Delta

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 and 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 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-1990s, the department recognized a small group of caribou in the Yanert drainage as a separate herd. The growing Delta Herd eventually swamped 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 herd rose from anonymity to a herd of local and scientific importance. Its close proximity to Fairbanks and fairly 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), Valkenburg et al. (1996), and Valkenburg et al. (2002) provide summaries and citations.

Estimated at 1500–2500 in 1975, by 1989 the Delta Herd had grown to a peak of nearly 11,000. It declined in the early 1990s, as did other central Alaska Range herds, to less than 4000. Valkenburg et al. (1996) present a detailed analysis of the decline.

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 trappers reduced wolf numbers by trapping to halt the decline of the caribou herd. This ground-based control program was terminated amid considerable controversy. Valkenburg et al. (2002) summarized the effects of this program on the Delta caribou.

Harvest and harvest regulations also varied widely due to population fluctuations and strong hunter interest. The Board of Game suspended hunting in 1992 in response to declining numbers, and the herd remained closed to hunting through the 1995–1996 regulatory year.

Research and enhancement of Delta caribou remain regional priorities. 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 included providing high-quality hunts, maximum harvests and trophy caribou. The recent decline of the herd gave impetus to the current management goals of restoring the herd and resuming consumptive use. Likewise, the current management objectives reflect regulations (5 AAC 92.125) enacting the 1993–1994 wolf control effort to reverse the decline. Although the wolf control program was suspended prematurely, 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 6000–8000 caribou.
- Sustain an annual harvest of 300–500 caribou.

METHODS

POPULATION CENSUS

We estimated population size using the radio-search technique and complete visual searching of areas where aggregations were most likely to occur (Valkenburg et al. 1985). We photographed large groups from a DeHavilland Beaver aircraft with a belly-mounted Zeiss RMK-A 9×9 camera and from Piper Cubs and Bellanca Scouts with 35-mm cameras loaded with 100 or 200 ASA Kodak color print film. The herd was counted on 27 June 1999 using 4 radiotelemetry-equipped aircraft, including the Beaver and on 24 June 2000 using 5 aircraft (4 radiotelemetry equipped). In 2000, because the aggregation consisted of relative small groups of caribou that could be either counted or photographed effectively with a 35-mm camera, the DeHavilland Beaver and camera were not used. Caribou in photographs were counted with an 8X magnifying glass.

Population Composition

We conducted composition surveys using an R-22 helicopter and Bellanca Scout or Piper Super Cub aircraft. Biologists in the fixed-wing aircraft located the radiocollared caribou. Observers in

the R-22 helicopter classified caribou that were in groups with radiocollared members and also classified any caribou found in a search of the surrounding area. We broadly searched areas containing numerous radiocollared caribou for additional groups. We also classified any caribou encountered while in transit between search areas. Classification categories consisted of cows; calves; and large, medium, and small bulls. Observers identified bulls by the absence of vulva and classified bulls by antler characteristics (Eagan 1993). We tallied the composition of each group on a 5-position counter and recorded the tallies on a data sheet. We classified 1519 caribou on 1 October 1998, 674 caribou on 2 October 1999 and 1010 caribou on 3–4 October, all under adequate conditions. During 2000, several hundred Nelchina and Delta caribou were mixed during the rut in the upper Nenana/Susitna drainages. A large group of caribou located in the Monahan Flats (63°14', 147°52') in 2000, in which 404 caribou were classified (48 small bulls, 41 medium bulls, 16 large bulls, 222 cows and 77 calves), was not included in the results because radiocollared caribou from the Delta Herd were not present in the group.

We monitored harvest characteristics through permit reports and summarized harvest data by regulatory year (RY = 1 Jul through 30 Jun, e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The Delta Herd declined from over 10,000 in 1989 to less than 4000 in 1993. 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 crude 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 (Table 1). Survey data indicated the herd increased slightly in 1994 and 1995, but subsequent data indicated a stable or declining trend. The minimum herd size declined from 4646 caribou in 1995 to 3227 caribou in 2000, and 2900 caribou in 2001.

During the 2000 census, caribou were widely distributed between 63°16' (East Fork of the Susitna River) and 63°58' (upper west fork of Mystic Creek) north latitude and 146°14' (Trident Glacier) and 148°18' (upper Moody Creek) west longitude, although the majority of caribou were located in upper west fork of Mystic Creek and upper Wood River drainages (Cody, Pass, Grizzly, Young and Big Grizzly creeks). This wide dispersion probably contributed to the relative high proportion (7/75) of the radiocollared caribou found alone during the census. While nearly 10% of the radiocollared caribou were located alone, only 1 single uncollared caribou was observed. Although this type of incongruity could result in an underestimate of the population, modeling the population with current productivity and survival estimates yielded a population estimate comparable to the census results.

During the 2001 census, caribou groups were widely scattered and census results were adjusted upward from the count of 2390 to 2965 caribou because only 54 of 67 active radio collars were found (Table 1).

Population Composition

Bull:100 cow ratios have varied considerably since 1990, ranging from 24 to 46, but have remained consistently high since 1998 (Table 1). The ratio of large bulls:100 cows improved once the steep population decline ended in about 1993. Most of the short-term variance in bull:cow ratios is probably a result of variable behavior and distribution of bulls during counts. Weather can affect herd distribution, movements, and behavior during rut counts.

Calf:100 cow ratios, generally, have been declining since 1994 and, in 2000 and 2001, were the lowest observed since 1993 (11 calves:100 cows, Table 1). Calf mortality studies conducted during 1995–1997 indicate this is primarily due to predation by wolves, grizzly bears, and golden eagles (Valkenburg et al. 2002). Analysis of fecal samples collected in late winter 1989 and 1993 indicated depletion of the foothill lichen 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 high compared to caribou from other Interior herds.

Distribution and Movements

Through the mid-1980s, the Delta Herd showed strong fidelity to calving areas between the Delta River and the Little Delta River in southeastern Unit 20A (Davis et al. 1991). However, as the Delta Herd increased, the area used for calving extended to the foothills between Dry Creek and the Delta River (Valkenburg et al. 1988). After 1993 the herd also used the upper Wood River, Dick Creek, upper Wells Creek, and the upper Nenana and Susitna drainages for calving (Valkenburg et al. 2002). During the remainder of the year, typically the herd is distributed among the northern foothills from the Delta River to the Nenana River. However, during the fall and early winter of 2000, a significant portion of the Delta Herd was located east of the Delta River in the Donnelly Dome/Flats area.

MORTALITY

Harvest

Season and Bag Limit.

	Resident open season	Nonresident open season
Unit 20A		
1 bull by drawing permit only; up to 100 permits may be issued.	10 Aug–20 Sep	10 Aug–20 Sep

Board of Game Actions and Emergency Orders. In response to a proposal at the March 1996 meeting, the Board of Game authorized a drawing permit hunt beginning RY96. As noted previously, harvest had been suspended in RY92. We recommended 75 permits based on improvement in recruitment and large bull:cow ratios, and issued 75 permits in RY96 and in RY97. We issued 100 permits annually during RY98–RY00 in response to proposals to increase the number of permits. No emergency orders were issued during this reporting period.

Permit Hunts. Since RY98, when we first issued 100 permits for DC827, both the numbers of hunters and success rates have declined (Table 2). In addition, the success rate in RY00 (35%) was the lowest recorded since the hunt began in RY96. The lower hunter success rate observed in RY00 may have been a function of the herd being widely dispersed and a large portion of the herd being distributed across the eastern portion of their range during the hunting season. The eastern portion of the herd's range is relatively inaccessible compared to the western portion where access is good, especially by ATV and horseback.

Hunter Residency and Success. Local residents of Unit 20 harvested more caribou than nonlocal residents or nonresidents during RY98–RY00 (Table 3). However, the success rate of nonresidents was higher than the other groups ($\bar{x}$ = 81%). Success rates of local residents and nonlocal residents were similar (56% for local vs. 45% for nonlocal residents).

Harvest Chronology. No clear trends are apparent in harvest chronology during RY96–RY00 (Table 4). During RY96 harvest was fairly evenly distributed, with slightly fewer caribou taken in late August. During RY97 the highest harvest of caribou occurred at the end of the season, whereas in RY98 the highest harvest was at the beginning of the season. During RY99 the highest harvest occurred in late August, while in RY00 the highest harvest was in early September. High harvests during these particular harvest periods had not occurred since this permit hunt began in RY96. We hypothesize that variations in harvest chronology within and among years are probably related to variations in weather and caribou distribution.

Transport Methods. During RY96–RY00, on average, the most common mode of transportation used by successful hunters was 3- or 4-wheelers followed by aircraft, ORVs, highway vehicles, horse and boats (Table 5). Interestingly, RY00 was the first year since this permit hunt began in which successful hunters accessed the hunt area by boat. The Fairbanks area received above average rainfall (Aug $\bar{x}$ = 1.96 inches, Sep $\bar{x}$ = 0.95 inches; National Weather Service) during August (2.59 inches) and September (1.28 inches), 2000 and water levels in local rivers and creeks were correspondingly high, which may explain this apparent anomaly.

Other Mortality

Research staff conducted calf mortality studies during 1995–1997, and wolves, grizzly bears, and eagles were primary predators of caribou in the subunit. Details of causes and trends in calf and adult mortality are in 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 and the subunit was identified by the Board of Game as part of the intensive management program developed to reduce wolf numbers in order to rebuild the caribou population. Valkenburg (1997) and Valkenburg et al. (2002) tested a diversionary feeding program that addressed predation by a wolf pack in the Wells Creek area.

HABITAT

Assessment and Enhancement

Research and management staff members periodically collect fecal samples on winter range to monitor the status and use of lichen ranges. 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.

CONCLUSIONS AND RECOMMENDATIONS

The primary concern at this juncture is whether the herd will be able to grow or support improved harvests with increasing wolf densities. Wolf numbers are currently high due to the abundant moose population. The degree to which high wolf:caribou ratios will influence predation rates on caribou is unknown. While high wolf:caribou ratios seem bound 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 primarily preying on moose. Low vulnerability of caribou due to improved nutritional status could also reduce kill rates on caribou. 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 and moderate declines are possible.

We met the objective to maintain 30 bulls:100 cows and 6 large bulls:100 cows. We did not meet our objectives to reverse the decline of the herd and increase the midsummer population to 6000–8000 and to sustain an annual harvest of 300–500 caribou. During intensive management deliberations in November 2000, the Board of Game adopted a population objective of 5000–7000 caribou and a harvest objective of 300–700 caribou for the Delta caribou herd. Continued research on the Delta Herd, including analysis of fecal samples and condition of caribou will help to determine if the current population objective is still too high. The following management objectives for the next reporting period follow directions from the Board of Game and will be to:

- Reverse the decline of the herd and increase the midsummer population to 5000–7000 caribou.

- Sustain an annual harvest of 300–700 caribou.

However, even with favorable weather, meeting the management objectives will be unlikely without more effective management of predation.

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Table 1 Delta caribou fall composition counts and estimated population size, 1983–2001

Survey date	Bulls: 100 Cows	Large bulls: 100 Cows	Calves: 100 Cows	Calves %	Cows %	Small bulls %	Medium bulls %	Large bulls %	% Total bulls	Composition sample size	Minimum herd size[a]	% Herd sampled
10/4/83	35	12	46	25	55	59	6	36	20	1208	5055	24
10/17/84	42	17	36	20	56	28	32	40	24	1093	6227	18
10/9–12/85	49	9	36	20	54	57	24	19	26	1164	8083	14
10/22/86	41	9	29	17	59	49	30	21	24	1934	7204[b]	27
10/05/87	32	8	31	19	61	53	23	24	20	1682	7780[b]	22
10/14/88	33	4	35	21	60	50	38	12	20	3003	8338[c]	36
10/10/89	27	2	36	22	62	64	28	7	16	1965	10,690	18
10/4/90	38	6	17	11	65	45	39	16	24	2411	7886[c]	31
10/1/91	29	5	8	6	73	55	29	16	21	1705	5755	30
9/28/92	25	3	11	8	74	46	43	11	19	1240	5870	21
9/25/93[d]	36	7	5	3	72	45	33	22	25	1525	3661	42
10/3–6/94[d]	25	10	23	16	68	33	29	39	7	2131	4341	49
10/3/95	24	10	20	14	69	41	19	40	17	1567	4646	34
10/3/96	30	9	21	14	66	51	20	29	20	1537	4100	37
9/27/97	27	9	18	12	69	48	20	32	19	1598	3699	43
10/1/98	44	9	16	10	62	31	49	20	27	1519	3829	40
10/2/99	44	10	19	11	62	37	40	23	27	674	3625	19
10/3–4/00	46	10	11	7	64	41	37	22	30	1010	3227	31
9/30/01	39	9	13	8	66	46	30	24	26	1378	2965	47

[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 radio collars.

Table 2 Delta caribou harvest data by permit hunt, regulatory years 1996–1997 through 2001–2002

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[a]	100							32

[a] Preliminary data.

Table 3 Delta caribou annual hunter residency and success, permit hunt DC827, regulatory years 1996–1997 through 2000–2001

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

[a] Residents of Unit 20.

Table 4 Delta caribou annual harvest chronology percent by harvest periods, permit hunt DC827, regulatory years 1996–1997 through 2000–2001

Regulatory year	Harvest periods by month/day					
	8/10–8/20	8/21–8/31	9/1–9/11	9/12–9/20	Unk	*n*
1996–1997	27	18	27	27		22
1997–1998	27	18	14	41		44
1998–1999	34	14	26	26		50
1999–2000	29	37	16	16	2	38
2000–2001	33	17	38	13		24

Table 5 Delta caribou percent harvest by transport method, permit hunt DC827, regulatory years 1996–1997 through 2000–2001

Regulatory year	Percent harvest by transport method[a]							
	Airplane	Horse	Boat	3- or 4-Wheeler	ORV	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

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 20B, 20C, 20D, 20E, 25C, and adjacent Yukon, Canada (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 presently ranges up to 50 miles into the Yukon, Canada

BACKGROUND

The Fortymile Caribou Herd (FCH) is 1 of 5 international herds shared between Alaska and Yukon, Canada. It has potential to be the most economically important herd in Interior Alaska and southern Yukon for consumptive and nonconsumptive uses. Like other caribou herds in Alaska, the FCH has displayed major changes in abundance and distribution. During the 1920s it was the largest herd in Alaska and was one of the largest in the world, estimated at 568,000 caribou (Murie 1935). For unknown reasons, the FCH declined during the 1930s to possibly 10,000–20,000 caribou (Skoog 1956). Timing of the subsequent recovery phase is unclear, but by the 1950s the FCH reached at least 50,000 caribou (Valkenburg et al. 1994). Herd recovery was likely aided by a federal predator control program that began in 1947. Until 1963 the herd fluctuated slightly, but most population estimates were about 50,000 animals (Valkenburg et al. 1994).

Between the mid-1960s and 1975, the herd again declined, probably due to a combination of high harvests, severe winters, and high numbers of wolves (Davis et al. 1978; Valkenburg and Davis 1989). The population low occurred during 1973–1976 when the herd was 5740–8610 caribou. Due to decreased herd size between 1966 and 1975, the FCH reduced its range size and changed its seasonal migration patterns. After 1967 the herd no longer crossed the Steese Highway, and by 1973 few animals moved into the Yukon each year. During the early 1970s to 1998, the herd's range size was about 19,300 mi^2 (50,000 km^2), less than 25% of the historical size.

The FCH began increasing in 1976 in response to favorable weather conditions, reduced harvests, and a natural decline in wolf numbers. In 1990 the herd was estimated at 22,766

caribou (the annual rate of increase during 1976–1990 was 5–10%). During 1990–1995 the herd remained relatively stable with an estimated population between 21,884 and 22,558 caribou. The population growth leveled off due to high adult mortality, unusually poor pregnancy rate in 1993, and low to moderate calf survival during this period (Boertje and Gardner 2000). During 1996 and 1997 the herd increased by 4% and 10%, respectively, primarily due to elevated pregnancy rates and higher adult and calf survival.

Within its range, the FCH historically provided much of the food needed by the villages and communities, by Alaskan and Yukon mining camps and by other early residents. 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 above 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, FCH hunting regulations were designed to benefit the subsistence hunter and to prevent harvest from limiting herd growth. Bag limits, harvest quotas, and season openings tailored to benefit local residents were primarily 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 along highways to along trail systems accessed from the Taylor Highway and to areas accessed from small airstrips within the Fortymile and Charley River drainages.

During the 1990s, harvest was further restricted to ensure little impact on herd growth. Harvest regulations became increasingly complex due to a change in Alaska's subsistence law that initiated dual state and federal management. A spin-off from reduced quotas and complex regulations was increased competition between Alaska hunters for the limited quota. In 1994 residents of Tok and members of the Tr'ondëk Hwëch'in First Nation requested that the department, federal agencies, and Yukon Department of Renewable Resources (YDRR) work with the public to develop a cooperative management plan promoting herd growth and benefiting all users of the herd.

MANAGEMENT DIRECTION

Since the FCH decline in the early 1970s, many residents of Alaska and the Yukon have called for management programs designed to increase herd size. Optimism and support for herd recovery increased following annual growth of 7–10% during the 1980s. In 1990, representatives of the YDRR, Canadian Wildlife Service, and Alaska Department of Fish and Game (ADF&G) met in Whitehorse, Yukon to decide management direction for the FCH. All parties were in agreement that the primary goal should be reestablishing the herd in its traditional range. This goal was presented to the residents of the upper Tanana/Fortymile Rivers region and was strongly supported. The primary management tools were reduced harvest and, if necessary, predator management.

During development of this initial Fortymile caribou management program, we failed to foresee the effects of federal subsistence management and special interest politics on our programs. We realized our lack of foresight concerning federal subsistence management when we asked the Federal Subsistence Board (FSB) to close their hunting seasons during 1991 and 1992 because

the annual harvest quota was reached. They refused to do so because the quota did not include a cooperatively agreed upon allocation for federal subsistence users.

The conflict between ADF&G and federal agencies was caused by differing interpretations of Alaska National Interest Lands Conservation Act (ANILCA). The federal agencies decided that managing the FCH hunt by a harvest quota without preference for federally eligible subsistence users violated ANILCA. They decided this ANILCA violation prevented them from following ADF&G's harvest management direction and stopping their hunts before the scheduled closure. Between 1991 and 1995, because of the inability of the agencies to agree on a harvest management direction, the possibility of an overharvest increased. As a result, the public faced more complex regulations and the working relationship between ADF&G and the federal agencies was strained.

Lack of foresight regarding predator management and public response also affected the original plan. In 1992 the Alaska Board of Game (board) adopted a wolf control program designed to benefit the Fortymile Herd. However, prior to implementation, Governor Walter Hickel rescinded the program due to public pressures primarily outside of the herd's range. Because we had a great deal of support within the herd's range for our management programs, we were surprised by the amount of interest and effort exerted by special interest groups to stop us from implementing them. It was obvious to all that were involved in FCH management that a new management direction that included input from the federal agencies and more of the Alaskan public was necessary. However, once the wolf control program was stymied the department did not have a contingency FCH management plan and little was done to benefit herd recovery and reduce the complexities of dual state and federal management during 1993 and 1994.

During this period, many residents within the herd's range were unhappy with the ineffectiveness of dual management. In response, the Upper Tanana/Fortymile Advisory Committee, the Tr'ondëk Hwëch'in First Nation, and other public groups requested that ADF&G and the federal agencies work with the public in developing a Fortymile Caribou Herd Management Plan. In July 1994 a Fortymile Caribou Herd Management Planning Team (Team) was established. The Team comprised 13 public members 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 (BLM), US Fish and Wildlife Service (FWS), National Park Service (NPS) and YDRR.

Boertje and Gardner (1998a) found consistent evidence that wolf predation was the major factor limiting herd growth. The Team concluded that reducing wolf predation was essential to stimulate and hasten herd growth. The Team developed a management plan that included management recommendations for herd population, harvest, and habitat. The plan recommended a combination of agency-conducted nonlethal wolf control and public wolf trapping to reduce wolf numbers within the herd's summer ranges, and hopefully wolf predation on calves. The board, the FSB, and the Yukon Fish and Wildlife Management Board endorsed the plan and it guided their regulatory decisions during 1996 through 2000.

Following are management goals and objectives applied during regulatory years (RY) 1996–1997 through 2000–2001 (RY = 1 Jul through 30 Jun, e.g., RY99 = 1 Jul 1999 through 30 Jun 2000). They were developed by the Team and the 5 advisory committees (Central, Delta, Eagle,

Fairbanks, and Upper Tanana/Fortymile) within the herd's range and were endorsed by the board. Population and harvest objectives have been revised by the advisory committees, the board, and the Team to guide herd management from RY01 through RY06. These objectives are included in the conclusions section of this report.

MANAGEMENT GOALS AND OBJECTIVES

- Restore the FCH to its traditional range in Alaska and the Yukon.
    - Provide conditions for the Fortymile Herd to grow at a moderate annual rate of 5–10% between June 1996 and June 2001.
        - Reduce annual harvest quota to 150 bulls.
        - Reduce calf mortality from wolf predation by reducing wolf numbers by 70–80% on the herd's summer range, excluding Yukon-Charley National Preserve, using a combination of public wolf trapping and nonlethal techniques including wolf fertility control and relocation.
    - Maintain an October bull:cow ratio of at least 35:100.
        - Maintain a bull only harvest at a level that will not cause a reduction in bull numbers.
- Minimize the impact of human activities on caribou habitat.
    - Work with land agencies, landowners, and developers to mitigate developments detrimental to caribou.
    - Maintain a near-natural fire regime.
- Provide for increased caribou hunting, viewing and other wildlife-related recreation in Alaska and Yukon.

METHODS

POPULATION CENSUS

We censused the FCH between late June and mid-July 1988–2000, excluding 1993. We used 3–5 spotter planes (Super Cub PA-18 or Bellanca Scout), 1 radiotracking airplane (Cessna 206, Bellanca Scout, or Super Cub), and a DeHavilland Beaver equipped with a belly-mounted, 9-inch format aerial camera. We located most postcalving aggregations by tracking the herd's radiocollared caribou. We photographed all groups that could not be counted accurately by the spotter planes (>50 caribou). All photographs were counted twice, each time by a different person. If counts were within 3% of each other, the 2 counts were averaged; otherwise, photographs were counted a third time. No correction factors were used to account for caribou missed during the search. We derived the population estimate by adding individual caribou counted on photographs to caribou counted from spotter planes.

We also evaluated population size and trend using population models developed by P Valkenburg and D Reed (ADF&G unpublished data, Fairbanks) and by R Boertje (Boertje and Gardner 1999).

FALL COMPOSITION SURVEYS

Each year we estimated herd sex and age composition between late September and mid-October. We used a Bellanca Scout to locate most of the herd by radiotracking collared animals. Since 1993 we have used a Robinson-22 helicopter to classify each caribou as a cow, calf or bull. Bulls were further classified as small, medium or large based on antler size (Eagan 1993). We attempted to classify 12–15% of the herd. Since 1996, costs for the composition surveys have been shared between ADF&G, FWS, and BLM.

SPRING COMPOSITION SURVEYS

We have not conducted spring composition surveys since 1993 because most of these data are collected during the calf mortality study. During 1988, 1991, 1992 and 1993 we conducted herd sex and age composition surveys in mid to late June. Techniques followed were the same as those used during fall surveys, except bulls were not classified by size, and large groups (i.e., >1000) were sometimes classified from the ground with spotting scopes. The Yukon government contributed money and personnel for the 1992 survey.

HERD AND RANGE CONDITION

During RY98–RY00 we used 3 indices to evaluate herd condition: 1) fall calf weights, 2) pregnancy rates of radiocollared cows, and 3) median calving date. Fall calf weights were obtained during fall capture activities conducted in 1991–2000. We evaluated the other 2 indices by radiolocating at least 50 adult cows (≥3 years old) on a daily basis during calving. Median calving date was the day by which 50% of the adult collared cows gave birth. We assessed range condition by evaluating the relative proportion of lichen and moss in the herd's winter diet.

RADIOTELEMETRY DATA

We obtained herd distribution, movements and estimates of annual mortality by radiotracking 50–70 radiocollared adults. From 1994 to 2000 an additional 50–80 newborn calves were also collared. Calves were located daily during May and June, and at least once every month thereafter. Adults were located approximately once every month throughout the year. We retrieved radio collars of dead caribou as soon as possible after detection in an attempt to determine cause of death.

HARVEST

Harvest was monitored using in field hunter contacts and registration hunt reports. We analyzed data on harvest success, hunt area, hunter residence and effort, and transportation type. To ensure against an overharvest, successful hunters were required to report their kill within 3 days. Harvest data were summarized by regulatory year.

MANAGEMENT PLANNING

During RY98–RY00, the Team met 2 times/year to discuss the management plan's progress, and to develop and implement other programs that would further benefit Fortymile caribou herd recovery and management. The US Fish and Wildlife Service, BLM and ADF&G funded these meetings.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The herd grew 4% in 1996, 10% in 1997, 20% in 1998, 7% in 1999 and 5% in 2000. Annual increases in herd size were due to elevated herd pregnancy rates in 1996 and 1998 and to improved adult and calf survival rates (Boertje and Gardner 1998*b*, 1999). As of 27 June 2000, estimated size of the herd was 34,640 caribou (Table 1). Optimal environmental conditions occurred during this period except during 2000. Improved nutritional status between 1995 and 1999 was indicated by elevated pregnancy rates, higher newborn weights, higher autumn calf weights and earlier calving. Predation rates were reduced during this period. During 1997, calf mortality rates declined significantly and adult survival has been elevated since 1995. Possible factors may be that during 1995 and 1996 the wolf population was reduced on the herd's wintering grounds by elevated wolf harvest rates. It was also reduced within the herd's summer range (this range was also used extensively by the herd during winters 1997 and 1998) by public wolf trapping and by ADF&G's nonlethal wolf control program. In winter 2000, snow depths were substantially above normal and spring temperatures were cooler causing a later vegetative green-up. As a result the median calving date was later and calf weights were lower indicating overall herd condition was reduced. In 2000, mortality rates were higher and herd growth declined to 2–5%.

Population Composition

During 1996 through 1999 the average fall percent calves in the herd (21%) was the highest since the late 1950s. Percent calves in the herd was 18.1% during the herd's growth phase in the 1980s, 16.8% during the stable phase between 1990 and 1995, and 16% during 2000 following a year of unfavorable climatic conditions (Table 1). Due to low harvests over the past 20 years, the bull:cow ratio was comparable to lightly harvested herds and has remained stable. Estimated ratios in late June counts were more variable, probably because June counts are more difficult to do accurately (Table 2).

Since 1995 the herd's age structure has changed comprising a greater percentage of young animals. This is due to increased productivity and calf survival. Since 1994 the estimated number of calves produced in May has increased by 62% (8090 calves produced in 1994 compared to 13,120 calves produced in 2000). The percentage of small bulls in the herd reflects this increase in production and recruitment. During 1996–2000 the percentage of small bulls was estimated at 49.2% compared to 42.7% during 1990–1995.

Distribution and Movements

In 1999 the FCH summered between the upper Salcha River, Mount Harper and Glacier Mountain. During August most of the herd ranged in the Charley River, upper Salcha River and Birch Creek drainages. During September the herd moved east and resided within the Salcha, Goodpaster, Charley rivers and Slate Creek drainages. During the rut most of the herd was in the Middle Fork, Goodpaster, and Charley river drainages.

In an apparent response to deep snows in early November 1999, about 10,000 Fortymile caribou moved into Yukon, Canada but only remained for about 3 weeks. This group moved back west along the Yukon River throughout December but became widely scattered thereafter. It was primarily in small groups in the West, Mosquito, Middle, and North Forks of the Fortymile River and in the Upper Eisenmenger, Goodpaster, and Salcha Rivers and Birch Creek.

During late April and early May 2000, the Fortymile Herd moved back to its calving grounds. Calving peak was 23 May. The primary calving grounds were Copper Creek, Charley River, Crescent Creek, Beverly Creek, Salcha River, and Caribou Creek. By early June most of the herd moved south onto Mosquito Mountain and Mount Harper. In mid-June most of the herd was on Mount Harper, in the Three-finger fork of the Charley River, and in the Slate Creek drainage. The herd ranged primarily between the Charley River to upper Birch Creek during August to mid-September.

Beginning in mid-September 2000, most of the herd traveled southeast and most of the rut occurred in the upper Middle Fork, Goodpaster, and Salcha river drainages. After the rut the herd spread out across its range with the largest concentrations in the Chena River, Birch Creek, North Ladue River, and Sixtymile river drainages. Snow depth was below average and did not impede movements or range use.

Generally, annual herd movements were comparable within the two-year report period, except the drainages where most of the calving occurred changed in both years, and during three weeks in both 1999 and 2000 when a segment of the herd moved into Yukon, Canada. We do not know all the environmental factors impacting the herd's choice of primary calving areas, though in years with deep snow in May much of the early calving occurs in the trees. The herd has begun to show greater use of the Birch Creek drainages during late summer and early fall. This distribution pattern increases the herd's vulnerability to hunters along the Steese Highway and its associated trails. Also, by using a greater proportion of its traditional range during the year, the herd is in contact with more wolf packs that have not been reduced by control activities. We observed higher wolf predation by nontreated packs during the past 2 years.

MORTALITY

Harvest

Season and Bag Limit. See Table 3 for specific bag limits and seasons for state and federal hunts.

Board of Game Actions and Emergency Orders. During the life of the FCH planning process (1996-2001) there were significant policy and regulatory changes affecting state and federal hunting seasons and quotas, as well as wolf management. During the 1996 spring meeting, the

board adopted a policy recommended by the Team to reduce harvest to 150 bull caribou until autumn 2001. To ensure against an overharvest, the board gave ADF&G authority to: 1) close the Chicken Trail to caribou hunters using motorized vehicles; 2) limit locales and times registration permits were issued; 3) require a short report period by successful hunters; and 4) enact area, road and temporary season closures if the herd became too vulnerable to harvest.

During 1996 through 1998, FCH harvest was allocated between 4 registration permit hunts (RC863, RC865, RC866 and RC867). RC863 was open between 10 August and 20 September in Units 20B and 20D and had an annual harvest quota of 15 bulls. Residents and nonresidents could participate. This hunt was closed by emergency order on 31 August 1996, 5 September 1997, 27 August 1998, 23 August 1999, and 18 August 2000. RC865 was open between 10 August and 30 September in Units 20E and 25C and had an annual harvest quota of 85 bulls. Only Alaska residents could participate in this hunt. RC865 was closed by emergency order on 29 September 1996, 30 September 1997, and 21 August (Unit 25C), and 1 September 1998 (Unit 20E). To ensure a more equitable season in both Units 25C and 20E, in spring 1999 the board allocated 35 bulls to Unit 25C under RC866 and 50 bulls to Unit 20E under RC865. RC866 was closed on 12 August in 1999 and 2000 and RC865 was closed on 20 September 1999 and 5 September 2000. RC867 had both a federal season (15 Nov–28 Feb) and a state season (1 Dec–28 Feb) open in Units 20E and 25C with a combined quota of at least 50 bulls. RC867's quota included any bulls not harvested during the fall season. Only Alaska residents could participate. RC867 was closed by emergency order on 26 December 1996, 2 January 1998, 3 December 1998, 2 December 1999, and 1 December 2000.

In spring 1996 the FSB made the following 2 important decisions in support of the Fortymile Caribou Plan: 1) it adopted the harvest quota of 150 bull caribou for the herd, which meant that both state and federal seasons would close once the quota was reached, and 2) it agreed both state and federal hunts would be managed using a joint state/federal registration permit that would be administered by the state. Those 2 decisions were instrumental in limiting harvest to the plan's recommended level. For the first time since dual management began, FCH seasons and bag limits were consistent under state and federal regulations and, compared with past years, regulations were much easier for hunters to understand (Table 3).

During its spring 1997 meeting, the board adopted a regulation allowing ADF&G to conduct nonlethal wolf control between fall 1997 and spring 2001 to benefit the FCH. The program also had to be approved by Governor Tony Knowles following the results of the National Academy of Sciences' review of wolf control. Governor Knowles allowed us to proceed in November 1997.

In spring 2000 the board reviewed and endorsed the Fortymile Caribou Herd Harvest Plan (Harvest Plan), 2001–2006. The Central, Delta, Eagle, Fairbanks, and Upper Tanana/Fortymile advisory committees cooperatively developed this plan with input from the Team, other state advisory committees, the Eastern Interior Regional Advisory Council, and public special interest groups and individuals. The plan's recommendations were designed to allow for increased harvest but at levels that allow for moderate herd growth. Harvest quotas will be set annually based on herd trend but are expected to reach over 2000 caribou within 5 years. Following the plan's recommendations, the board passed regulations that lengthened the autumn resident

season by 10 days in Units 20B and 20D, changed the resident bag limit from 1 bull to 1 caribou throughout the herd's range, created a nonresident season with a bag limit of 1 bull in Units 20E and 25C, and adopted a quota system that will ensure hunting opportunity across the herd's range during both the autumn and winter seasons while maintaining adequate protection against overharvest. These regulatory changes were effective autumn 2001.

These regulatory changes are expected to attract thousands of hunters to the Fortymile range. The board was concerned about the possible effects on local moose populations due to excessive incidental take by caribou hunters. Based on the historic movement patterns of the Fortymile Herd, the greatest danger for excessive incidental take of moose would occur in Unit 20E. In response the board created a joint caribou/moose registration permit for most of Unit 20E that requires the hunter to choose either caribou or moose to hunt. This will not affect most subsistence hunters because traditionally moose and caribou are hunted in different areas and at different times in Unit 20E. This regulation would not preclude any hunter from completing 1 hunt for 1 species, turning in that permit, and then hunting the other species. The intent of the registration permit requirement is to stop the incidental take of moose and not limit caribou hunting opportunity.

The FSB has been asked to review and endorse the Harvest Plan during their May 2001 meeting. Their decision will be important because in the future proposals may be submitted to increase the federal subsistence take of the FCH to numbers above Harvest Plan recommendations. If the FSB decides not to endorse the Harvest Plan and adopts more liberal proposals, the state hunt will have to be further restricted, more complex regulations will be enacted, and once again FCH hunters will suffer under dual management.

In March 2001 the Eastern Interior Regional Council developed a Fortymile caribou harvest proposal to be passed onto the FSB for their decision during their May 2001 meeting. This proposal adopts the harvest quota recommended in the Harvest Plan and, if adopted, will allow the joint state/federal harvest permit to be used. To meet the intent of ANILCA and to benefit federal eligible subsistence hunters, the council proposed a federal season of 1 November–28 February and a combined state/federal winter quota. However, at least 50 caribou in the quota would be allocated to the federal season.

The board set herd (50,000–100,000 caribou) and harvest objectives (1000–15,000 caribou) for the FCH using criteria required by the Intensive Management Law. Intensive management may be implemented if harvest is reduced and the population and harvest objectives are not met because the population is depleted or has reduced productivity.

Hunter Harvest. During RY96 through RY00, the annual Fortymile caribou harvest quota has been 150 bulls. Through the use of registration permits and emergency orders, harvest was limited to 146–155 caribou including illegal kills (Tables 4 and 5). Hunters deserve much of the credit for maintaining annual harvests near the desired quota. In support of the management plan, many hunters voluntarily stopped hunting the FCH. During the 5 years of reduced harvest, hunter participation rate declined by 55% compared to the previous 5 years when the quotas ranged from 395–450 bulls. Hunters who did participate became more knowledgeable about identifying caribou, thereby reducing illegal kill.

Even with hunter assistance there are steps that need to be taken by the managing agencies if harvest is to be maintained at the desired quota. In the case of the FCH, 500–900 hunters participated annually in hunts that had quotas of 15–85 bulls. At times there were thousands of caribou accessible to harvest. The following management steps worked for us to maintain harvest at the desired levels and to offer the maximum amount of hunting opportunity.

- Intensively monitor the herd and rapidly close areas if the herd becomes vulnerable to overharvest.

- Maintain close working relationships with air taxi operators, outfitters, and guides to better track how many hunters are in the prime hunting areas.

- Issue permits from a minimum number of offices/vendors, with close contact among offices/vendors to track number of permits issued in relation to herd vulnerability.

- Require successful hunters to report within a short period of time after making their kill.

- Enact access restrictions in areas that are historically heavily hunted.

- Work closely with Alaska Fish and Wildlife Protection to maintain a presence in the field.

- Maintain a number of communication avenues to keep hunters informed on hunt status and to give them credit for their efforts.

- Develop criteria to estimate actual harvest based on number of hunters in the field and the number of caribou in the area, and use this estimate to initiate the emergency closure process.

Illegal Harvest. Since RY92 the number of illegally harvested cow caribou (found or reported) was 3–21 (2–9% of the harvest). Determining the sex of caribou can be difficult, especially if the hunter does not know all of the distinguishing characteristics or does not take the time to look for them. A continuing program to help hunters become better at identifying caribou is necessary in areas where harvest is restricted by sex of the animal or by antler confirmation. In the ADF&G Tok office, we informed hunters by photographs, pamphlets, and video as they registered for the hunt. The other important component to reducing illegal kill is the presence in the field by protection officers and department personnel. Hunters have told us our presence increases their awareness of the importance of making sure of their decision to shoot. These efforts have proved to be effective based on the reduction of illegal kills since we enacted these programs. However, even with these programs I am doubtful that illegal harvest will ever decline below 3–10% because of the annual influx of hunters with little or no caribou hunting experience and because there are hunters willing to take a chance on questionable animals in order to kill a caribou during a hunt.

Harvest Plan. The Yukon territorial government, the First Nations, and the Yukon public are developing a Yukon Fortymile caribou harvest plan. They expect to have an interim harvest plan agreement between the Yukon and Tr'ondëk Hwëch'in governments ready for the 2001 hunting

season. As soon as the interim plan is in place it is the Yukon government's intent to begin the process to develop a comprehensive FCH management plan that will include a long-term plan for harvest. There has been agreement between the Yukon and the board that the initial harvest allocation would be 65% to Alaska and 35% to the Yukon.

Hunter Residency and Success. During RY98–RY00, 532–880 people annually participated in FCH hunts (Table 6). The range of hunters who annually participate in each registration permit hunt were: RC863, 50–72 hunters; RC865, 284–589 hunters; RC866 116–255, and RC867, 114–242. Success rates by hunt were 15–36% for RC863, 10–25% for RC 865, 26-32% for RC 866 and 15–31% for RC867. Residency and harvest success information for all hunts combined is included in Table 6.

The intent of the Fortymile Caribou Management Plan was to reduce harvest to the minimum subsistence levels during RY96–RY00. Hunts RC865 and RC867 were structured to offer adequate opportunity for those who have the longest history hunting FCH or have the greatest subsistence needs. Before the reduced harvest, 26% of the participants were subsistence hunters who took 21% of the harvest. During the reduced harvest quota, 37% of the participants were subsistence hunters who took 37% of the harvest. The harvest reduction was successful in providing for subsistence needs and met the plan's intent.

Nonresidents could participate in hunt RC863. The hunt area is remote and is primarily accessed by air. Nonresidents composed 14–28% of the hunters and took 44–100% of the harvest. Air taxi operators flew in all of the nonresidents. Most of the resident hunters accessed the hunt area from the Steese Highway but were not successful because there are no trails to the areas where the herd ranged.

Harvest Chronology. During FY99 and FY00, >90% of the FCH was in the upper Salcha River and Birch Creek drainages during the first 7–10 days of the fall season (Table 7). About 20% of the herd was accessible to hunters along trails adjacent to the Steese Highway (Unit 25C). As a result, the quota was taken within 2 days.

The effects of the low quotas make it difficult to assess harvest chronology. Since the reduced quota was enacted in RY96, the season has gone to term in only 1 of the 17 possible hunts. Knowing the possibility of an early closure, hunters were out during opening week or as soon as there were reports the herd was available. When the Fortymile seasons have gone to term, we used harvest chronology to track herd accessibility to either the Taylor or Steese Highways.

Since RY91 during winter there were caribou available in Units 20E and 25C throughout the season. However, during RY98–RY00 a greater percentage of the herd was available on opening day; consequently, the winter quota was reached quickly (1–3 days). Prior to the reduced quota, the season ran 3-4 weeks and timing during the winter season was affected by temperature, holidays, and available daylight. Another factor that has caused the winter hunt to close early is the policy of the federal government to manage their hunts by area and not by herd. In the case of the federal Fortymile hunt during November, most of the caribou available on federal land along the first 50 miles of the Taylor Highway were Nelchina caribou herd animals. The BLM chose to continue their hunt in this area even though there was no open season for Nelchina caribou in Unit 20E. Caribou harvested during this hunt counted toward the FCH quota.

Transport Methods. Transportation types used by successful hunters in each of the 4 registration permit hunts differ. During RY98–RY00 successful hunters in RC863 used airplanes 60–100% of the time. This hunt area is remote with no trails and cannot be reached by ground transportation (Table 8).

During RY98–RY00 the 2 most common transportation types used by successful hunters in RC865 were airplanes and 4-wheelers. The hunt area is accessible using the Taylor Highway and is interspersed with trails and suitable landing areas. Herd distribution dictates the most efficient transportation type. In RY98–RY00 the herd remained in the central portion of its range for most of the season and was accessible primarily by aircraft, resulting in fewer animals harvested along trails and highways. RC866 takes place along the Steese Highway in Unit 25C. During RY99 and RY00, much of the herd was accessible using trails originating from the Steese Highway. Hunters using 4-wheelers took 73 and 76% of the fall harvest. RC867 is a winter hunt and hunters access the herd using snowmachines and highway vehicles along the Taylor and Steese Highways.

Other Mortality

Boertje and Gardner (1998*a*, 1998*b*, 1999) described in detail the factors limiting the FCH. In summary, wolf and grizzly bear predation were the most important sources of mortality. Wolves were the most important predator. Prior to nonlethal wolf control activities, wolves killed 2000–3000 calves and 1000–2300 older caribou annually. Herd nutritional status was good based on pregnancy rates and calf weights. Antibody screening of blood samples collected since 1980 indicated there were no known infectious diseases affecting population dynamics of the FCH. Winter range is in excellent shape and can support elevated caribou numbers, both in regard to lichen availability on current range and to the availability of vast expanses of winter range formerly used by the herd.

The Team used this information to develop management recommendations designed to restore the herd's use of traditional range. The Team recommended nonlethal wolf control methods that were adopted by the board. These methods included relocation of all subordinate wolves from the herd's summer range and fertility control of the dominate pairs. All nonlethal control activities are conducted outside Yukon-Charley National Preserve and do not violate NPS policies or mandates.

As of 1 December 2000, 85 subordinate wolves 11 months and older were relocated from the herd's summer range. Through a combination of trapping and relocation, 1–2 dominant wolves were left in 15 pack territories. During the same period, we sterilized 35 dominant wolves. Nine of these have died (4 from trapping and 5 were killed by other wolves). Of the 15 packs we fertility controlled, all have gone through 1–3 breeding seasons and no pups were produced, and the fertility-controlled wolves have maintained their territory. As a result, wolf numbers were reduced by 80% within a portion of the herd's summer range excluding Yukon-Charley Rivers National Preserve.

Depending on herd movements during the year, the number of wolf packs preying on the FCH was 26–40 (Boertje and Gardner 2000). Also, grizzly bear numbers have not been reduced by department-conducted control activities or by hunter harvest. As a result, annual wolf and grizzly

bear predation rates on calf and on adult caribou remain similar to pretreatment years. Most of the wolf predation has occurred within the territories of untreated packs. One of the major limiting factors to reducing early wolf-caused calf mortality is the inability to reduce wolf numbers in Yukon-Charley Rivers National Preserve, which is part of the herd's calving range. Preliminary results indicate the program has caused an overall reduction in wolf predation rates during the calving period compared to pretreatment years, which has allowed more calves to survive to 5 months. Also when compared to adjacent herds in Interior Alaska and central Yukon, Canada, the Fortymile Herd has had lower calf and adult mortality rates during the past 2 years. It is the only Interior herd that has increased during the past 2 years.

We will continue controlling wolf numbers within the 15 wolf territories through June 2001. Once these wolves are released from control activities, the effects of the program will continue until the fertility-controlled wolves no longer control the territories and wolf numbers begin to increase. We will continue to test the effectiveness of the nonlethal wolf control program through 2003 and report the results in future research and management reports.

HABITAT

Assessment

Range condition was evaluated by determining the percent lichen fragments in relation to the percent moss in Fortymile caribou fecal samples. During winters 1991, 1992, 1995, 1996 and 1999, range conditions were excellent as evidenced by high proportions of lichen fragments (72–81%) and a low proportion of mosses (8%). Fecal samples from overgrazed winter ranges contain a relatively high proportion of mosses (30–60%) (Boertje 1984).

The multi-year density of the FCH exceeded 500 caribou/1000 km^2 (500/386 mi^2) in 1998, the first time in 3 decades. The herd is beginning to expand its range as it increases in size. It moved farther to the west near the Steese Highway during the fall and utilized winter range in the Yukon during the past 2 winters. Still, more than 70% of the historic Fortymile range has not been used for over 30 years, and the far eastern portion of the range has not been used for over 50 years. The historic range supported hundreds of thousands of caribou.

Except in 1993, nutritional stress has not been detected (Boertje and Gardner 1996). In 1993 low pregnancy rates (66%, n = 47) probably occurred because many adult cows did not gain sufficient fat to ovulate in 1992. This may have happened because of a short growing season or severe weather and deep snow before the rut. Also, high adult mortality during 1989–1992 may have been related in part to stress from adverse weather. Overall, we found consistent data for moderate to high nutritional status in the Fortymile Herd when compared to other Alaska herds (Boertje and Gardner 1998*b*, 1999). Also, indices to nutritional status improved when the herd began to increase.

Enhancement

The Alaska Interagency Fire Management Plan, implemented in the early 1980s, should ensure a near-natural fire regime necessary for the long-term management of caribou range in Interior Alaska. In July 1998 we burned 58,000 acres of spruce forest in the eastern portion of the herd's range in Alaska. In 1999 we burned 31,000 acres of spruce forest within the Ketchumstuck

Creek drainage, which has been an important wintering area. Both these areas were covered by climax spruce forest. Based on caribou range recovery in adjacent burns, we expect benefits to caribou from this fire within 10–20 years.

One of the goals of the Fortymile Caribou Management Plan is to ensure adequate range for the herd during and after recovery. Team members from both Alaska and Yukon are working with landowners, land managing agencies, and developers to work toward this goal. The Team has produced a document entitled "Habitat Management Needs Assessment for the Fortymile Caribou Herd" that identifies the ranges the herd uses during the year and discusses how these ranges are important. This document has been sent to landowners and managers, industry, and the military to be used in their land use decisions.

Current habitat/development issues are mostly related to mining and military activities in the herd's calving and postcalving areas. The herd is most sensitive to disturbance during calving and postcalving. The calving period is important because the adult cows are in poor physical condition due to lactation, and disturbance will add to their energy demands. This period is critical to the survival and development of calves, and disturbance may increase their vulnerability to predators if they are periodically displaced. Free movements of the large groups that form during the postcalving period are critical. During both these periods, to minimize the effects of mining exploration and low flying military aircraft, we developed a website that displayed the areas the herd was using. The website was updated when the herd changed distribution. This was usually every 1–2 days. The mining industry and military have used this website to plan their activities around the herd and have minimized their impacts during calving and postcalving during summers 1999 and 2000.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

The Fortymile Caribou Herd Management Plan is nearing completion but 2 of the plan's objectives need to be continued – habitat protection and a public awareness program. Protecting caribou habitat and informing the public about herd status and consumptive and nonconsumptive use opportunities are essential components of the Team's goal restore the Fortymile Herd to its traditional range, and promote healthy wildlife populations for their intrinsic value. Habitat protection is being addressed through land use plans and agreements made with the mining industry and the military. The public awareness plan needs agency support. The Team, prior to sunsetting, sent letters to state, federal, and territorial government agencies requesting their support in developing and implementing such a plan.

The timing for a public awareness plan is optimal. The nonlethal wolf control program, voluntary reduction in hunter harvest, and the mining industries' efforts to limit impacts has cast a spotlight on the herd. The FCH is increasing and once again beginning to use portions of its traditional range. People's interest in the herd is increasing. A cooperative state–federal program enhancing the viewing, education, and hunting opportunities of the Fortymile Herd would benefit Alaska. Even though the Team has ended, several members are working to find funding and hopefully, within the next few years a Fortymile Caribou Public Awareness Plan will be developed.

Currently, the only program designed to keep the public informed about FCH management is a newsletter produced by Division of Wildlife Conservation called "The Comeback Trail." This newsletter is sent to 4500 Alaskan and Yukon residents and is produced once or twice annually. This publication does not reach most of the schools in Alaska nor does it go to many of the special interest groups that would be interested in uses of the FCH other than hunting.

CONCLUSIONS AND RECOMMENDATIONS

The FCH increased through the 1980s at an annual rate of 5–10%. Between 1990 and 1995, it was essentially stable. The rate of increase improved to 14% between 1996 and 1999 due to optimal environmental conditions and reduced predation. The herd continued to grow during 2000 following a severe winter, but the growth rate declined to 5%. The FCH was the only Interior caribou herd in Alaska and Yukon, Canada to increase during 2000. The FCH has the potential to continue to increase. Current range conditions are excellent, and >70% of its traditional range is available. The nutritional condition of the herd is good to excellent, and the incidence of disease is minimal.

We implemented nonlethal wolf control in combination with public trapping in November 1997. The goal of reducing wolf numbers is being achieved within a portion of the herd's summer range. As of 10 April 1999, we completed treatment of 15 wolf pack territories. During the first 3 years of the program, we fertility controlled 35 dominant wolves and relocated 85 subordinate wolves. In combination with public trapping we reduced the wolf population in these 15 territories by 80%. Preliminary results indicate that wolf predation has declined on the calving grounds, but the annual wolf predation rate has remained comparable to pretreatment levels due to predation by nontreated packs throughout the year.

Harvest was not a limiting factor to herd growth even before the harvest quota was reduced to 150 bulls in RY96. Since RY73 hunters have harvested <2% of the Fortymile caribou population in all but 3 years. During RY96–RY00, harvest was <1%. Weather and predation, not harvest, were the primary factors limiting herd growth. Hunters contributed to the herd recovery effort by supporting reduced harvest. During the life of the plan, hunters have verified their support by voluntarily foregoing their opportunity to participate in the hunts. During the past 5 years hunter participation has declined by 55%.

State and federal harvest regulations are now consistent, making them easier to understand and greatly reducing the chance for overharvest.

A coalition of the Upper Tanana/Fortymile, Fairbanks, Delta, Eagle, and Central advisory committees developed a harvest plan that was endorsed by the board in spring 2000. The goal of the Harvest Plan was to manage harvest to allow continued herd growth at moderate levels. The board passed regulations that will guide Fortymile caribou harvest for the next 5 years following the recommendations of the Harvest Plan. The Harvest Plan will be presented to the FSB for their endorsement in spring 2001. It is the hope of the advisory committees, the Team, and the state, federal, and territorial managing agencies that the FSB will structure the federal subsistence harvest following the recommendations outlined in the Harvest Plan to ensure herd growth and to minimize the effects of dual management on the subsistence hunter. The Eastern

Interior Regional Advisory Council has taken the first step in this process by developing a proposal for the FSB that does follow the intent of the Harvest Plan and satisfies ANILCA.

The Fortymile Caribou Herd Management Plan was fully implemented during RY98–RY00. Reduced harvest quota and nonlethal wolf control will end following June 2001. The Team has met with principal landowners, developers, and land managing agencies to plan strategies that protect critical habitat, and meet the needs of landowners and developers. The Team developed a document entitled "Habitat Management Needs Assessment for the Fortymile Caribou Herd" to be used by landowners and agencies, industry, and the military to plan their land-use activities around the needs of the herd. The Division of Wildlife Conservation developed a website that illustrates caribou distribution during calving and postcalving that is used by the mining industry and military to plan their activities to minimize impacts on the herd.

The Team initiated a program to develop a Fortymile caribou public awareness plan.

Following are recommended objectives and activities for the next reporting period that reflect the herd and harvest objectives set by the board and the board-endorsed Fortymile Caribou Herd Harvest Plan, 2001–2006.

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 1000–15,000 caribou.

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

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.

- Provide for increased caribou hunting, viewing, and other wildlife-related recreation in Alaska and Yukon.

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Table 1 Fortymile caribou fall composition counts and population size, 1986–2001

Date	Bulls: 100 Cows	Calves: 100 Cows	% Calves	% Cows	% Small bulls	% Medium bulls	% Large bulls	% Bulls	Composition sample size	Estimate of herd size [a]
10/13/86	36	28	17	61	35	24	41	22	1381	15,307
9/28/87	40	37	21	57	13	43	44	22	2253	
10/2–3/88	38	30	18	59	29	41	30	23	1295	19,975
10/13/89	27	24	16	66	34	41	25	18	1781	
9/27–28/90	44	29	17	58	42	39	19	26	1742	22,766
10/10/91	39	16	10	64	41	34	25	25	1445	
9/26/92	48	30	17	56	37	36	27	27	2530	21,884
10/3/93	46	29	17	57	48	36	17	26	3659	
9/30/94	44	27	16	57	45	33	22	24	2990	22,104
10/3/95	43	32	18	57	43	31	27	25	3303	22,558
9/30/96	41	36	20	57	46	31	23	23	4582	23,458
9/30/97	46	41	22	53	48	28	24	25	6196	25,910
9/29/98	40	38	21	56	49	27	24	23	4322	31,029
9/29/99	48	37	20	54	55	29	16	26	4336	33,110
10/01/00	45	27	16	58	48	28	24	26	6512	34,640
9/29/01	49	38	20	53	44	32	24	27	6878	40,204

[a] Herd estimates were the result of the summer censuses.

Table 2 Fortymile caribou mid to late June composition counts[a], 1985–1993

Date	Bulls:100 Cows	Calves:100 Cows	% Calves	% Cows	% Bulls	Composition sample size
6/19/85	18	48	29	60	11	3803
6/26/87	46	47	25	52	24	3596
6/30/88	54	36	19	53	29	1799
6/14/91	35	25	16	62	22	2998
6/22/92	41	46	25	54	22	3313
6/16/93	40	23	14	61	24	3143

[a] No counts were done in 1986, 1989, 1990, and 1994–2000.

Table 3 Fortymile Caribou seasons and bag limits, regulatory years 1987–1988 through 2000–2001

	Unit 20B SE of Steese		Unit 20D N of Tanana River		Unit 20E		Unit 25C SE of Steese	
	State	Federal	State	Federal	State	Federal	State	Federal
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
1987–1988	8/10–9/20 1 bull	–[a]	8/10–9/20 8/10–9/30[b] 12/1–2/28[b] 1 bull	–[a]	8/10–9/20 8/10–9/30[b] 12/1–2/28[b] 1 bull	–[a]	8/10–9/20 1 bull	–[a]
1988–1989	8/10–9/20 1 bull	–[a]	8/10–9/20 8/10–9/30[b] 12/1–2/28[b] 1 bull		8/10–9/20 8/10–9/30[b] 12/1–2/28[b] 1 bull		8/10–9/20 1 bull	–[a]
1989–1990	8/10–9/20 1 bull	–[a]	8/10–9/20 1 bull 8/10–9/30[b] 12/1–2/28[b] 1 caribou	–[a]	EAST: 8/10–9/20[c] 1 bull 8/10–9/30[bd] 12/1–2/28[bd] 1 caribou WEST: 8/10–9/20 1 bull 8/10–9/30[b] 12/1–2/28[b] 1 caribou	–[a]	8/10–9/20 1 bull	–[a]
1990–1991	8/10–9/20 1 bull 2/15–3/15 1 caribou	–[a]	8/10–9/20 1 bull	–[a]	EAST: 8/10–9/30[de] 1 bull 12/1–2/28[de] 1 caribou WEST: 8/10–9/20 1 bull 8/10–9/30[e] 12/1–2/28[e] 1 caribou	–[a]	8/10–9/20 1 bull	–[a]

Regulatory year	Unit 20B SE of Steese		Unit 20D N of Tanana River		Unit 20E		Unit 25C SE of Steese	
	State	Federal	State	Federal	State	Federal	State	Federal
	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit
1991–1992	8/10–9/20 1 bull	No open Season	8/10–9/20 1 bull	No open season	EAST: 8/10–9/30[de] 1 bull 12/1–2/28[de] 1 caribou WEST: 8/10–9/20 1 bull 8/10–9/30[e] 12/1–2/28[e] 1 caribou	EAST: 8/10–9/30[de] 1 bull 12/1–2/28[de] 1 caribou WEST: 8/10–9/20 1 bull 8/10–9/30[e] 12/1–2/28[e] 1 caribou	8/10–9/20 1 bull	8/10–9/20 2/15–3/15 1 bull
1992–1993	8/10–9/20 1 bull	No open Season	8/10–9/20 1 bull	No open season	EAST: 8/10–9/30[de] 1 bull 12/1–2/28[de] 1 caribou WEST: 8/10–9/20 1 bull 8/10–9/30[e] 12/1–2/28[e] 1 caribou	EAST: 8/10–9/30[de] 1 bull 12/1–2/28[de] 1 caribou WEST: 8/10–9/20 1 bull 8/10–9/30[e] 12/1–2/28[e] 1 caribou	8/10–9/20 1 bull	8/10–9/20 2/15–3/15 1 bull
1993–1994	8/10–9/20[d] 1 bull	No open Season	8/10–9/20 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[f] 1 bull 12/1–2/28 1 bull[f]	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[f] 1 bull 12/1–2/28[f] 1 bull
1994–1995	8/10–9/20[d] 1 bull	No open Season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[f] 1 bull 12/1–2/28 1 bull[f]	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[f] 1 bull 12/1–2/28[f] 1 bull
1995–1996	8/10–9/20[d] 1 bull	No open Season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull	8/10–9/30[f] 1 bull	8/10–9/30[de] 1 bull	8/10–9/30[f] 1 bull

Regulatory year	Unit 20B SE of Steese		Unit 20D N of Tanana River		Unit 20E		Unit 25C SE of Steese	
	State	Federal	State	Federal	State	Federal	State	Federal
	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit	Season/Bag limit
					12/1–2/28[de] 1 bull	11/15–2/28 1 bull[f]	12/1–2/28[de] 1 bull	12/1–2/28[f] 1 bull
1996–1997	8/10–9/20[d] 1 bull	No open season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 11/15–2/28 1 bull[f]	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 12/1–2/28[f] 1 bull
1997–1998	8/10–9/20[d] 1 bull	No open season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 11/15–2/28 1 bull[f]	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 12/1–2/28[f] 1 bull
1998–1999	8/10–9/20[d] 1 bull	No open season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 11/15–2/28 1 bull[f]	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 12/1–2/28[f] 1 bull
1999–2000	8/10–9/20[d] 1 bull	No open season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 11/15–2/28 1 bull[f]	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 12/1–2/28[f] 1 bull
2000–2001	8/10–9/20[d] 1 bull	No open season	8/10–9/20[d] 1 bull	No open season	8/10–9/30[de] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 11/15–2/28 1 bull[f]	8/10–9/30[deh] 1 bull 12/1–2/28[de] 1 bull	8/10–9/30[fg] 1 bull 12/1–2/28[f] 1 bull

[a] No separate season.
[b] Subsistence hunters or residents domiciled in communities or units in rural areas as defined by the Federal Subsistence Board and Alaska Board of Game.
[c] Drawing permit for resident hunters only.
[d] Registration hunt.
[e] Definition of subsistence hunter changed to include any resident of the state, Dec 1989.
[f] Registration hunt for federal subsistence users only. Who qualifies as a Fortymile caribou federal subsistence user differs between subunits, i.e., in Unit 20E it is rural residents of Unit 12 north of Wrangell-St Elias National Park and Preserve, Unit 20D and Unit 20E; in Unit 25C eligible federal subsistence are all rural residents in the state.
[g] Federal hunt managed under a joint state/federal permit issued by the state.
[h] Hunt area was changed to east of the east bank of the mainstem of Preacher Creek to its confluence with American Creek, then east of the east bank of American Creek.

Table 4 Reported Fortymile caribou harvest by type of hunt, regulatory years 1989–1990 through 2000–2001

Hunt	Regulatory year	Permits issued	% Did not hunt	% Successful hunters	% Unsuccessful hunters	Harvest			Total reported harvest[a]	Notes
						Bulls	Cows	Unk		
572 Drawing permit	1989–1990	750	31	11	89	57	0	0	57	
575[b]	1989–1990	681	28			148	98	0	246[c]	
Registration permit	1990–1991	1478	29	25	75	238	18	8	265	
	1991–1992	1864	21	23	77	335	1	1	337	
	1992–1993[d]	973	17	34	66	262	10	0	272	
	1993–1994	2809	22	15	85	325	10	0	335	
	1994–1995	2472	19	15	85	294	12	0	306	
	1995–1996	1860	26	12	88	160	15	0	175	
	1996–1997[e]	1025	28	16	84	138	7	0	145	150 bull quota
	1997–1998[f]	1305	31	16	84	143	8		151	150 bull quota
	1998–1999[f]	886	38	27	73	151	4		155	150 bull quota
	1999–2000[g]	1317	35	17	83	142	10	3	155	150 bull quota
	2000–2001[gh]	1173	28	17	83	142	7	1	150	150 bull quota
General[i] hunt	1987–1988			25	75	142	0	0	142	561 hunter reports
	1988–1989			42	58	399	2	0	401	964 hunter reports
	1989–1990			47	53	121	0	0	121	255 hunter reports
	1990–1991			10	90	47	2	0	49	467 hunter reports
	1991–1992			27	73	95	4	1	100	424 hunter reports
	1992–1993					60	0	0	60	102 hunter reports
	1994–1995	308	44	9	91	15	0	0	15	
	1995–1996	306	37	23	77	40	0	0	40	
	1996–1997	99	35	36	64	23	0	0	23	
575	1991–1992	20				4	0	0	4	
Federal hunt	1992–1993	244	18	39	61	59	12	11	82	
	1993–1994	77	58	3	97	1	0	0	1	

Hunt	Regulatory year	Permits issued	% Did not hunt	% Successful hunters	% Unsuccessful hunters	Harvest			Total reported harvest[a]	Notes
						Bulls	Cows	Unk		
	1994–1995[j]	<30	100	0	0	0	0	0	0	
	1996–1997[k]	0	0	0	0	0	0	0	0	
Total for all hunts	1987–1988			25	75	142	0	0	142	561 hunter reports
	1988–1989			42	58	399	2	0	410	965 hunter reports
	1989–1990			37	63	32	98	0	424	1264 hunter reports
	1990–1991			21	79	295	20	8	313	1520 hunter reports
	1991–1992			23	77	434	5	2	441	1919 hunter reports
	1992–1993			34	66	382	24	11	417[d]	1086 hunter reports
	1993–1994	2886	23	15	85	326	10	0	337	
	1994–1995	2780	22	15	85	309	12	0	321	
	1995–1996	2166	28	14	86	200	20	0	220	
	1996–1997	1025	28	16	84	138	7	0	145	150 bull quota
	1997–1998	1305	31	16	84	143	8		151	150 bull quota
	1998–1999	886	38	27	73	151	3		154	150 bull quota
	1999–2000	1317	35	17	83	142	2	3	147	150 bull quota
	2000–2001[h]	1173	28	17	83	142	2	1	145	150 bull quota

[a] Total harvest does not include harvest occurring in Canada. Canadian harvest since 1973 has been less than 20 caribou per year. Total does not include extrapolation for nonreporting from general hunts.
[b] Hunt 575 was renamed RC865 in 1993.
[c] Harvest may include 44 Nelchina/Mentasta caribou taken from southern portion of Unit 20E and 1 Macomb caribou from northern Unit 12.
[d] Canadian harvest was estimated to be 50 additional caribou.
[e] Includes RC865 and RC867.
[f] Includes RC863, RC865, and RC867.
[g] Includes RC863, RC865, RC866 and RC867.
[h] Preliminary harvest results.
[i] During 1994 permit hunt RC863 was set up in Units 20B and 20D. Alaskan residents, nonresidents, and aliens could participate. Approximately 35–40% of successful hunters do not report in general hunts, so totals for these hunts are actually higher.
[j] Federal Subsistence office never sent data. Estimates generated through discussions with local federal biologists.
[k] During regulatory years 1996–1997 through 2000–2001, state and federal hunts were managed under a joint permit. State and federal quota was 150 bulls.

Table 5 Fortymile caribou harvest and accidental death, regulatory years 1985–1986 through 2000–2001

Regulatory	Reported[a]				Estimated			Yukon	
year	M	F	Unk	Total	Unreported[b]	Illegal	Total	harvest	Total
1985–1986	261	0	0	261	160	20	180	0	441
1986–1987	223	0	0	223	137	20	157	0	380
1987–1988	142	0	0	142	87	20	107	0	249
1988–1989	399	2	0	401	244	150[c]	394	0	795
1989–1990	326	98	0	424	74	0	74	3	501
1990–1991	285	20	8	313	28	2	30	0	343
1991–1992	434	5	2	441	59	5	64	0	505
1992–1993	382	14	0	396	0	21	417	50	467
1993–1994	326	0	0	326	0	10	336	10	346
1994–1995	309	0	0	309	0	12	321	7	328
1995–1996	200	0	0	200	0	20	220	5	225
1996–1997	138	0	0	138	0	7	145	1	146
1997–1998	143	0	0	143	0	8	151	0	151
1998–1999	151	0	0	151	0	4	155	0	155
1999–2000	142	0	3	145	0	10	155	0	155
2000–2001[d]	142	0	1	143	0	7	150	0	150

[a] Includes all Alaskan harvest reporting systems.
[b] Unreported harvest calculated by multiplying reported general hunt harvest by 1.59 to compensate for nonreporting by successful hunters.
[c] Forty cows found abandoned within 50 yards of trails; 150 assumed taken.
[d] Preliminary harvest results.

Table 6 Fortymile caribou hunter residency and success of hunters reporting residency, regulatory years 1989–1990 through 2000–2001

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] Resident	Nonlocal resident	Nonresident	Total (%)	
1989–1990	291			347 (35)	182	453		635 (65)	982
1990–1991	105	157		262 (25)	273	517		790 (75)	1052
1991–1992	91	260	23	374 (21)	339	1052	34	1425 (79)	1799
1992–1993	116	219		335 (35)	261	373		634 (65)	969
1993–1994	45	270	9	324 (16)	431	1278	15	1724 (84)	2048
1994–1995	87	211	11	309 (15)	296	1477	8	1781 (85)	2090
1995–1996	40	138	22	200 (14)	312	950	14	1276 (86)	1476
1996–1997	33	96	17	146 (22)	214	301	1	516 (78)	662
1997–1998	53	83	7	143 (16)	250	480	7	737 (84)	880
1998–1999[b]	52	92	7	154 (29)	109	266	3	378 (71)	532
1999–2000	50	93	4	147 (17)	208	497	2	707 (83)	854
2000–2001	39	97	9	145 (17)	180	504	2	686 (83)	831

[a] Residents of Unit 12 north of Wrangell/St Elias, Unit 20E, or Unit 20D and residents of Circle and Central.

[b] Unknown residents included in total.

Table 7 Fortymile caribou autumn harvest by month/day, regulatory years 1988–1989 through 2000–2001

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*
1988–1989				189[a]					
1989–1990[bc]	5	8	5	8	0	1	1	1	29
1990–1991	48	61	35	50	19	14	7	10	244
1991–1992	187	67	17	9	17	22	–[d]	–[d]	319
1992–1993[e]	289	0	1	0	1	0	47	7	345
1993–1994	167	16	12	15	10	4	1	0	225
1994–1995	51	16	21	21	17	9	4	19	158
1995–1996	33	10	6	5	12	2	3	1	72
1996–1997[f]	14	10	9	12	13	4	7	7	76
1997–1998[f]	22	3	1	18	12	9	16	6	87
1998–1999	57	20	4	1	0	0	0	0	82
1999–2000	50	8	2	7	19	7	0	0	93
2000–2001	81	13	11	4	1	0	0	0	110

[a] Between 1 Sep and 10 Sep, 189 caribou were harvested.
[b] Data from registration permit only.
[c] An additional 231 caribou were harvested between 1 Oct and 31 Dec.
[d] Closed by emergency order.
[e] State season was closed by emergency order 14 Aug 1992.
[f] Data from RC865 only. Harvest quota was 85 bull caribou.

Table 8 Fortymile caribou harvest percent by transport method, regulatory years 1987–1988 through 2000–2001

Regulatory year	Harvest percent by transport method									
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Walking	Unk	*n*
1987–1988[a]	58	1	3	19	3	3	13	0	0	142
1988–1989[a]	29	1	2	36	1	4	27	0	0	401
1989–1990[b]	27	0	0	10	6	5	52	0	0	424
1990–1991[c]	1	1	0	43	10	1	43	1	0	313
1991–1992[d]	16	1	2	53	5	4	23	5	0	441
1992–1993[c]	5	0	1	58	5	7	21	0	3	378
1993–1994[c]	16	0	2	38	16	8	17	0	2	326
1994–1995[c]	11	0	1	23	28	7	28	0	2	298
1995–1996[c]	33	0	2	14	19	6	26	0	2	326
1996–1997[c]	29	0	4	18	12	5	30	0	1	146
1997–1998[c]	36	1	4	15	22	7	11	0	3	143
1998–1999[c]	10	0	2	34	18	5	27	0	5	155
1999–2000[c]	23	1	1	28	9	3	31	0	3	147
2000–2001[c]	18	0	3	38	16	10	11	0	5	145

[a] General hunt numbers only.

[b] Drawing and registration permit hunt results.

[c] Registration permit hunt results only.

[d] Registration permit and general hunt results.

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNITS: 20F, 21C, 21D, and 24 (48,000 mi^2)

HERDS: Galena Mountain, Ray Mountains, Wolf Mountain

GEOGRAPHIC DESCRIPTION: Galena Mountain, Kokrines Hills, and Ray Mountains

BACKGROUND

Caribou in Units 21D and 24 are in 3 distinct herds located north of the Yukon River in the Kokrines Hills and Ray Mountains. They are the Galena Mountain, Wolf Mountain, and Ray Mountains Herds, named for a mountain peak or mountains where the herds calve.

Each herd has a distinct calving area. The western group of approximately 250–500 animals typically calves east of Galena Mountain and winters west of the mountain. Galena Mountain is a local name given the 3274 ft unnamed mountain northeast of Galena. The middle group calves on Wolf Mountain and winters to the north and east in the Melozitna and Little Melozitna River drainages, overlapping with the Galena Mountain Herd. The Wolf Mountain Herd contains approximately 600–850 animals. The easternmost group (Ray Mountains Herd) calves primarily on the south side of the Ray Mountains and around Kilo Hot Spring, and winters on the north side in the Kanuti-Kilolitna drainage. With approximately 1800 animals, this is the largest of the 3 herds.

The Galena and Wolf Mountain Herds are difficult to survey or census during fall and winter because they travel in small groups in dense black spruce forest where sightability is poor. The Ray Mountains Herd is also difficult to survey because fog, clouds, and winds often limit survey opportunities in fall.

The origin of these herds is unknown, but some residents believe these animals are feral reindeer from a commercial reindeer operation in the Kokrines Hills. The commercial reindeer operation in that area ended around 1935, and there is no evidence of reindeer physical characteristics or reindeer genes in the herds. The mid-May calving dates of all 3 herds also indicate the animals are caribou. Local residents were aware of these herds for many years, but the Alaska Department of Fish and Game (ADF&G) did not survey them until 1977.

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. Since the early 1970s, hunting seasons were 10 August–30 September for the Galena and Wolf Mountain Herds, principally to keep harvest low but also to discourage harvest of cows. During 1984–1985 additional protection was given to the Ray Mountains Herd in southern Unit 24 to prevent overharvest near the Dalton Highway. That area was previously under Western Arctic Caribou Herd (WACH) regulations. The combined average of reported and known unreported harvest from all 3 herds over the last 10 years was <10 caribou per year.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Ensure harvest does not result in a population decline.
- Provide increased opportunity for people to participate in caribou hunting.

MANAGEMENT OBJECTIVES

- Harvest up to 50 cows and up to 75 bulls from the Ray Mountains Herd.
- Harvest up to 10 cows and up to 25 bulls from the Wolf Mountain Herd.
- Harvest up to 10 cows and up to 25 bulls from the Galena Mountain Herd.

METHODS

The methods outlined in this report reflect efforts to accomplish the activities and management objectives established in the previous reporting period.

Caribou from these herds were monitored through cooperative radiotelemetry studies involving ADF&G, US Fish and Wildlife Service (FWS), and Bureau of Land Management (BLM). In April 1992, 8 adult females, 2 female calves, and 10 adult male caribou were radiocollared on the winter range of the Galena Mountain Herd north of Galena. In October 1993, 4 female calves were radiocollared in the Galena Mountain Herd. In October 1994, 8 female calves were radiocollared in the Galena Mountain Herd, 20 female calves were radiocollared in the Ray Mountains Herd, and 3 female calves were radiocollared in the Wolf Mountain Herd. In October 1995, 8 female calves were radiocollared in the Wolf Mountain Herd. In October 1996, 3 female calves were radiocollared in the Wolf Mountain Herd.

For the Ray Mountains Herd, we conducted annual composition counts with either a fixed-wing aircraft (Super Cub or Scout) or a Robinson (R-22 or R-44) helicopter in October 1994–2001 (Eagan 1993). Surveys of the Galena or Wolf Mountain Herds were flown during regulatory years (RY) 1998–1999 and 1999–2000 (RY = 1 Jul–30 Jun, e.g., RY98 = 1 Jul 1998 through 30 Jun 1999) using fixed-wing aircraft that did not allow for sex or age classification. We monitored hunting mortality from caribou harvest reports and interviews with local residents. Information obtained from the reports and interviews was used to determine total harvest, harvest location,

hunter residency and success, harvest chronology and transportation used. Harvest data were summarized by regulatory year.

We radiocollared 17 caribou (15 short yearling females and 2 short 2-year-old females) on 29 March 2002, but 4 died from capture-related causes. As of 1 May 2002 there were 13 active radiocollars.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Galena Mountain Herd. The Galena Mountain Herd has never been censused, but the population was probably 300–500 caribou during RY98–RY00. The highest number of caribou seen was 313 in December 1998 (Table 1). The population was probably stable because of relatively moderate winters and extensive habitat. Although radiocollaring caribou was expected to help locate caribou aggregations, use of the collars did not increase the number of caribou found. The use of radio collars did demonstrate that caribou occupy dense black spruce habitat during the rut, where sightability is low. Continuation of surveys or censuses during summer or postcalving aggregations may provide the best estimates of population size for this herd.

Wolf Mountain Herd. The first fall composition survey of the Wolf Mountain Herd was conducted in October 1995 (Table 2). The highest count during June surveys was 595 caribou in 1992. Based on these counts, Osborne (1995) estimated the population of the Wolf Mountain Herd was 600–850 caribou, which was higher than previous estimates. That higher estimate of the population probably reflected improved survey methods rather than population growth. The population was probably stable during RY98–RY00.

Ray Mountains Herd. The Ray Mountains Herd was first thoroughly surveyed by ADF&G and BLM in fall 1983 and periodically surveyed by BLM for the next 2 years. On 1 November 1983, 400 caribou were counted. In 1987 the population estimate was 500 (Robinson 1988) based on a survey of all known upland ranges, but excluding the Caribou Mountain area. Composition counts during a radiotracking flight in October 2000 indicated a new minimum herd size of 1736 (Table 3). The population probably declines in years of poor recruitment and increases when recruitment is good, but it has increased at a mean rate of about 10% per year since 1983.

Population Composition

Because counts of the 3 herds were conducted with fixed-wing or helicopter aircraft, not all counts yielded composition data (Tables 1–4). Helicopters were used beginning with the 1992 fall surveys and provided the first accurate composition data on these herds. Comparison of composition data to previous years is inconclusive due to limited data. Only caribou in the Ray Mountains were classified during the report period. Ray Mountains caribou had calf:cow ratios of 13:100 in 1997, 32:100 in 1998 and 19:100 in 2000.

Calf:cow ratios of the three herds are similar to other Interior herds, with means and ranges of 20:100 (12–32:100) for the Ray Mountains Herd, 25:100 (15–36:100) for the Wolf Mountain

Herd, and 21:100 (7–40:100) for the Galena Mountain Herd. Calf:cow ratios for the Fortymile Herd between 1985 and 1994 averaged 29:100 with a range of 16–37:100 (Boertje et al. 1995). The Delta caribou herd calf:cow ratio between 1970 and 1993 averaged 29:100 with a range of 2–65:100. The highest values often occurred following predator control programs (Valkenburg 1994).

Distribution and Movements

Galena Mountain Herd. Galena Mountain caribou usually migrate toward alpine areas east of Galena Mountain in April. They are found on the alpine slopes of the southern Kokrines Hills during calving season. Most radiocollared caribou were in alpine areas west of the Melozitna River from June to September in all years. In September a few bulls have been seen along the Yukon River and also north of Galena. During October the caribou usually migrate from alpine areas across Galena Mountain toward the Holtnakatna Hills and around Hozatka Lake where they winter. In October 1995 radiocollared caribou from the Galena Mountain Herd were in the Holtnakatna Hills when composition counts were conducted. In 1996 they were scattered from these hills eastward to the Melozitna River where some were mixed with Wolf Mountain caribou (Saperstein 1997).

In late September–early October 1996, 10,000–15,000 caribou from the Western Arctic Herd moved east into Unit 21D. They crossed the Koyukuk River about 50 miles upstream of the mouth of the river. This group did not remain long in Unit 21D, and it is not known if there was any mixing with the Galena Mountain Herd.

Wolf Mountain Herd. A general migration pattern for the Wolf Mountain Herd was hypothesized based on tracks seen during surveys in the early 1980s. The herd calved on the slopes of Wolf Mountain, spent most of the summer in the surrounding alpine habitat, then in October moved northward toward Lost Lakes on the Melozitna River. Radiocollared caribou confirmed these patterns but also identified specific sites. In May 1995 the radiocollared caribou were located in the headwaters of Hot Springs Creek. In May 1996 they were located on the north side of Wolf Mountain. In October 1994 approximately 500 caribou were seen in the Hot Springs Creek area during collaring activities. The herd was on the north side of Wolf Mountain in the west fork of Wolf Creek in October 1995. And in October 1996, the herd was on the lower part of the Melozitna River, approximately 10–35 miles southwest of Wolf Mountain.

Ray Mountains Herd. Prior to October 1994 there were no radiocollared caribou in the Ray Mountains, and movements of the herd were not well known. Robinson (1988) found them north of the Ray Mountains and in the upper Tozitna River drainage. 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. Near Sithylemenkat Lake small groups of male caribou (10–20) were regularly seen earlier in the year during March, and during this time 200 caribou were seen in the Kanuti Lake area. We do not know if these caribou were from the Ray Mountains Herd or Western Arctic Herd.

Since radiocollaring began in October 1994, radiolocations during winter were primarily on the northern slopes of the Ray Mountains and during calving season were 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).

Body Weights and Genetics

During October, female calves from the Galena Mountain Herd were among the heaviest in Alaska (Valkenburg et al. 1993). Weights of Wolf Mountain and Ray Mountains calves were also heavy.

In contrast, caribou calves captured in the Ray Mountains on 29 March 2002 were relatively light, indicating that body condition had declined considerably since 1994. It is unknown whether that decline in condition is due to a short-term (summer weather) event or is a density-dependent decline. Analysis of mitochondrial DNA by Cronin et al. (1995) indicated that none of the samples from Galena Mountain Herd, Wolf Mountain Herd, or Ray Mountains Herd caribou contained any unique reindeer genes. Allele frequencies were similar to other Alaskan caribou and were not consistent with any known allele frequencies for reindeer. The Galena Mountain/Wolf Mountain samples also contained a rare allele not previously reported for reindeer or caribou in Alaska. The significance of this rare allele is unknown.

MORTALITY

Harvest

Season and Bag Limit.

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
Unit 20F, North of the Yukon River		
RESIDENT HUNTERS: 1 caribou.	10 Aug–31 Mar	
NONRESIDENT HUNTERS: 1 caribou.		10 Aug–30 Sep
Units 21B, 21C, and that portion of Unit 21D north of the Yukon River and east of the Koyukuk River and Unit 21E.		
1 caribou; however, 2 additional caribou may be taken during a winter season to be announced.	10 Aug–30 Sep (Winter season to be announced)	10 Aug–30 Sep
Unit 24, 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		

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
southeast bank of the Kodisin-Nolitna Creek, then downstream along the east bank of the Kanuti-Kilolitna River to its confluence with the Kanuti River.		
1 caribou.	10 Aug–31 Mar	10 Aug–30 Sep
Unit 25D, that portion drained by the west fork of the Dall River, west of the 150°W long.		
1 bull.	10 Aug–30 Sep	10 Aug–30 Sep

The Western or Central Arctic caribou herds seasonally occupy areas in Units 24 and 21D north of the Yukon River and west of the trans-Alaska pipeline. Seasons and bag limits in that area reflect harvest recommendations for those herds.

Board of Game Actions and Emergency Orders. In March 1991 the Alaska Board of Game gave us emergency order authority to open a portion of Unit 21D when WACH are present. A bag limit of 2 caribou was established. This action allowed hunters the opportunity to take caribou while protecting the smaller Galena Mountain Herd that may be intermixed with the WACH. This special winter season is not opened unless the Galena Mountain Herd constitutes 10% or less of the total number of caribou north of the Yukon River and east of the Koyukuk River in Unit 21D. It was not opened during RY98–RY00.

The Board of Game adopted several changes in regulations for these herds at their March 2000 meeting. The primary changes were to allow for the harvest of any caribou and to make the regulations for the Ray Mountains Herd consistent in Units 21C, 20F and 24. The regulations also changed the boundaries for the hunt areas of the Ray Mountains Herd in Unit 24, moving it further south, and including all of Unit 20F north of the Yukon River. There were no emergency orders issued during this reporting period.

Hunter Harvest. During the RY98 and RY99 hunting seasons, only 1 bull and 1 cow caribou were reported taken. One cow was harvested in the Ray Mountains Herd and 1 bull was harvested in the Wolf Mountain Herd (Table 5).

Hunter access to the Ray Mountains Herd during the open season in winter is limited to lengthy snowmachine trips. The Galena Mountain Herd is most accessible for hunting when it crosses the Galena-Huslia winter trail during winter. However, the season there was closed during winter to limit the potential for a serious overharvest. The Wolf Mountain Herd is almost never accessible for hunting because of the scarcity of aircraft landing areas. Several years ago, a guide using horses was able to access a limited part of the Wolf Mountain Herd's range and occasionally took caribou from this herd. Moose hunters on the Melozitna River incidentally

took Wolf Mountain caribou, but only very rarely. Success of hunters in all 3 herds was limited, and most hunters were not local residents (Table 6).

The total reported harvest averages <10 caribou per year. Each year 1 or 2 caribou are taken but not reported along the Yukon River near Ruby, and 3–5 caribou are taken along the Yukon River in the Rampart-Tanana section (Osborne 1995). These caribou, usually bulls, are occasionally found on remaining snowbeds near the river in August, or wandering to the river during September. In addition, 5–7 caribou are probably taken by hunters using snowmachines from Tanana (Osborne 1995).

Other Mortality

Judging from fall calf percentages (Tables 1–4), natural mortality of caribou calves continued to be high in all 3 herds. Black bears are probably still the primary calving-ground predators on the Wolf and Galena Mountain Herds. Grizzly bears are found throughout the calving ranges of all 3 herds. Predation was probably the main limiting factor, but no studies to determine mortality factors have been completed for these herds. Total adult mortality was probably very low. There was some concern that the recent high moose populations have supported higher levels of wolf and bear numbers, and that an increase of incidental predation on the Galena Mountain caribou may be causing a decline in that herd. Less than 100 caribou were seen on 2 different surveys of the Galena Mountain Herd in 1999 and 2000.

CONCLUSIONS AND RECOMMENDATIONS

The mountains between Galena and the upper Hodzana River on the north side of the Yukon River contain 2700–3150 caribou in 3 herds centered around 3 main calving areas. Although open hunting seasons for caribou exist, few are taken due to limited access. Predation is probably the primary factor restricting herd growth. Survey and inventory information for wolves and bears indicate the number of predators were increasing during RY96–RY99 (Stout 1999, 2000). Alternatively, habitat is apparently not restricting growth because lichen ranges are lush. The early calving date and large body size and weight of calves and adults for the Ray Mountains Herd previously indicated good nutrition (Osborne 1995). The recent decline in calf weights may indicate that there is less high-quality summer range available for Ray Mountains caribou than previously thought. The large body size and heavy weight of calves and adults in the Galena Mountain Herd also indicate that these caribou continue to be in excellent nutritional condition (Osborne 1995).

Both management goals for the report period were apparently met. Because all 3 herds seem to be stable or increasing, it is implicit that the limited harvest had no negative effect on the population. The second goal was also achieved at least to the extent there were no population declines that would require more restrictive harvest regulations. All management objectives were met. Harvest of bulls and cows did not exceed desired levels for the 3 herds. Very little has changed with respect to management since the last reporting period.

To allow harvest from the WACH 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 when the WACH is not present. Maintaining radio collars in the Galena and Wolf Mountain

Herds would help managers distinguish them from the WACH. In addition, radio collars would help managers obtain better population estimates. Other management work on these herds will remain a low priority because of insignificant harvest and relatively few animals.

Finally, changes in Unit 24 caribou regulations were accomplished in 2000. Seasons for the Ray Mountains Herd in Unit 24 were modified to be consistent with the Unit 20F seasons. Because of the sustained growth of the Ray Mountains Herd over the last 10 years and the low harvest, the regulations were changed to allow an either-sex bag limit for the fall hunting season. This measure addressed the second goal of increasing harvest opportunity.

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Table 1 Galena Mountain caribou fall composition counts, 1991–2001

Date	Bulls:100 cows	Calves:100 cows	Calves	Cows	Bulls	Total caribou observed
12/91						260
10/92	40	7	9	123	49	181
10/93	32	25	41	165	53	259
10/94	22	40	46	115	25	186
10/95	28	19	40	211	59	310
10/96	37	13	19	151	56	232
12/98[a]						313
12/99[a]						89
01/01[a]						65

[a] Fixed-wing survey, no composition classifications.

Table 2 Wolf Mountain caribou composition counts, 1991–2000

Date	Cows	Calves (%)	Bulls	Total caribou observed
6/91	117	18 (12)	11	146
6/92				595
1993[a]				
5/94	337	121 (26)	16	474
1/95				194
10/95	192	51 (15)	103	346
10/96	167	37 (14)	62	266
5/97[b]				423
1/98[b]				163
1999[a]				
2000[a]				

[a] No surveys.
[b] US Bureau of Land Management survey; no composition classifications.

Table 3 Ray Mountains caribou fall composition counts and estimated population size, 1991–2000

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
6/91		31						13[a]		446
6/91			19							303[b]
10/91[c]										140[d]
10/94[c]										652
10/94	37	19	12	64	4	8	11	24	629	629
1/95[c]										684
6/95[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
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	1736

[a] Includes 50 unclassified adults.
[b] Included 245 unclassified adults.
[c] No composition classifications.
[d] Caribou Mountain portion only.
[e] Photocensus.

Table 4 Galena Mountain caribou summer calving counts, 1991–2000

Date	Cows	Calves	(%)	Bulls	Total caribou observed
6/91	97	11	(8)	27	135
6/92	191	13	(5)	37	241
5/93	65	12	(13)	16	93
6/93	130	24	(13)	40	194
5/94	56	13	(12)	40	109
6/94	104	34	(18)	53	191
1995 through 2000[a]					

[a] No counts completed during 1995–2000.

Table 5 Ray, Galena, and Wolf Mountain caribou reported harvest, regulatory years 1990–1991 through 2000–2001

Regulatory year	Herd					
	Ray Mountains		Galena Mountain		Wolf Mountain	
	Bulls	Cows	Bulls	Cows	Bulls	Cows
1990–1991	3	0	0	0	1	0
1991–1992	2	0	0	0	1	0
1992–1993	5	0	0	0	2	0
1993–1994	9	0	0	0	0	0
1994–1995	2	0	1	0	2	0
1995–1996	0	0	0	0	0	0
1996–1997	0	0	1	0	0	0
1997–1998	0	0	0	0	0	0
1998–1999	0	0	0	0	0	0
1999–2000	0	1	0	0	1	0
2000–2001	2	0	2	0	0	0

Table 6 Galena Mountain, Wolf Mountain and Ray Mountains caribou hunter residency and success, regulatory years 1990–1991 through 2000–2001

Regulatory year	Successful				Unsuccessful				Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Total	Local resident[a]	Nonlocal resident	Nonresident	Total	
1990–1991	0	4	0	4	3	23	3	29	33
1991–1992	0	3	0	3	2	28	0	30	33
1992–1993	0	5	2	7	1	7	2	10	17
1993–1994	1	6	1	8	0	15	2	17	25
1994–1995	0	3	2	5	2	18	0	20	25
1995–1996	0	0	0	0	2	10	0	12	12
1996–1997	0	1	0	1	1	11	1	13	14
1997–1998	0	0	0	0	1	5	2	8	8
1998–1999	0	0	0	0	4	0	2	6	6
1999–2000	0	1	1	2	0	4	2	6	8
2000–2001	3	1	0	4	3	13	2	18	22

[a] Residents of Units 20; 21B, C, and D; and 24.

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 21D, 22A, 22B, 23, 24 and 26A

HERD: Western Arctic

GEOGRAPHIC DESCRIPTION: Northwest Alaska

BACKGROUND

The Western Arctic Caribou Herd (WACH) ranges over approximately 140,000 mi^2 (363,000 km^2) of northwestern Alaska (Fig 1). Summer range encompasses the calving grounds and consists of the northern foothills and mountains of the Brooks Range west of the Trans-Alaska Pipeline. In most years since the mid 1980s, at least half of the WACH has wintered in the eastern third of the Seward Peninsula and in the Nulato Hills as far south as the Unalakleet River drainage. Since 1996, caribou expanded this winter range to include the eastern half of the Seward Peninsula. Additionally, in several years during the late 1990s many caribou wintered in upper Koyukuk River drainages and on the North Slope between Atqasuk, Wainwright and Umiat.

In 1970, the WACH population numbered approximately 243,000 caribou. By 1976 it had declined to an estimated 75,000 animals. From 1976 to 1990, the WACH grew about 13% annually, and from 1990–1996 it grew 1–3% annually. The herd may have peaked in 1996 at 463,00 caribou. Census results suggest the WACH declined about 2% annually between 1996 and 1999 to 430,000 caribou; however, the 1999 estimate may be conservative and the population may have remained stable during this time.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- To protect and maintain the WACH and its habitat.
- To provide for subsistence and recreational hunting on a sustained yield basis.
- To provide for viewing and other uses of caribou.
- To perpetuate associated wildlife populations, including carnivores.

MANAGEMENT OBJECTIVES

- To maintain a postcalving population of ≥200,000 caribou.
- To minimize conflicts with the reindeer industry.
- To monitor the size, sex and age composition, productivity and recruitment, mortality and distribution of this population.
- To improve public understanding of WACH management, improve harvest reporting and encourage public involvement in the regulatory process.
- To minimize human impacts, e.g. resource development, tourism, commercial activities (guiding and transporting hunters and nonconsumptive users) and transportation corridors, on caribou and their habitat.
- To cooperatively manage this herd through a Working Group comprising major stakeholders (e.g. village representatives, guides, transporters, nonconsumptive users, nonlocal hunters, and state and federal resource managers).
- To re-write the WACH Management Plan by December 2002.

METHODS

In this report 'caribou' in the generic sense refers to the WACH. Reference to caribou from other herds will be identified in text.

Population Status and Trend. Conventional VHF and satellite radiotelemetry 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 WACH. Configuration of conventional collars, relocation techniques, types of data collected, allocation of collars between bulls and cows, and sources of error in telemetry data have been previously described in Dau (1997, 1999).

As in the past, we attempted to complete each "collar year" (1 Oct–30 Sep) with ≥100 functional transmitters on living caribou during this reporting period. To meet this goal, in recent years we began each collar year with 115–130 potentially active collars in the herd. We have not attempted to radiocollar a cross-section of ages and sexes in the population. For example, we do not have an accurate cross-section of bull cohorts collared because only large adults are collared and we attempt to maintain only 15 collared bulls in the total marked sample annually. The radiocollared sample of cows, however, is probably representative of adult female cohorts because collars are randomly deployed annually among females >2 years old irrespective of maternal status. Only those individuals in very poor physical condition are not collared.

We began the 1998–1999 collar year with 118 potentially active conventional collars on living caribou (105 cows and 13 bulls). Of these, 15 collars on cows were also equipped with a functional platform terminal transmitter (PTT or satellite collar). We began the 1999–2000 collar year with 127 potentially active conventional collars on living caribou (110 cows and 17 bulls).

Of these, 22 collars on cows were also equipped with a functional PTT. We began the 2000–2001 collar year with 127 potentially active conventional collars on living caribou (114 cows and 13 bulls). Of these, 20 collars on cows were also equipped with a functional PTT.

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). As in the past, we did not remove radio collars or recollar caribou during the reporting period.

Twenty eight radio collars were deployed on 8 bulls and 20 cows at Onion Portage during 1998; 10 of these collars deployed on cows were also equipped with a PTT. Of the 10 PTTs deployed in 1998, 8 were model ST-14s and 2 were a prototype of what later became ST-18s. We suspected the 2-cannister ST-14 satellite collar configuration predisposed some cows to early mortality so worked with Telonics, Inc., to develop the ST-18 collar. Advantages of the ST-18 compared to the ST-14 were reduced weight (1388g vs. 1789g) and a more streamlined configuration with both the PTT and conventional beacons within 1 cannister. In 1999, 30 caribou (5 bulls and 25 cows) were radiocollared; 10 collars on cows were also equipped with an ST-18 PTT. In 2000 (after this reporting period), 20 caribou (3 bulls and 17 cows) were radiocollared, and 4 collars on cows were equipped with an ST-18 PTT. In fall 2000 we programmed a duty cycle (18 hours on and 6 hours off, 7:00 a.m. to 1:00 a.m. daily) into all conventional transmitters to extend their functional life. This was the first time duty cycles were used in conventional transmitters in the WACH. The history and objectives of the WACH PTT program, configuration of satellite collars, PTT duty cycles, and use of data was summarized by Dau (1997).

Population Size and Composition. We determined population size using the aerial direct count photo extrapolation technique (Davis et al. 1979). The herd was photographed in July 1999 and the estimate was finalized in June 2000. Department staff put overlap lines on the photographs and private individuals were contracted to count most photographs. Our policy is to census the WACH every 3 years until evidence of a rapid population decline warrants more frequent estimates of population size. The next census will be attempted July 2002.

Population composition for the WACH was estimated from calving surveys during June, composition counts during October, and short yearling surveys during April–May. For each of these surveys and throughout this report ‘maternal cow’ refers to a female with a calf at heel or $\geq$1 hard antler during June. ‘Calf’ refers to any caribou <12 mos old and ‘adult’ to any caribou >12 mos old.

In 1999 calving surveys were conducted 11–13 June using a C-185 and C-206, each with 1 observer. In 2000 calving surveys were conducted 7 and 12–14 June in a C-185 with 3 observers. Calving survey techniques, criteria to determine maternal status and geographic coverage were the same as previously described (Dau 1997). In both years, areas outside core calving areas were searched at low intensity for radiocollared cows.

Fall composition surveys were conducted 5–7 October 1999 using techniques previously described by Dau (1997). As in previous years we retrieved moose and caribou radio collars on

mortality mode in conjunction with fall composition surveys. Weather precluded composition surveys in October 2000.

Spring composition (short yearling) surveys were conducted on 9 and 27 April and 13, 17 and 19 May 1999. In 2000, short yearling surveys were conducted on 7, 9, 10, 13, and 27–29 April. In both years we used survey techniques previously reported by Dau (1997).

Distribution and Movements. Distribution and movements of the herd were assessed using spring (Jan–May), summer (June) and fall (Aug–Dec) range-wide conventional telemetry surveys often in conjunction with composition surveys. Flights were based out of Barrow, Kotzebue, Nome and Fairbanks using survey techniques previously described by Dau (1997). Additionally, PTT data supplemented conventional telemetry locations.

During range-wide telemetry surveys we located: 93 of 150 potentially active collars during fall 1998 (62%); 91 of 137 (66%) during spring 1999; 91 of 142 (64%) during fall 1999; 107 of 140 (76%) during spring 2000; and 86 of 134 (64%) during fall 2000. Since fall 1998 we've located an average 66% (SD = 5.5) of all potentially active conventional collars during range-wide surveys. Often, collars missed during a range-wide survey are located during the subsequent survey mixed with caribou that had been found. This suggests long frequency scan times, topography, movements of caribou and infrequent relocation flights are responsible for 'missed' collars rather than incomplete coverage of range.

Mortality. Annual mortality rates for adult WACH caribou were estimated from cows with conventional radio collars or ST-18 PTTs during the 12-month period 1 Oct–30 Sep ('collar-year'). The October 1998–September 1999 mortality estimate corresponds with the 1999 recruitment (i.e., short yearling) estimate. Radiocollared bulls and cows collared with ST-3 or ST-14 PTTs were not used to estimate mortality (Dau 1997). Three "collar years" (1997–1998, 1998–1999, and 1999–2000) span portions of this reporting period. Radiocollared cows not located for 2 years were retroactively dropped from the sample of potentially active collars. Therefore, annual mortality estimates often increased 1–3% for up to 2 years after each collar year. Estimated mortality rate includes all sources of mortality.

Harvest. In this report 'local' hunter refers to a resident of Alaska who lives north of the Yukon River and west of the Dalton Highway (i.e., within the range of the WACH). 'Nonlocal' refers to residents of Alaskan who live outside this area as well as nonresident and alien hunters.

We monitored harvest using 3 systems: 1) registration permits for hunters residing within the range of the WACH; 2) statewide harvest tickets for all other hunters; and 3) community-based assessments for selected communities within the range of the WACH. Seventeen communities within the range of the WACH were surveyed during this reporting period (Table 1). Beginning in the 1998–1999 regulatory year the Information Management section of the Division of Wildlife Conservation (DWC) reestablished the practice of sending up to 2 reminder letters to hunters who failed to submit their statewide caribou harvest report, and all data was entered into the statewide harvest database.

For the 1999-2000 regulatory year we estimated total harvest by local hunters using community harvest data. We used unadjusted counts of harvested caribou for communities surveyed during

1999-2000. For communities that were not surveyed during this period but which have been surveyed in the past we calculated a mean per capita harvest rate from historical data and multiplied it by the current (1999 or 2000) community population size. When using historical data to calculate 1999-2000 per capita harvest we excluded years we knew were incomparable because of herd growth, geographic distribution of caribou, etc. For communities never surveyed we used per capita harvest for nearby communities surveyed in 1999 or communities surveyed during previous years with similar access to caribou. When combining several communities to calculate per capita harvest for an unsurveyed community we summed human population sizes and caribou harvests over all communities (i.e., 'people' and 'caribou' were the sample units, not 'community') to avoid disproportionately weighting samples from small communities. For communities near areas where the Central Arctic Caribou Herd (CACH), Teshekpuk Lake Caribou Herd (TLCH) and WACH mingled, we initially estimated total community harvest as described above. We then estimated the percentage of total harvest comprised of WACH caribou based on the distribution of conventional- and satellite-collared caribou from each herd as well as direct observations by staff and hunters. This attempt to differentiate harvests among herds was more qualitative than quantitative. Although there is some uncertainty associated with assigning harvest levels to individual caribou herds where they mixed (which is not incorporated into our estimated confidence intervals) we felt this approach was better than ignoring mixing of herds altogether. Confidence intervals were calculated for each community using a parametric bootstrap technique. This technique employed a Poisson distribution with 'WACH total harvest' as the distribution parameter. Each 95% interval was calculated by randomly selecting 1000 samples from the Poisson distribution, sorting them and dropping the lowest 2.5% (25) and the highest 2.5% (25) of the values. The smallest remaining value was the lower limit and the largest was the upper limit. Lower and upper confidence limits of individual communities were respectively summed to produce an interval around total harvest.

Other Mortality

We collected blood samples from living caribou while deploying radiocollars at Onion Portage. Caribou were captured and restrained as previously reported (Dau 1997), and then released. We conducted serological tests to monitor prevalence of 8 selected bacteria and viruses in the herd (Dau 1997). In September 1998 we sampled 51 bulls and 62 cows; in 1999, 40 bulls and 42 cows; and in 2000 (after this reporting period), 57 bulls and 59 cows. Body condition (very skinny, skinny, average, fat, very fat) and maternal status (with calf/no calf) were recorded for caribou from which a blood sample was collected.

In 1999 we began analyzing sera for haptoglobin levels. Haptoglobins are proteins that indicate inflammation regardless of cause (Oderkirk 1998). The benefit of measuring haptoglobins is that they may reveal conditions for which there is no serologic test (e.g. *Fusibacterium necrophorum*, the causative agent of hoof rot). Sera from 1998–2000 have been analyzed for haptoglobin levels. We are currently analyzing haptoglobin levels in sera from 1992–1997.

During 7–11 June 2000 we investigated the causes of a mortality event that occurred in the northwest portion of Unit 23 during the winter of 1999–2000. Two veterinarians, Dr. Victoria Woshner (North Slope Borough Department of Wildlife Management) and Dr. Cheryl Rosa (University of Alaska Institute of Arctic Biology – Fairbanks) necropsied 34 carcasses. They recorded gross characteristics and collected tissue samples to analyze for metals and

radionuclides. NANA/Cominco provided helicopter support, food, lodging and transportation between Red Dog and Kotzebue. The department paid each veterinarian and provided all other transportation. The department and North Slope Borough Department of Wildlife Management shared laboratory costs.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The July 1999 photocensus produced a minimum estimate of 430,000 caribou (Table 2, Fig 2). There were 4 components to this estimate:

1) 9 X 9 photo counts	416,379 caribou
2) direct counts from Beaver	4012 caribou
3) direct counts from Cubs/C-185	2147 caribou
4) correction for 'missed' caribou	7515 caribou

As in the past, we relied heavily on radiocollared caribou to conduct the census. The correction for missed caribou was based on 2 collared caribou located in peripheral groups that totaled 2147 caribou (1073.5 caribou/collar). Seven collared caribou not located anytime during the census were subsequently found alive. Assuming these 7 missed collared caribou were distributed in small groups similar to the 2 peripheral groups found during the photography, 7 X 1073.5=7515 caribou. This is the same approach used for the 1990 and 1993 WACH censuses.

We found 89 collared caribou during the actual photography. Five additional collared caribou located during the census week in large aggregations that were eventually photographed were not heard during the actual photography. We assumed these 5 caribou were photographed which brings the total number of 'found' collars to 94. Radiocollars indicate 93% of the WACH was present during the census photography.

There were 14 collared caribou with potentially active transmitters that we did not find during the census or anytime thereafter. We assumed all of these transmitters had exhausted their batteries and did not use them for any aspect of the census.

Most factors that affect the accuracy of photocensuses were favorable during 1999. This was the first time the software program 'Photoman' (developed by R De Long and J VerHoef, ADF&G, Fairbanks, AK) was used on a WACH census. This program links an on-board GPS receiver and radar altimeter to a PC computer to show the area of 9 X 9 coverage during the photography. As a result fewer 9 X 9 photographs lacked overlap compared to previous WACH censuses. Aggregations of caribou were not too dense to count or diffuse to photograph, caribou were not rapidly moving, and lighting was excellent. We completed the photography in 2 consecutive days, confirmed there was no mixing of photographed and unphotographed caribou between the 2 days. We did not have to take any 35 mm photos, and the large format camera provided high quality photographs.

The only factor that may have reduced the accuracy of the 1999 census was the small size of caribou images on the 9 X 9 photographs. Coastal fog threatened to obscure portions of the largest aggregations. As a result the Beaver exposed photographs at the highest possible altitude to expedite photography. The small images of caribou may have caused counters to miss many calves that were in close proximity to their mother or in densely packed groups. This may have caused us to undercount the herd.

The 1999 estimate suggests the WACH declined about 2% annually since 1996. Conversely, annual estimates of adult mortality and recruitment suggest the herd should have grown substantially during 1997 and 1998, and remained stable during 1999. This apparent inconsistency may indicate we have been working within the range of accuracy and precision for all 3 parameters (recruitment, adult mortality and herd size) since 1990 and that the herd has essentially been stable for the last 10 years. Alternatively, we may have underestimated herd size in 1999. Even if we did undercount the herd in 1999, these results unequivocally indicate the WACH is still very large. If it has declined since 1996, it has done so only slowly.

Population Composition

Calving. We observed 58 calves:100 radiocollared cows during June 1999 and 69 calves:100 cows in 2000 (Table 3). The 2000 ratio is the highest observed since 1994. Estimates of calf production are probably conservative because we do not record udder status for collared cows (Whitten 1995) and do not consistently conduct calving surveys just prior to or during peak calving.

The strong negative correlation between the calf:cow ratio and the proportion of cows with velvet antlers during calving previously reported (Dau 1997) continued through this reporting period (r = -0.95, n = 13 years). The mean proportion of cows with velvet antlers during years when the calf:cow ratio was >70:100 (n=6, SD = 3.3) was 2.8% and during years when this ratio was <70:100 the mean proportion was 16% (n=7, SD = 5.1). Cows with substantial growth of velvet antlers during calving either failed to conceive the previous fall or lost their fetus during early pregnancy. This suggests the low calf:cow estimates are real and not artifacts of sampling error.

Calf production generally declined from 1987 to 2000 (Fig 3). The coefficient of determination indicates a gradual linear decline in calf production during this period (R^2 = 0.43, n = 13). However, a scatter plot of this data suggests a step function decline in calf production may have occurred after 1992. The mean calf:cow ratio for 1987–1992 was 78:100 (SD = 4.3) and 61:100 (SD = 4.9) during 1993–2000 (1-tailed t-test P<0.001, equal variances).

The distribution of cows was unusually far south during the 2000 calving season: 11 of 50 (22%) maternal radiocollared cows and 8 of 22 nonmaternal cows (36%) were south of the Brooks Range crest. Between 1987 and 1999 only 6 of 511 maternal cow observations (1%) and 19 of 301 nonmaternal cow observations (6%) were observed south of the Brooks Range crest. Breakup was exceptionally late during spring 2000. This probably slowed the northward migration and caused many cows to calve *en route* to the calving grounds.

Between 1992 and 1999 there was no correlation between the June and subsequent fall calf:cow ratios (r = 0.19, n = 8). This suggests calf survival through summer has a greater effect on the fall calf:cow ratio than initial productivity.

Fall Composition. The fall calf:cow ratio was 45:100 in 1998, and 47:100 in 1999. This ratio has ranged from 34:100 to 52:100 since 1992 when we initiated fall composition surveys from an R-22 helicopter (Table 4). Part of the variability in fall calf:cow ratios may be attributable to misclassification of small bulls as cows during 1992–1994 (P Valkenburg, pers commun). Young bulls are easily confused with cows if an observer uses any criteria other than presence of a vulva patch for classification.

Since 1992 the fall calf:adult ratio has ranged from 24–33:100. This ratio is less vulnerable to misclassification than the calf:cow ratio because calves are easy to distinguish from adults. However, spatial or temporal segregation of bulls and cows likely confounds calf:adult estimates because we do not sample the entire WACH, and because segregation of bulls and cows occurs but varies among years in degree as well as in spatial and temporal pattern. Between 1992 and 1999 there has been a weak correlation (r = 0.59, n = 8) between the October calf:adult ratio and subsequent April/May calf:adult ratio. This may indicate calf survival through summer has a greater effect on recruitment than survival through winter.

The fall bull:cow ratio was 54:100 in 1998 and 49:100 in 1999 (Table 4). Sampling errors probably account for more variability in this parameter than actual changes in population composition.

Spring Composition. We observed 15 short yearlings:100 adults in spring 1999 and 18:100 in spring 2000 (Table 5). This continued the general decline in recruitment since 1979 (Figs. 4 and 5).

Distribution and Movements

Historical Summary. Our understanding of the distribution of the WACH has evolved during the last 25–30 years with the application of telemetry techniques in northern Alaska. Caribou have inhabited northwestern Alaska since the Pleistocene period (Guthrie 1968 as reported by Skoog 1968). During the latter half of the 1800s, caribou in northwest Alaska disappeared from the Seward Peninsula and began to decline in coastal portions of Kotzebue Sound. By the 1890s, caribou had completely disappeared from Norton and Kotzebue Sounds. The reasons for this decline are unknown but may involve long-term, periodic, natural variations in caribou abundance (Skoog 1968). During this time, caribou remained abundant across the western North Slope (Skoog 1968; Brower, unpubl. ms.).

By the late 1930s caribou in northwest Alaska began to increase and reoccupy Kotzebue Sound. Aggregations estimated >250,000 caribou were observed in the Baird and De Long Mountains during the mid to late 1940s (Skoog 1968). Although such estimates were little more than qualified guesses, they indicate caribou were abundant within the current range of the WACH during this time.

During the 1950s and 1960s biologists considered all caribou north of the Brooks Range as a single “Arctic Herd” (Skoog 1968). Two developments in caribou research allowed biologists to

refine this. In1968 Skoog identified the single criteria still used today to define caribou herds: repeated use of a discrete calving area. Soon thereafter funding for caribou research became available as oil development was contemplated on the North Slope and conventional radio telemetry techniques were applied to caribou in northern Alaska. By the mid 1970s the "Arctic Herd" was determined to consist of the WACH, Porcupine Caribou Herd (PCH), CACH and TLCH. Since the mid 1970s, when the WACH began to rapidly increase, it has reoccupied habitat caribou have not used for >100 yrs; however, range expansion has occurred more slowly than population growth.

Winter Range. Since the mid-1970s most of the WACH wintered in the Kobuk, Selawik and Buckland River drainages. Prior to this time a substantial portion of the WACH wintered north of the Brooks Range or near Wiseman and Anaktuvuk Pass (J. Davis, J. Hemming and J. Reakhoff, pers commun). Approximately 50,000–60,000 caribou wintered between the Alatna Hills, Iniakuk Lake and North Fork of the Koyukuk River during the winter of 1997–1998. This was the first time a substantial portion of the WACH wintered in this portion of the Koyukuk River drainage since the early 1970s (J. Reakhoff, pers commun). Roughly 10,000–20,000 caribou wintered between Wainwright, Atqasuk and Umiat during the winters of 1998–1999 through 2000–2001. For the first time in >15 years almost no caribou wintered in the Nulato Hills south of Koyuk during the winter of 1999–2000; instead, the majority of the WACH caribou wintered in the Purcell Mountains, Zane Hills and Kobuk River drainage between Selby Lake and the Ambler River.

Movement of caribou onto the Seward Peninsula continued to provide hunters from Nome and surrounding communities opportunities to harvest caribou for sport and subsistence. Caribou hunting has been intense along the Kougarok Road and near Council. Village hunters and reindeer herders report wolf numbers have increased on the Seward Peninsula as a result of caribou reoccupying this area.

Several unusual caribou movements were observed by staff or reported by the public during this reporting period. During the winter of 1998–1999, residents of Point Hope and several local pilots reported 3–6 groups of 200–600 caribou up to roughly 10 miles offshore between Cape Thompson and Cape Lisburne (E. Kingik, pers commun). A lead reportedly formed between one group of caribou and shore, and residents of Point Hope watched a group of about 600 caribou drift to sea. In February 2000, an employee of the Cape Lisburne Air Force station reported that over several days up to 3000 caribou marched north (i.e., out to sea) along a pressure ridge that extended from Cape Lisburne (D. Lamont, pers commun). It is unknown whether they returned to land. In April 2000, I observed roughly 4000 caribou travel almost 50 statute miles over sea ice on Kotzebue Sound as they moved from the Sullivan Bluffs area (southwest of Deering) to Cape Blossom on the Baldwin Peninsula. This movement required about 24 hrs to complete. Amazingly, these caribou traveled almost linearly without landmarks for most of this movement.

Calving Grounds. The WACH continued to calve in the Utukok Hills during this reporting period as they generally have since the mid 1970s (J. Coady, pers commun). Since 1987, 890 of 931 observations (96%) of maternal and nonmaternal collared cows have been observed north of the Brooks Range crest during calving surveys. Even so, in some years many caribou calved in areas far from the Utukok Hills. In 2000, breakup was very late which probably delayed the

northward movement of caribou: 11 of 50 maternal cows (22%) and 8 of 21 nonmaternal cows (38%) were observed south of the Brooks Range crest..

Some of the variability in distribution of collared cows during calving may be attributable to the timing of surveys in relation to date of peak calving. For example, in 1990 most collared cows were located west of the Utukok Hills. Even though the timing of calving surveys in 1990 was no later than in most other years, if calving peaked early in 1990 we may have located them during the westward post-calving movement rather than near their parturition site. Daily rates of travel for satellite-collared cows may reveal periods of peak calving; however, we have not examined this.

During this reporting period a University of Alaska graduate student (R. Kelleyhouse) initiated a project investigating WACH and TLCH calving data in relation to climatic variables. The principal investigator is Dr. B. Griffith. The objectives of this study are: 1) quantitatively estimate the annual calving distributions of the TLCH and WACH; 2) determine if there is a global warming signature in the relative amount of green plant biomass on these calving grounds; 3) estimate habitat selection by calving caribou of these herds in relation to amount of green plant biomass, rate of increase in green plant biomass during lactation, and extent of snow cover during calving; 4) compare and contrast habitat selection during the calving season between these herds; and 5) compare temporal trends in amounts of green plant biomass between the calving grounds of these herds. The department has provided all conventional and satellite collar data from May and June 1987–2000 for the TLCH and WACH to Ms. Kelleyhouse.

Satellite Collars. Satellite collars enabled us to effectively search for conventional radiocollared caribou. They also allowed us to monitor the distribution and movements of the WACH on a very coarse scale during periods of inclement weather and short day length. The PTTs were especially useful for notifying reindeer herders of potential conflicts with caribou. Viewed collectively, satellite collars reflected the onset of spring and fall migrations.

Despite never having >10 functional PTTs on living WACH caribou at any time before 1998, satellite collars indicated the overall distribution of the WACH within and among years amazingly well. A scatter plot of all WACH PTT locations collected since 1987 closely agrees with our representation of overall range (Fig 1) determined from thousands of conventional collar locations as well as countless opportunistic observations and public reports. The winters of 1999–2000 and 2000–20001 were somewhat atypical in that disproportionate numbers of satellite-collared caribou wintered in a small portion of the Seward Peninsula while other areas known to harbor substantial numbers of caribou lacked PTT-collared caribou.

Scatter plots for WACH and TLCH satellite collars show caribou from these herds are relatively discreet on the North Slope during summer, and that most caribou near Wainwright and Barrow are from the latter herd. Conventional and satellite collars have shown these herds frequently mix on winter range in the central Brooks Range. Also, the TLCH infrequently (e.g. during 1996–1997) winters along the coast between Capes Lisburne and Krusenstern, and as far south as the Seward Peninsula Lava Beds and Purcell Mountains.

Limitations of WACH satellite collar data have been previously discussed (Dau 1999). Although we have increased the number of PTTs deployed in the WACH through time and programmed-

duty cycles to provide more frequent locations during some times of the year (Fig 4), a primary limitation of this data is the small number of collared caribou in relation to herd size. Additionally, we have not deployed PTTs on bull caribou.

No method typically used to analyze telemetry data is entirely satisfactory (J. Ver Hoef, pers commun). In this reporting period the department agreed to provide all WACH satellite telemetry data and $4,000 funding to a University of Iowa Ph. D. student (Aaron Christ) to develop a spatial model for analyzing telemetry data. Dr. J. Ver Hoef will be the principal investigator.

At their request, a satellite collar is being provided to the Reindeer Herders Association to deploy on a female caribou incidentally corralled with reindeer on or near the Seward Peninsula during 2001-2002. Staff from the University of Alaska Reindeer Research Project will fit the collar on the caribou.

MORTALITY

Since 1985 annual mortality has ranged from 7 (1997–1998) to 20 (1992–1993) deaths:100 collared adult cows (Table 6, Fig 5). The winters of 1997–1998 through 2000–2001 were unusually mild. Although the 1997–1998 mortality rate was the lowest ever observed, mortality during 1999–2000 and 2000–2001 was comparable to previous years of more typical weather.

Our estimates of adult cow mortality are a conservative index of overall WACH mortality because they exclude bulls, which tend to experience higher mortality rates than cows. Also, our sample of collared cows excludes emaciated, injured, or clinically diseased individuals even though they comprise part of the population. Although these factors would shift the WACH mortality curve up, they should not affect temporal trend (Dau 1997).

Annual estimates of adult mortality showed no trend through time ($R^2 = 0.15$, Fig 5). Three-year moving averages reduce the effects of annual variability and suggest mortality slowly increased from roughly 1985 through 1993 and gradually declined from 1993 through 2000 (Fig 6).

Adult caribou mortality is most meaningful in relation to recruitment. The significance of Figs. 5 and 6 is that from the early 1980s to mid 1990s recruitment and adult cow mortality slowly converged. Since the mid 1990s both parameters have exhibited substantial annual variability; however, 3-year moving averages suggest recruitment generally exceeded adult mortality and the herd should have increased. This is inconsistent with the 1996 and 1999 photocensus results. If successful, the census that will be attempted in July 2002 should allow us to evaluate the accuracy of the 1999 census as well as recent annual estimates of recruitment and adult mortality.

Harvest

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

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season

Units 21D, 22A, 22B, 23, 24, and 26A Resident Hunters: 5 caribou per day. Nonresident Hunters: 5 caribou total per year.		
Bulls	No closed season	No closed season
Cows	1 July–15 May	1 July–15 May

Federal hunting seasons during this reporting period were identical to state regulations during this reporting period. However, the bag limit was 15 caribou per day for federally qualified subsistence users in Unit 23. The federal bag limit in other units used by the WACH was 5 caribou per day.

Board of Game Actions and Emergency Orders. Many emergency orders (EOs) were issued for caribou hunting in portions of Game Management Unit 22. These were in response to recent influxes of caribou into areas where 1) they had not appeared for many years, 2) where reindeer husbandry occurred and 3) there were no permanent caribou hunting regulations. When EOs opened hunting, bag limits were 5 caribou per day for resident and 5 caribou per year for nonresident hunters. The following regulatory actions, in chronological order, were taken that affected the WACH:

1. In response to caribou moving into the eastern portion of Unit 22D each fall since 1996, in late October 1999 the Board of Game established permanent caribou hunting regulations in a portion of Unit 22D. This area includes the Kuzitrin drainage upstream of the Kuzitrin River Bridge and east of the Taylor Highway. Seasons and bag limits are identical to other Units (e.g. Unit 23) within the range of the WACH. This regulation became effective July 1, 2000.

2. EO 05–08–98 opened caribou hunting 19 December 1998–June 30, 1999 in that portion of Unit 22D including the Kuzitrin drainage upstream of the Kuzitrin River bridge and east of the Taylor Highway.

3. EO 05–03–99 opened caribou hunting 24 October 1999–June 30 2000 in that portion of Unit 22D including the Kuzitrin drainage upstream of the Kuzitrin River bridge and east of the Nome-Taylor Highway.

4. EO 05–04–99 opened caribou hunting 6 November 1999–30 June 2000 in that portion of Unit 22D east of the Nome-Taylor Highway.

5. EO 05–05–99 opened caribou hunting 20 December 1999–30 June 2000 in the northeastern portion of Unit 22E.

6. EO 05–01–00 opened caribou hunting 22 July 2000–31 August 2000 in the eastern portion of Unit 22E.

7. EO 05–04–00 opened caribou hunting 1 September 2000–30 June 2001 in the northeastern portion of Unit 22E.

8. EO 05–06–00 opened caribou hunting 12 October 2000–30 June 2001 in that portion of Unit 22D east of the Taylor Highway (Nome-Kougarok Road) and south of the Kuzitrin Bridge.

Human-Induced Harvest. During the 1999-2000 regulatory year hunters harvested roughly 15,500 western Arctic caribou. This constituted about 3.6% of the entire herd (based on the 1999 WACH population estimate).

Permit Hunts. All hunting by residents residing north of the Yukon River within the range of the WACH is by registration permit. Registration permits are available at license vendors and department offices in northwestern, western, and interior Alaska. All hunting by nonresidents and residents residing south of the Yukon River is by statewide harvest ticket.

Hunter Residency and Success. Beginning in the 1998-1999 regulatory year, the statewide caribou harvest report system resumed being administered as for other big game, e.g. moose. Up to 2 reminder letters were sent to hunters who acquired a statewide caribou harvest ticket and failed to report their harvest or effort. Statewide caribou harvest data were entered into department computer harvest files. In the 1998-1999 regulatory year, nonlocal hunters reported harvesting 678 caribou: 28 in Unit 22 (4%), 571 in Unit 23 (84%), 32 in Unit 24 (5%) and 47 in Unit 26A (7%). Nonlocal hunters have probably harvested <1000 caribou annually in recent years which is somewhat lower than previously reported (Dau 1997, 1999). Harvest by nonlocal hunters appears to be increasing in Unit 23. Fish and Wildlife Protection officers indicate most nonlocal hunters possess a statewide caribou harvest ticket when hunting caribou (C. Bedingfield and J. Rodgers, pers. commun.). We think this system is reasonably accurate for monitoring caribou harvested by nonlocal hunters especially since we began sending reminder letters to individuals who failed to voluntarily return their harvest report.

Community-based harvest assessments have been conducted in selected villages within the range of the WACH since 1985 (Table 1). Most of these assessments have been conducted by Subsistence Division staff often working with local government or nonprofit Native corporation employees (Alaska Department of Fish and Game 2000; Pedersen and Opie 1990, 1991, 1993; S. Georgette, personal communication). Additionally, some assessments have been conducted by private organizations (Brower and Opie 1996, 1997; Fuller and George 1997; Hepa et al. 1997) or by private consultants contracted by the Department of the Interior Minerals Management Service (Braund 1991, 1993). Community based harvest estimates indicate only about 10% of caribou taken by local residents are reported under the registration permit system (Georgette 1994).

Without considering many factors that affect caribou harvest levels, e.g. hunting regulations or traveling conditions, community-based assessments suggest all communities within the range of the WACH harvested about 14,544 caribou (13,388–15,696 caribou 95% bootstrap confidence interval) during the 1999-2000 regulatory year (Table 7). This was about 3.4% of the WACH using the 1999 caribou population estimate. Assuming nonlocal hunters harvested about 1000 caribou during this period, total harvest was roughly 3.6% of the population.

Several factors may have caused this estimate of local harvest to be somewhat lower than the 20,000 caribou previously reported (Dau 1997, 1999). Perhaps the biggest factor is that the estimate reported here includes only caribou from the WACH for communities with access to >1 herd (i.e., it excludes caribou harvested from the TLCH and CACH). The previously reported WACH estimate did not make this distinction. For 1999-2000 roughly 2668 TLH and 256 CAH caribou were harvested by residents of communities in Unit 26A and Anaktuvuk Pass (i.e., within the range of the WACH; G. Carroll, pers commun.). Another factor that reduced the 1999-2000 estimate in relation to the 20,000 caribou previously reported relates to the respective periods of time these estimates cover. The previously reported figure was little more than an educated guess of annual local harvest, based on typical harvests over a span of 10+ years. It did not consider variation in local harvests through time and space. Conversely, the estimate of 14,544 caribou reported here applies only to the 1999-2000 regulatory year and does consider availability of caribou to individual communities. The distribution of caribou during winter 1999-2000 caused some communities, which typically have relatively high WACH harvest rates such as Unalakleet and Shaktoolik, to take fewer caribou than normal. No additional communities harvested western Arctic caribou as a result of this unusual distribution. Finally, although the harvest estimate reported here does not include all caribou taken by individuals living outside community boundaries (i.e., 'camp' residents), we think this effect was small because 1) few people live in remote camps year round and 2) some of them were surveyed during community assessments. We are developing a model to refine our estimate of 'local' harvests that will consider an array of independent variables that affect caribou harvests (R. Sutherland, pers commun.).

Community harvest assessments will continue to be conducted in selected communities within the range of the WACH each year. We hope to survey communities that lack harvest data to avoid applying mean per capita harvest rates from other communities. Additional range-wide estimates of annual harvests will provide opportunities to evaluate spatial and temporal variability in this parameter within and among years. They will also improve our ability to evaluate the strengths and weaknesses of this approach. Hopefully, this approach will eventually allow us to better understand the dynamic relationship between human harvests and WACH population dynamics.

Harvest Chronology. Subsistence harvest patterns are tied to seasonal movements of caribou. For example, Point Hope and North Slope villages harvest western Arctic caribou mainly during July and August while Shaktoolik and Unalakleet hunters primarily take them during September through March. In Unit 23, harvests are typically high during fall and spring migration periods, and also when caribou winter near communities. Unlike many subsistence activities that are seasonally specific, subsistence hunting of caribou occurs whenever they are available.

During early fall, subsistence hunters primarily harvest large bulls because they provide the best meat. Once bulls enter rut and become unpalatable, typically after 7–10 October, most subsistence hunters take cows until approximately March or April. In decades past, subsistence hunters resumed harvesting bulls in roughly mid to late December (W. Uhl, personal communication). During the rest of the year subsistence hunters take caribou of both sexes based on availability and the body condition of individual animals.

Virtually all harvest by nonlocal hunters occurs between late August and late October and harvest peaks during mid September. Nonlocal hunters harvest large bulls almost exclusively even after the onset of rut.

Transport Methods. Most subsistence hunters harvest WACH caribou using snow machines during October–May and boats or 4-wheelers during the rest of the year. Few local hunters use aircraft to hunt caribou. In contrast, nonlocal hunters depend almost entirely on aircraft to initially access caribou hunting areas. Once in a hunting area many nonlocal hunters use boats. Although a few guides have used 4-wheelers for hunting, this practice has dramatically increased since the mid-1990s in Unit 23. In Unit 23 increasing numbers of village residents are transporting nonlocal moose and caribou hunters via boats.

Other Mortality

Disease. Serology results show no temporal trends in exposure to 8 selected bacteria and viruses in the WACH (Table 8). This may be at least partly because serologic surveys are inherently poor for monitoring the prevalence of disease in wildlife populations (J. Blake and T. O'Hara, pers commun). Our primary objective for collecting caribou sera annually is to provide 'red flag' indicators for pathogens most likely to occur in this herd.

Threshold values for the respiratory viruses IBR, BVD and PI3 were raised in 1998 (R. Zarnke, personal communication). This reduced the percentage of positive reactors in the WACH compared to previous years (Dau 1997, 1999). Even so, exposure to these viruses has approached 20–25% since 1992.

Preliminary analyses showed 38 of 304 caribou (13%) sampled during 1998–2000 exhibited an elevated haptoglobin level. Sixty one of 79 caribou (77%) serologically positive to $\geq$1 bacteria or virus had an elevated haptoglobin level. Note: a 'positive' serology test only indicates a caribou has been *exposed* to a pathogen and not that it harbors an active infection. The 18 serologically positive caribou that exhibited a normal haptoglobin level may have been exposed to a disease without actually contracting it or had recovered from an active infection. Conversely, only 20 of 225 caribou (9%) with no serologic evidence of exposure to a disease had an elevated haptoglobin level. These individuals may have been infected by a disease, e.g. hoof rot, for which we do not test. Certainly, haptoglobin analyses occasionally indicate inflammation when there is none, and fail to reflect inflammation when present.

Haptoglobin levels were clearly related to body condition at the extremes of condition categories. Four of 5 caribou (80%) classified as 'very skinny' had an elevated haptoglobin level. In contrast, zero (0) of 14 caribou classified as 'very fat' had an elevated haptoglobin level. This suggests emaciated caribou probably harbor some type of infection and are not merely aged or naturally thin. It also suggests very fat caribou are likely free from bacteria or viruses. The latter observation may seem trite; however, each year hunters report abandoning carcasses of very fat caribou they have harvested when they encounter parasites, scar tissue or any hint of discoloration near lymph nodes.

Eight to 10 caribou with characteristic hoof rot lesions were observed during October 1998 composition surveys. Hoof rot was also observed in the Mulchatna and Alaska Peninsula caribou herds at this time (J. Woolington, pers commun). Crowding and moist soil conditions are

sometimes reported to cause outbreaks of hoof rot in wildlife populations. These explanations are difficult to apply to the WACH, given that huge, insect-induced aggregations form multiple times each summer, and that caribou are almost constantly in wet tundra.

Exposure to brucellosis has shown no trend through time. Since 1992, exposure to *Brucella suis* has ranged from 0 (1997) to 11 or 12% (1993–1995). Of 526 caribou tested for exposure to brucellosis, only 6% have been sero-positive. We occasionally observe individuals with lesions characteristic of this disease.

Local subsistence hunters continued to be concerned about "sick" caribou during this reporting period. In January 2001 the department published 'A Field Guide To Common Wildlife Diseases and Parasites in Alaska' (Elkin and Zarnke 2001). This booklet has been distributed among all villages within the range of the WACH. It was modified from a booklet developed by the governments of the Northwest Territories and Nunavut.

Starvation. Between late October and late November 1999, telemetry data indicated about 20,000 caribou rapidly moved from Wainwright-Atqasuk, down the Chukchi Sea coast and into the Wulik-Kivalina River area. During January, 2000, I began to receive calls from residents of Point Hope and Kotzebue of dead and moribund caribou on the Tigara Peninsula and near Cape Thompson. Many of these caribou were reportedly calves or yearlings. I received the lower legs of 2 calves and 1 yearling from E. Kingik. These caribou had died from natural causes. They had red but waxy marrow so it didn't appear they had died of chronic starvation.

During short yearling surveys in early April between Cape Krusenstern and the lower Kukpuk River we counted only 6 short yearlings:100 adults, one of the lowest ratios ever counted in a specific area. Even from the plane it was obvious these caribou were in poor condition, and some individuals even staggered when attempting to flee. Although the area was wind scoured with about 50% bare ground, we saw no carcasses. One of 7 collared caribou in the area had died (it was collared with an ST-14 PTT). The next day I retrieved the PTT from the carcass. The cow had been dead <1 month and had not been scavenged. She was frozen so I could not do a necropsy. Like the legs Earl had sent me, her bone marrow was red but waxy. She was emaciated to the point that a storm may have killed her. I walked about 1.5 miles to and from the carcass and observed almost no fruticose lichens, e.g., *Cladina* and *Cladonia* spp., although crustose lichens and *Stereocaulon* spp. were abundant. Surprisingly, there were few fecal pellets in the area even though there were thousands of caribou in the area. Numerous icicles of urine were tan to dark brown.

On 3–5 June 2000 I employed local observers to help me search by PA-18 airplane the area roughly within 10 miles of the coast between Kivalina village and Cape Dyer. We counted 1878 carcasses. The highest density of carcasses occurred within ½ mile of the coast in the hills just south of Ogotoruk Creek. Another high density carcass area was along the Kukpuk River near the mouth of the Ipewik River. A surprising number of carcasses were on lagoon ice between Cape Thompson and Point Hope. We found few carcasses >5 miles inland. However, near Angmakrok Mountain and the lower Ipewik River we found carcasses about 20 miles inland and I suspect additional carcasses occurred farther east at low densities. Unlike in 1995 when a few carcasses were distributed as far south as Mount Noak, we found no carcasses south of the Asikpak River.

Consistent with hunters' reports, many carcasses appeared to be calves or yearlings. The antler status of bulls suggests they did not begin dying until after antler casting was over in late November. Many carcasses had cow-like antlers so were either pregnant females or young bulls. Even from the air caribou carcasses appeared emaciated at the time of death. Many carcasses had not been scavenged and were curled up as if asleep. We landed and walked to the carcasses of a calf, a young bull and an adult cow. All were emaciated with classic chronic starvation bone marrow.

Gross examinations of 34 carcasses necropsied during June 2000 suggest the animals starved without complications from poisoning or disease (V Woshner and C Rosa, pers commum). Results of tissue analyses are currently not available.

This event caused greater mortality compared to 1994–1995, when 2000–3000 caribou were estimated dead out of roughly 10,000 wintering in the area. However, the 1999-2000 mortalities probably constituted a smaller proportion of caribou in the area.

HABITAT

Assessment

The department did not monitor range condition for the WACH during the reporting period. During July and August 1997, BLM and the Natural Resources Conservation Service evaluated reindeer ranges near Koyuk and Shaktoolik (Henry and Sagoonik herds). They also assessed range condition in McCarthy's Marsh and Death Valley on the Seward Peninsula. In July 1998 BLM evaluated range condition for 3 reindeer herds (Gray, Menadelook and Noyakuk) now used by the WACH as winter range. During July 1999, Ducks Unlimited, BLM and USF&WS ground truthed a satellite-based land cover classification in the eastern Buckland drainage, northern Nulato Hills, and a portion of the Selawik and Koyukuk National Wildlife Refuges. In July 2000 BLM evaluated range condition in McCarthy's Marsh (R. Meyers, pers commun).

Enhancement

There were no WACH habitat enhancement activities during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

WACH Cooperative Management

Since 1995 we have actively explored the potential for cooperative management of the WACH. We view cooperative management as a resource stewardship process, emphasizing shared decision-making across cultural or institutional boundaries.

For department biologists, co-management offers the advantage of greater participation in day-to-day management by stakeholders, more effective integration of western and indigenous knowledge about caribou and their habitat, and greater coordination in administering a caribou herd across many jurisdictions and cultural boundaries. Many Alaska Natives see co-management as an opportunity to assume a more meaningful role in protecting their subsistence-based cultures and in managing the caribou resource.

For the last two years, we have applied these concepts by actively supporting the WACH Working Group (Working Group). In January, 2000 the Working Group reorganized and now consists of 19 voting chairs representing geographic clusters of subsistence-hunting communities, as well as guides, transporters, non-consumptive users, reindeer herders and recreational hunters. Most of these chairs are now filled. Ten of the 19 voting chairs on the Working Group were nominated by State of Alaska Advisory Committees. Resource agency representatives from ADF&G, BLM, FWS and NPS provide technical and fiscal support to the Working Group, but are not voting members.

The Working Group now has a charter and by-laws. Its mission is to: "Develop a grassroots process for sharing representation, responsibility and decision-making among stakeholders in management of the Western Arctic Caribou Herd." Meetings are held twice a year. Most recently the Working Group met in Nome (January, 2000), Anaktuvuk Pass (August, 2000) and Kotzebue (January, 2001).

Members of the Working Group produce a newsletter, *Western Arctic Caribou Trails*, which is mailed to 9,000 post office box holders within the range of this herd twice a year. The Working Group has engaged a planner and begun to rewrite the WACH strategic management plan.

School programs

As in the past, department staff made presentations on WACH caribou in schools throughout the range of this herd. Ambler high school students participated in the Onion Portage (Kobuk River) collaring project during September 1998, 1999 and 2000. In 1998, DWC public communication staff filmed high school students from Ambler and Kotzebue participating in this project. This video, *Connecting with Caribou*, was completed in 1999 and is available to the public. In 2000, 7th and 8th grade students from Anaktuvuk Pass participated in the collaring project.

Conflicts between the WACH and reindeer industry

In most years since at least the mid 1970s the majority of the WACH wintered in the Nulato Hills between the Buckland drainage and Unalakleet River. Reindeer herds, even those situated along the base of the Seward Peninsula, remained largely unaffected by caribou until about 1990 (Dau 2000), although caribou were using the Kiwalik drainage and Monument Mountain area as early as 1983 (J. Coady, pers commun).

Between 1990 and 1995, 3 of 4 of the easternmost reindeer herds (Hadley, Buckland; Sheldon, Candle; and Henry, Koyuk) completely joined the WACH and were lost to the reindeer industry. These losses appeared to be more the result of increased WACH population size than a change in caribou movements or distribution.

During September and October 1996 roughly 80,000–90,000 WACH caribou moved onto the Seward Peninsula as far west as the Kougarok Road. This was not the first time caribou used this area in recent years. In several years during the early 1980s thousands of caribou were observed near the Lava Beds (J. Coady, pers commun). The 1996 incursion of caribou into this area was significant because of the number of caribou involved, and because caribou have repeated this movement annually since that time. Although this is a modest geographic expansion of winter range, initially only 50–60 miles west of areas where tens of thousands of caribou had regularly

wintered for the previous 10–15 years, it posed a tremendous threat to additional Seward Peninsula reindeer herds. Between the winters of 1996–1997 and 2000–2001, 5 reindeer herds (Karmun, Deering; Gray, White Mountain; Menadelook, Coffee Dome; Noyakuk, Teller; and Sagoonick, Shaktoolik) lost ≥50% of their deer when they joined the WACH. In the winter of 2000–2001 an unknown number of reindeer from the Davis (Nome) and Kakarak (Teller) herds joined the WACH and were lost. Since 1990, at least half of the reindeer on the Seward Peninsula have been lost to the WACH. At this time, only the Olanna (Brevig Mission), Weyiouanna (Shishmaref) and Ongtowasruk (Wales) reindeer herds have not been substantially impacted by the WACH. Since 1996, caribou have gradually expanded their use of the Seward Peninsula to now include its entire eastern half.

Approximately 90,000 caribou wintered on the Seward Peninsula during the winter of 1997–1998. Initially, these caribou moved as far west as the Niukluk River and then settled in the Fish River Flats, Bendeleben Mountains and Lava Beds. During the winter of 1998-1999 roughly 80,000 caribou moved into the Lava Beds, Death Valley and Fish River Flats during September and October. By November 1998 many of these animals moved southeast into the Nulato Hills which reduced their impact on reindeer herds. About 40,000–50,000 caribou wintered on the Seward Peninsula during the winter of 1999–2000. Most of these caribou were in the Bendeleben Mountains, Fish River Flats and Sullivan Bluffs area. During the winter of 2000–2001 at least 200,000 caribou were distributed from the western end of the Lava Beds, through the Fish River Flats and Nulato Hills to the Unalakleet River.

User issues

Conflicts between nonlocal hunters, commercial operators (guides and transporters) and local hunters continued in portions of WACH range during this reporting period. These conflicts are most pronounced in Unit 23, but have also occurred in Units 26A and 24 near Anaktuvuk Pass. This complex issue involves all hunters, not just caribou hunters, and is affected by: 1) reliance on aircraft by nonlocal hunters and commercial operators in contrast to local hunters' use of boats and snow machines; 2) other portions of Alaska experiencing shortened seasons, reduced bag limits, crowding, and few trophy animals; and 3) fewer places to hunt multiple big game species, especially for nonresidents. The limiting factor driving this conflict in Unit 23 is not inadequate numbers of wildlife, certainly not with regard to WACH caribou. Rather, the limiting factor is inadequate space to accommodate all users. An *ad hoc* group comprised of a broad spectrum of users (residents throughout Unit 23, guides, transporters and nonlocal hunters) met several times during the reporting period to discuss user issues throughout Unit 23. Additionally, 2 subgroups of local and nonlocal users each met once during the reporting period to address issues in the Squirrel and upper Kobuk River drainages. The user issues process was discontinued at least temporarily in 2001 largely because of inadequate staffing.

CONCLUSIONS AND RECOMMENDATIONS

Census results indicate the WACH grew rapidly from 1975 through 1990, grew slowly from 1990 to 1996, and may have declined from 1996 to 1999. The slower population growth rate and possible decline appear to be attributable to declining recruitment rather than increasing adult mortality. Calf production doesn't appear to currently limit recruitment.

Body condition of WACH caribou has shown no clear temporal trend. In 1993 and 1995 when fall caribou body condition was poor, the "bottleneck" appeared to occur during summer. The reasons for this are unknown but may be related to the amount of time individual caribou spend in huge, insect-induced aggregations during summer. Several localized mortality events each involving 2000–4000 western Arctic caribou have occurred since 1990. Starvation appeared to be the cause of death each time. There is no evidence that environmental contaminants or disease are affecting the population dynamics of this herd.

A substantial (but unknown) number of reindeer on the Seward Peninsula were lost to the WACH during the reporting period. The department should continue to provide as much information regarding movements and distribution of caribou to herders as possible within the constraints of staff, weather, aircraft and budgets.

Conflicts between local subsistence hunters, nonlocal sport hunters, and commercial operators have intensified in portions of WACH range since 1992. The primary limiting factor driving these conflicts is inadequate space to accommodate all users.

The department should continue to support the WACH Working Group and work with the planning subgroup to revise the management plan for this herd.

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Figure 1 Seasonal ranges of the Western Arctic Caribou Herd

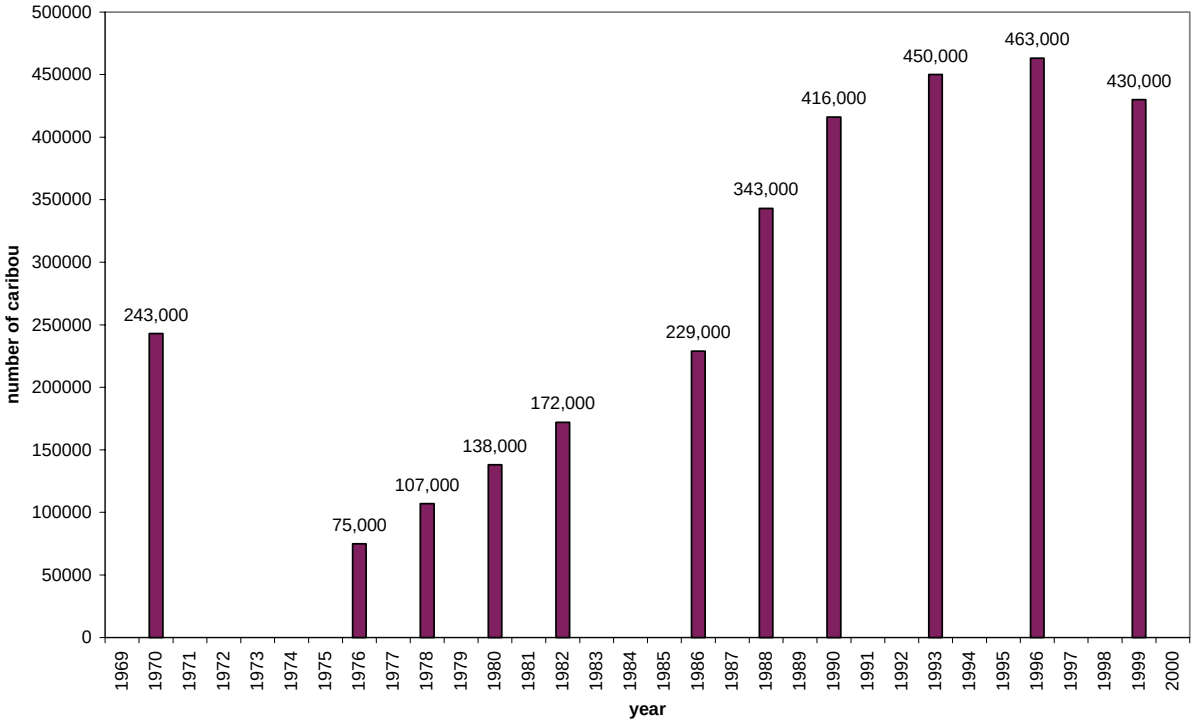

Figure 2 Photocensus estimates of the Western Arctic Caribou Herd, 1970-1999

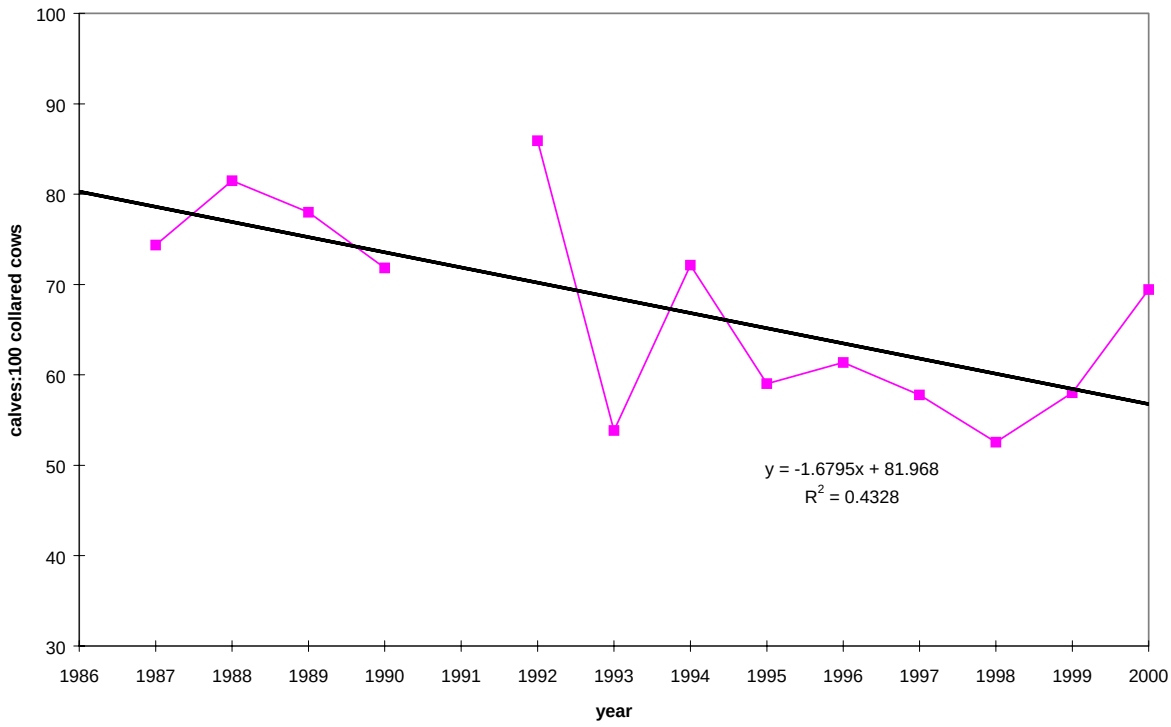

Figure 3 Results of calving surveys for the Western Arctic Caribou Herd, 1987-2000

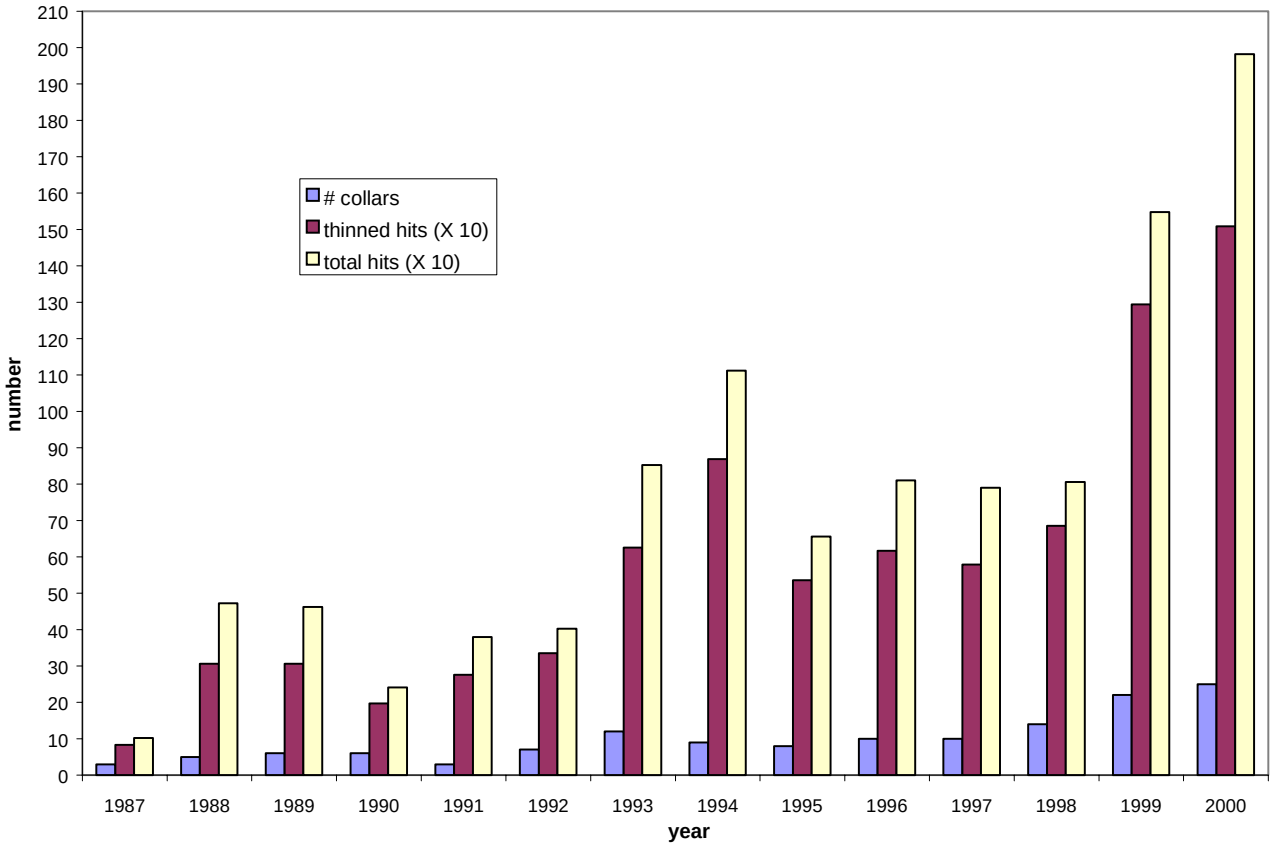

Figure 4 Numbers of functional platform terminal (satellite) transmitters and locations for the Western Arctic Caribou Herd by year, 1987-2000 ('thinned hits' are a subset of data that provide a standard frequency of locations among collars and seasons)

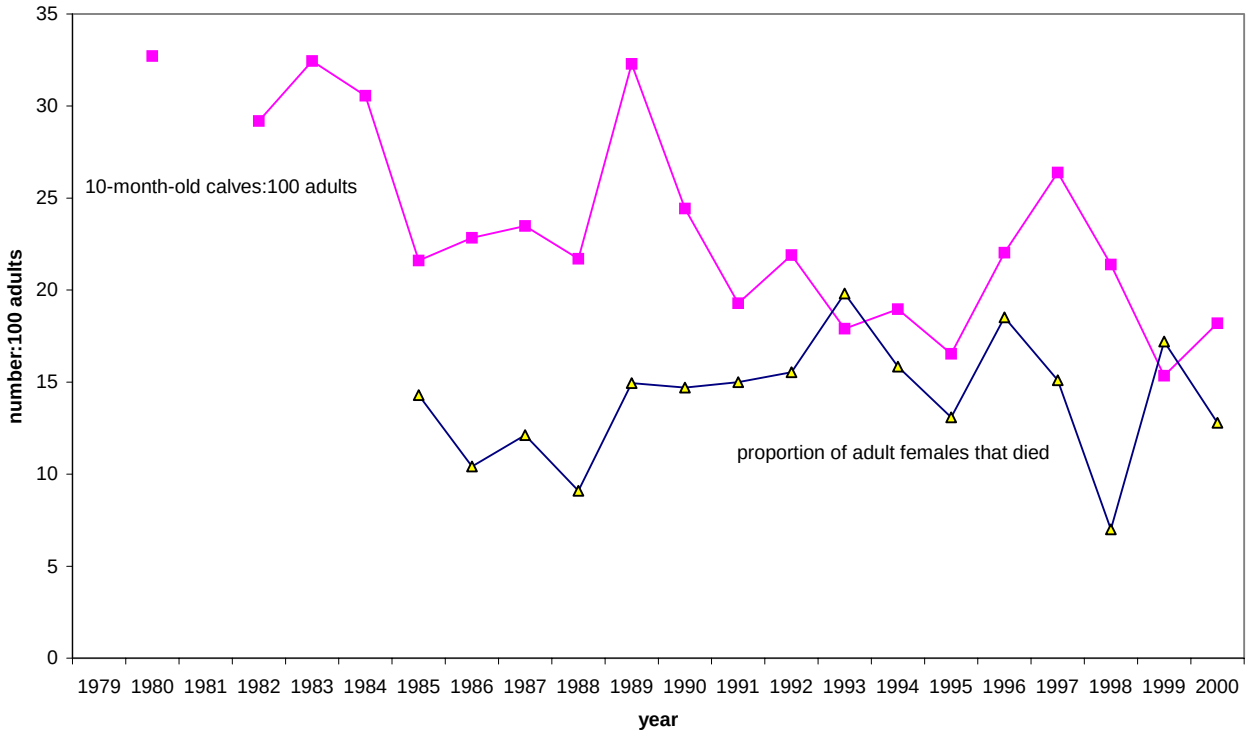

Figure 5 Annual estimates of adult mortality and calf recruitment for the Western Arctic Caribou Herd, 1980-2000

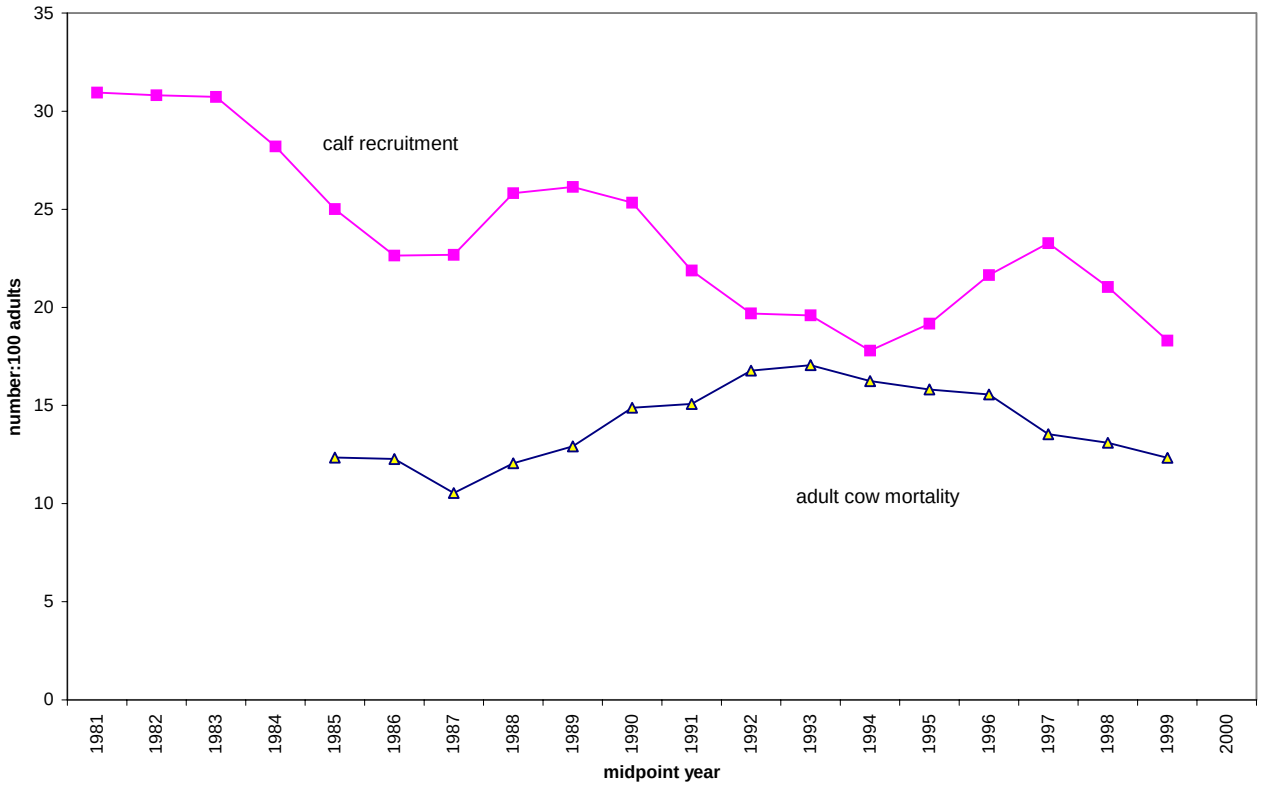

Figure 6 Three-year moving averages of adult cow mortality and calf recruitment for the Western Arctic Caribou Herd, 1979-2000

Table 1 Summary of community-based harvest assessments (ADF&G unless otherwise noted) for communities within the range of the Western Arctic Caribou Herd, 1985–1999 (population numbers in parentheses estimated during household interviews rather than by Department of Commerce and Economic Development)

Unit	Community	Survey Year	Human Population[a]	Number of Caribou Harvested	Reference
21					
	Galena	1996	548	40	ADF&G[b]
	Galena	1997	536	39	ADF&G[b]
	Galena	1998	481	7	ADF&G[b]
	Galena	1999	592	8	ADF&G[b]
	Kaltag	1996	227	16	ADF&G[b]
	Kaltag	1997	247	8	ADF&G[b]
	Kaltag	1998	227	6	ADF&G[b]
	Kaltag	1999	251	0	ADF&G[b]
	Nulato	1996	328	13	ADF&G[b]
	Nulato	1997	311	3	ADF&G[b]
	Nulato	1998	282	5	ADF&G[b]
	Nulato	1999	347	0	ADF&G[b]
22					
	Golovin	1989	169	40	ADF&G[b]
	Koyuk	1998	277	263	ADF&G[b]
	Shaktoolik	1998	235	167	ADF&G[b]
	Shaktoolik	1999	216	125	ADF&G[b]
	Shismaref	1989	472	197	ADF&G[b]
	Shishmaref	1995	560	342	ADF&G[b]
	Wales	1993	152	4	ADF&G[b]
	Elim	1999	306	227	ADF&G[b]
	White Mountain	1999	197	93	ADF&G[b]
23					
	Deering	1994	147	142	ADF&G[b]
	Kivalina	1992	344	351	ADF&G[b]
	Kotzebue	1986	(2681)	1917	ADF&G[b]
	Kotzebue	1991	2751	3782	ADF&G[b]
	Noatak	1994	379	615	ADF&G[b]
	Noatak	1999	423	683	ADF&G[b]
	Shungnak	1998	245	561	ADF&G[b]

Unit	Community	Survey Year	Human Population[a]	Number of Caribou Harvested	Reference
	Kiana	1999	398	488	ADF&G[b]
	Point Hope	1992	699	225	Fuller and George 1997
	Selawik	1999	767	1289	ADF&G[b]
24					
	Alatna	1997	25	21	ADF&G[b]
	Alatna	1998	25	11	ADF&G[b]
	Alatna	1999	34	0	ADF&G[b]
	Allakaket	1997	176	11	ADF&G[b]
	Allakaket	1998	191	43	ADF&G[b]
	Allakaket	1999	197	13	ADF&G[b]
	Anaktuvuk Pass	1990	314	592	Pedersen and Opie 1990
	Anaktuvuk Pass	1991	272	545	Pedersen and Opie 1991
	Anaktuvuk Pass	1992	270	566	Fuller and George 1997
	Anaktuvuk Pass	1993	318	574	Pedersen and Opie 1993
	Anaktuvuk Pass	1994–95	318	322	Brower and Opie 1996
	Bettles	1997	23	0	ADF&G[b]
	Bettles	1998	31	25	ADF&G[b]
	Bettles	1999	36	21	ADF&G[b]
	Evansville	1997	44	3	ADF&G[b]
	Evansville	1998	28	4	ADF&G[b]
	Evansville	1999	24	2	ADF&G[b]
	Huslia	1997	218	56	ADF&G[b]
	Huslia	1998	245	264	ADF&G[b]
	Huslia	1999	283	78	ADF&G[b]
26					
	Barrow	1987	3016	1595	Braund et al. 1991
	Barrow	1988	3379	1533	Braund et al. 1991
	Barrow	1989	3379	1656	Braund et al. 1991
	Barrow	1992	3908	1993	Fuller and George 1997
	Atqasuk	1994–95	237	262	Hepa et al. 1997
	Nuiqsut	1985	337	513	Pedersen 1995
	Nuiqsut	1992	418	278	Fuller and George 1997
	Nuiqsut	1993	361	672	Pedersen 1995
	Nuiqsut	1994–95	418	258	Brower and Opie 1997
	Nuiqsut	1999	468	413	Pedersen 2001

Unit	Community	Survey Year	Human Population[a]	Number of Caribou Harvested	Reference
	Point Lay	1987	(121)	157	Pedersen 1989
	Wainwright	1988	506	505	Braund et al 1993
	Wainwright	1989	468	711	Braund et al 1993
	Wainwright	1992	584	748	Fuller and George 1997

[a] Human population figures from Alaska Department of Commerce and Economic Development, Alaska Community Database (www.dced.state.ak.us/mra/CF_CUSTM.htm)
[b] Alaska Department of Fish and Game Community Profile Database, 2000

Table 2 Photocensus population estimates of the Western Arctic Caribou Herd, 1970–1999

Census year	Minimum population size	Mean annual rate of change[a]	Estimated population size
1970	243,000		
1971		-18	200,000
1972		-18	164,000
1973		-18	135,000
1974		-18	111,000
1975		-18	91,000
1976	75,000		
1977		19	89,000
1978	107,000		
1979		14	121,000
1980	138,000		
1981		12	154,000
1982	172,000		
1983		7	185,000
1984		7	198,000
1985		7	213,000
1986	229,000		
1987		22	280,000
1988	343,000		
1989		10	378,000
1990	416,000		
1991		3	427,000
1992		3	438,000
1993	450,000		
1994		1	454,000
1995		1	459,000
1996	463,000		
1997		-2	452,000
1998		-2	441,000
1999	430,000		

[a] Mean annual rate of change = e^r

$e = 2.7183$; $r = [\ln(N_{t2}) - \ln(N_{t1})]/t$ where: t = number of years between censuses; N_{t1} = pop. estimate at $time_1$; and N_{t2} = pop. estimate at $time_2$

Table 3 Aerial calving surveys from observations of radiocollared cows in the Western Arctic Caribou Herd, 1987–2000

Year	June dates	With Calf	No Calf ≥1 hard antler	No Calf soft antler	No Calf no antler	Total	Maternal	Non-Maternal	Calves: 100 Cows
1987	17–19	29	0	1	9	39	29	10	74
1988	3–5	27	17	1	9	54	44	10	81
1989	10–12	34	5	2	9	50	39	11	78
1990	11–13	51	0	5	15	71	51	20	72
1991									
1992	12–14	55	6	0	10	71	61	10	86
1993	11–17	39	3	17	21	80	42	39	52
1994	10–13	42	15	2	21	80	57	23	71
1995	9–13, 19–20	47	2	13	21	83	49	34	59
1996	5–6, 13–14	38	16	13	21	88	54	34	61
1997	4–7	39	13	16	22	90	52	38	58
1998	12–15	36	5	16	21	78	41	37	53
1999	11–13	47	0	11	23	81	47	34	58
2000	7, 12–14	39	11	5	17	72	50	22	69

Table 4 Fall population composition of the Western Arctic Caribou Herd, 1961–1999

Year	Bulls	Cows	Calves	Total	Calves: 100 Cows	Calves: 100 Adults	Bulls: 100 Cows
1961	276	501	187	964	37	24	55
1970	1748	2732	1198	5678	44	27	64
1975	720	2330	1116	4166	48	37	31
1976	273	431	222	926	52	32	63
1980	715	1354	711	2780	53	34	53
1982	1896	3285	1923	7104	59	37	58
1992	1600	2498	1299	5397	52	32	64
1993	859	2321	859	4039	37	25	37
1994	1354	3284	1118	5756	34	24	41
1995	1176	2029	1057	4262	52	33	58
1996	2621	5119	2525	10265	49	33	51
1997	2588	5229	2255	10072	43	29	49
1998	2298	4231	1909	8438	45	29	54
1999	2059	4191	1960	8210	47	31	49

Table 5 Short yearling[a] survey results of the Western Arctic Caribou Herd, 1980–2000

Year	Number of caribou			Number		SY[a]:100 adults	3-yr running average
	Adults	SY[a]	Total	Groups	Radio-collared cows		
1980	7823	2559	10382			33	
1981							31[b]
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	5044	1111	6155	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	8568	1559	10127	42	48	18	

[a] Short yearlings are 10–11-month-old caribou.
[b] Calculates average using values from 1980 and 1982.

Table 6 Annual mortality and binomial confidence intervals for Western Arctic Caribou Herd cows collared with conventional radiocollars, 1984–1985 through 1999–2000 "collar years" (1 Oct–30 Sep)

				Binomial Confidence Level		
Collar year[a]	Sample size[b]	No. died	Mortality rate[c] (%)	80%	90%	95%
1984–1985	28	4	14	6–27	5–30	4–33
1985–1986	48	5	10	5–18	4–21	3–23
1986–1987	66	8	12	7–19	6–21	5–22
1987–1988	88	8	9	5–14	5–16	4–17
1988–1989	87	13	15	10–21	9–23	8–24
1989–1990	102	15	15	10–20	9–22	8–23
1990–1991	100	15	15	10–21	9–22	9–24
1991–1992	103	16	16	11–21	10–23	9–24
1992–1993	106	21	20	15–26	14–27	13–29
1993–1994	101	16	16	11–22	10–23	9–24
1994–1995	107	14	13	9–18	8–20	7–21
1995–1996	108	20	19	14–24	13–26	12–27
1996–1997	106	16	15	11–21	10–22	9–23
1997–1998	100	7	7	4–11	3–13	3–14
1998–1999	93	16	17	12–23	11–25	10–26
1999–2000	99	11	11	7–16	6–18	6–19

[a] "Collar year" defined as 1 October–30 September

[b] Sample size = total number of potentially active conventional radiocollars active on adult cows at the beginning of the collar year

[c] Mortality rate = Number caribou died/Sample size

Table 7 Estimated harvest of Western Arctic Herd Caribou during the 1999–2000 regulatory year by residents living within the range of this herd

Unit	Community	Human Population	Per Capita Caribou Harvest	Total Community Harvest	% WACH in Harvest	Estimated No. of WACH caribou harvested	Assessments used to estimate per capita harvest[a]
21	Galena	592	0.01	8	100	8	Galena 99
	Kaltag	251	0.00	0		0	Kaltag 99
	Koyukuk	100	0.04	8	100	8	Gal. 96–98, Kal. 96–98
	Nulato	347	0.00	0		0	Nulato 99
	Total Unit 21					16	
22	Brevig Mission	291	0.24	69	100	69	Golovin 89
	Elim	316	0.74	234	100	234	Elim 99
	Golovin	142	0.74	105	100	105	Koyuk 98; Elim 99; Wh. Mt.-99; Shkt. 98
	Koyuk	289	0.95	274	100	274	Koyuk 98
	Nome	3620	0.10	350	100	350	Reg. Permit Sys.
	Saint Michael	368	0.03	10	100	10	Wales 93
	Shaktoolik	227	0.58	131	100	131	Shaktoolik. 99
	Shishmaref	547	0.61	334	100	334	Shishmaref 95
	Stebbins	543	0.03	14	100	14	Wales 93
	Teller	281	0.24	67	100	67	Golovin 89
	Unalakleet	757	0.58	438	100	438	Shkt. 99
	Wales	154	0.03	4	100	4	Wales 93
	White Mountain	207	0.47	98	100	98	White Mt. 99

Unit	Community	Human Population	Per Capita Caribou Harvest	Total Community Harvest	% WACH in Harvest	Estimated No. of WACH caribou harvested	Assessments used to estimate per capita harvest[a]
	Total Unit 22					2128	
23	Ambler	298	2.29	682	100	682	Shungnak 98
	Buckland	442	1.64	727	100	727	Noa. 94, 99; Shg. 98; Kia. 99; Sel. 99
	Deering	155	1.64	255	100	255	Noa. 94, 99; Shg. 98; Kia. 99; Sel. 99
	Kiana	366	1.23	488	100	488	Kiana 99
	Kivalina	382	1.02	390	100	390	Kivalina 92
	Kobuk	96	2.29	220	100	220	Shungnak 98
	Kotzebue	3000	1.37	4124	100	4124	Kotzebue 91
	Noatak	423	1.61	683	100	683	Noatak 99
	Noorvik	634	1.23	777	100	777	Kiana 99
	Point Hope	792	0.32	255	100	255	Pt. Hope 92
	Selawik	792	1.68	1289	100	1289	Selawik 99
	Shungnak	257	2.29	588	100	588	Shungnak 98
	Total Unit 23					10478	
24	Alatna	34	0.00	0		0	Alatna 99
	Allakaket	197	0.07	13	100	13	Allakaket. 99
	Anaktuvuk Pass	312	1.76	549	80	439	Anak. Pass 90–95
	Bettles	36	0.58	21	100	21	Bettles 99
	Evansville	24	0.08	2	100	2	Evansville 99

Unit	Community	Human Population	Per Capita Caribou Harvest	Total Community Harvest	% WACH in Harvest	Estimated No. of WACH caribou harvested	Assessments used to estimate per capita harvest[a]
	Hughes	77	0.38	29	100	29	Husl. 97–99; Alat. 97–99; Allak. 97–99
	Huslia	283	0.28	78	100	78	Huslia 99
	Total Unit 24					582	
26A	Atqasuk	273	1.11	302	40	121	Atqasuk 94–95
	Barrow	4541	0.50	2270	30	681	Brw. 87–89, 92
	Nuiqsut	468	0.88	413	10	41	Nuiqsuit 99
	Point Lay	217	1.27	276	80	221	Pt. Lay 87; Ww 88–89, 92
	Wainwright	545	1.27	690	40	276	Ww 88–89, 92
	Total Unit 26A					1340	
Total: All Units						14544[b]	

[a] Abbreviations: Alatna (Alat.); Allakaket (Allak.); Barrow (Brw.); Galena (Gal.); Kaltag (Kal.); Kiana (Kia.); Noatak (Noa.); Selawik (Sel.); Shaktoolik (Shkt.); Shungnak (Shg.); Wainwright (Ww); White Mountain (Wh. Mt.)
[b] 13,388–15,696 caribou (95% bootstrap confidence interval)

Table 8 Percent positive results and sample sizes for 8 selected pathogens from serology analyses of the Western Arctic Caribou Herd, 1962–2000

	IBR[a]		BVD[b]		PI3[c]		RSV[d]		EHD[e]		BT[f]		Leptospirosis		Brucellosis[h]	
Year	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)
1962															30	(56)
1963															19	(74)
1964															14	(37)
1965															12	(149)
1975	18	(11)	18	(11)	0	(12)							0	(9)	14	(14)
1981	0	(20)	0	(19)	0	(20)			0	(20)	0	(20)	0	(19)	39	(23)
1986	5	(40)	3	(40)	24	(41)	0	(40)	2	(41)	0	(41)	0	(41)	19	(37)
1992	5	(59)	3	(59)	22	(58)	0	(55)	0	(59)	0	(59)	3	(59)	4	(52)
1993	2	(63)	8		8	(63)	0	(63)	5	(63)	0	(63)	5	(63)	12	(51)
1994	0	(61)	5	(61)	8	(61)	0	(60)	11	(61)	0	(61)	2	(61)	11	(47)
1995	2	(44)	18	(44)	2	(44)	0	(44)	0	(44)	0	(44)	0	(44)	12	(34)
1996	6	(71)	18	(71)	11	(66)	7	(71)	0	(71)			1	(70)	3	(76)
1997	0	(75)	15	(75)	16	(73)	1	(75)	0	(71)			0	(75)	0	(76)
1998	4	(112)	21	(110)	7	(111)	8	(112)	0	(104)			15	(112)	7	(113)
1999	6	(70)	14	(64)	4	(52)	0	(52)	0	(74)	6	(72)	12	(77)	5	(77)
2000	0	(116)	10	(116)	4	(70)	0	(72)			0	(116)			6	(115)

[a]IBR = Infectious Bovine Rhinotracheitis
[b]BVD = Bovine Viral Diarrhea
[c]PI3 = Parainfluenza type 3
[d]RSV = Respiratory Synctial Virus
[e]EHD = Epizootic Hemorrhagic Disease
[f]BT = Bluetongue
[g]Leptospirosis = *Leptospira* spp.
[h]Brucellosis = *Brucella suis* type 4

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 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 the Yukon and Northwest Territories in Canada. Most of the herd's 130,000-mi^2 range is remote, roadless wilderness. The PCH typically calves on the coastal plain of the Arctic National Wildlife Refuge (ANWR), which is also the most promising onshore petroleum prospect in the United States (Clough et al. 1987). Both industry and government have an interest in developing potential oil resources on the coastal plain. Therefore, various state and federal agencies and their Canadian counterparts are cooperating in baseline ecological studies of the PCH. These studies are expected to provide the basis for mitigation of any adverse effects of petroleum development on caribou.

In 1987 the United States and Canada established the International Porcupine Caribou Board to coordinate management and research among government and user groups. The board includes a representative of ADF&G, representatives of the governments of the United States, Canada, Yukon and Northwest Territories, and members from communities and Native organizations from Alaska and Canada. Managing the herd to provide for a variety of uses is impacted by variety of factors, including board recommendations, biological studies, and Congressional actions regarding the opening of ANWR to petroleum development.

The PCH remained more stable than other Alaskan herds during the 1960s and 1970s at about 100,000 caribou (Table 1). In 1979 the population began a steady increase and reached 178,000 caribou by 1989. Annual rates of growth averaged about 5% from 1979 to 1989. The PCH then decreased to 160,000 caribou in 1992, probably in response to lower yearling recruitment after harsh winters. The herd continued to decline to an estimated 129,000 animals in 1998 and 123,000 in 2002, probably due to increased adult mortality (Arthur et al., in press).

MANAGEMENT DIRECTION

Prior to the early 1970s, the PCH was a low priority for management and research because of its remote location and the small number of people who harvested PCH caribou. However, increasing pressure for oil development in northeast Alaska and growing international interest in the herd resulted in a higher management priority and heightened attention from biologists (Garner and Reynolds 1986; Griffith et al. 2002).

MANAGEMENT GOALS

The following goals, proposed by the International Porcupine Caribou Board (International Porcupine Caribou Board 1998:Appendix 1), were used to guide management activities during recent years.

- 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 OBJECTIVES

To accomplish goals, ADF&G established the following management objectives:

- Maintain a minimum population of 135,000 caribou.
- Monitor the harvest through field observations, hunter reports, and contact with residents.
- Conduct censuses and sex and age composition counts.

METHODS

Personnel from ADF&G, ANWR, and Yukon Renewable Resources Department (YRRD) cooperate to estimate population size with aerial photocensuses conducted at intervals of 2–3 years, using methods described in previous reports (Davis et al. 1979, Valkenburg et al. 1985, Whitten 1993*a*). However, the photocensus planned for 2000 was precluded by weather. Instead, the census was conducted on 3 July 2002. At this time the PCH was loosely aggregated on the arctic coastal plain between the Kongakut and Jago Rivers, with most of the herd located near the Aichilik River. Movements, productivity, mortality, and seasonal distribution of the herd were also monitored, primarily through periodic relocation of radiocollared caribou (Fancy and Whitten 1991, Whitten 1993*b*, 1995*a*). Calf production and survival were assessed by

monitoring radiocollared cows during June (Whitten et al. 1992). In addition, personnel from YRRD conducted composition counts on the PCH winter range during March of each year.

Harvest tickets submitted by nonlocal hunters (Alaskans residing outside Units 25, 26B and 26C) provided most data on harvest in this region in Alaska. The department's Division of Subsistence staff gathered additional data on harvest by local hunters through field interviews. Canadian harvest and composition data were obtained from YRRD. Harvest data were summarized by regulatory year (RY = 1 Jul–30 Jun; e.g., RY99 = 1 Jul 1999 through 30 Jun 2000).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Personnel from ADF&G, US Fish and Wildlife Service (FWS), YRRD, and Canadian Wildlife Service counted 127,944 caribou on aerial photographs taken in late June and early July 1998. An additional 412 caribou were seen in small groups, but were not photographed. The total count was 128,356. Because some small groups of caribou may have been missed, herd size was estimated to be about 129,000 (Table 1). The photographs taken on 3 July 2001 produced a total count of 120,368 plus 2684 caribou that were not photographed, for a total estimate of 123,052 caribou. During a previous survey in July 1994, we estimated the herd at 152,000 caribou. The highest population ever recorded was 178,000 during 1989. These results indicate the herd declined by 3–4% per year from 1989 to 1998, and 1.5% per year from 1998 to 2001. Although these censuses may have slightly underestimated the population, all censuses used similar methods and it is unlikely that census errors account for the decline that has occurred since 1989.

Population Composition

We have not estimated composition of postcalving groups since 1992, and the last fall composition count was done in 1980 (Table 2). The bull:cow ratio is unknown, but is probably between 35 and 60:100 because of relatively good recruitment and the relatively low harvest. Surveys of radiocollared cows during late June found 70 calves:100 cows during 1999 and 44 calves:100 cows during 2000 (Table 3). Winter surveys by the YRRD found 56 and 28 calves:100 cows during March 1999 and 2000, respectively (Table 3; D Cooley, personal communication). Composition surveys from different months are not directly comparable. The June surveys included only mature, radiocollared cows, and were not representative of the entire herd. Although the March surveys were not limited to radiocollared caribou, only a small proportion of the herd was classified.

Calf:cow ratios were probably influenced by demographic effects of poor calf recruitment during 1991–1993. Adverse weather during these years reduced parturition rates and increased calf mortality. Ratios initially increased during 1994–1996 because fewer nonbreeding cows, aged 1–3 years, were present in the population. Beginning in 1997, ratios declined because the larger cohorts born during 1994–1996 increased the proportion of adults, although most did not initially produce calves. Calf:cow ratios should increase to levels seen before 1991 as these cohorts enter the breeding population. Calf survival was relatively high in 1999 but declined in 2000, probably

because of an unusually late spring that delayed migration. As a result of the delay, many calves were born before the cows reached the normal calving grounds.

Reproduction and Calf Survival

Calving surveys during June 1999 were hindered by cool, cloudy weather. The presence of snow on the Alaskan coastal plain evidently deflected many caribou cows into the foothills of the Brooks Range, and caused some to remain in Canada during the peak of calving. Radiotracking on 5 June indicated that 84% of adult cows produced calves (Table 3). This was slightly above the mean annual parturition rate of 81% observed since data collection began in 1982. Of 22 calves whose survival was determined, 19 (86%) survived until 24 June.

During June 2000 spring migration and calving success likely were influenced by deep snow during the previous winter and the unusually late onset of spring. On 1 June snow cover was extensive in both Alaska and Yukon from the arctic coast to the Porcupine River. By 10 June most of the area north of the Porcupine River and east of the US–Canada border was clear of snow, although the Alaskan coastal plain remained mostly snow-covered until 15 June. Cool, cloudy weather continued in Alaska through the remainder of June, and few mosquitoes were observed on the Alaskan coastal plain until 1 July. Migration was delayed, caribou calving occurred over a larger area than usual, and many calves were born outside traditional calving areas. On 1 June, when calving probably began, all collared caribou cows were in Canada, along the southern edge of the Canadian coastal plain, in the foothills of the British Mountains, or scattered along the migration route extending southeastward from the Babbage River to the Driftwood River. From 1 June to 15 June, caribou congregated along the Canadian coastal plain near the mouth of the Babbage River. Parturition rate and early calf survival were both very low (Table 3). For 45 radiocollared cows that were observed both in early and late June, 32 (71%) were judged to be parturient. Twenty-four cows were seen with calves and 8 were assumed to have given birth and lost their calves (based on presence of hard antlers and enlarged udders). Only 20 calves of radiocollared cows survived until 1 July (63% of 32 calves believed to have been born). This survival was less than during any year from 1991–1999. The estimated ratio of 44 calves:100 radiocollared cows on 1 July was lower than during any year from 1987–1999 (Table 3). Conditions during spring 2001 were similar to 2000, with cool, cloudy weather and snow cover persisting into early June. Spring migration and the calving period were again delayed, and followed a similar pattern to 2000. Although parturition and early calf survival rates were slightly higher than during 2000 (Table 3), these rates were still low, and the estimated ratio of 51 calves:100 cows was among the lowest recorded for the PCH.

Distribution and Movements

Information on movements and distribution of the PCH has been summarized by Garner and Reynolds (1986), Whitten (1987, 1993*b*, 1995b), Whitten and Regelin (1988), Fancy et al. (1989), Golden (1989, 1990), Whitten and Fancy (1991), and Griffith et al. (2002). During 1997 and 1998 snowmelt and new plant growth occurred earlier than in previous years, continuing a trend seen in 1995 and 1996. Due to relatively light snow cover, caribou began their spring migration to the coastal plain earlier than in years with more snow, and most reached ANWR and the coastal plain by 1 June. In contrast, during both 1999 and 2000 deep snow and cold weather delayed the spring migration, and prolonged the calving period. This was especially

pronounced in 2000, when calving occurred over a much wider area than usual, and many calves were born south and east of the traditional calving area, including parts of northwestern Yukon and northeastern Alaska. Caribou left the coastal plain and moved into the Brooks Range foothills of Alaska and Canada during late June and early July. Most of the PCH was in Canada by mid-August, and few returned to Alaska during fall, except in winter 1999–2000 when a substantial number wintered in the vicinity of Arctic Village. Few caribou wintered in Alaska during the following year. There appears to be a long-term decline in the number of PCH caribou wintering in Alaska. Consequently, fall subsistence harvests in Alaska were probably low. In the Yukon, caribou were accessible from the Dempster Highway during much of both winters, and harvests were relatively high.

MORTALITY

Harvest

Season and Bag Limit. The state of Alaska hunting season for all hunters during this reporting period 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 nonresidents was 5 caribou. The bag limit for all Alaska residents was 10 caribou.

Alaska Board of Game Actions and Emergency Orders. The Alaska Board of Game took no regulatory action regarding the PCH during RY98 and RY99.

Hunter Harvest. Harvest data from northern Yukon are not yet available for RY99 and RY00. Estimated harvests in Alaska were 300–400 during these years. Total harvests for the PCH were approximately 2437 and 1671 during RY96 and RY97, respectively (Table 4). This represents 1–2% of the estimated population (Table 1).

Harvests by local and nonlocal residents in Alaska were reported differently. Nonlocal hunters used statewide caribou harvest ticket report cards. Standardized reporting of harvest by hunters living north of the Yukon River was not required after 1989, and prior to 1989, most local residents did not report even though it was required. Therefore, local harvest was estimated based on knowledge of local hunting patterns and the availability of caribou near communities.

Harvest by nonlocal hunters was a minor part of the overall PCH harvest, although it increased slightly during this report period. Most harvest by nonlocal hunters occurs in Unit 25A (Table 5). Most nonlocal hunters were Alaska residents, and harvested primarily bull caribou.

In Alaska local harvest depends largely on the relative availability of caribou. Caribou were available to Kaktovik residents primarily in early summer during this report period. Caribou were briefly available to most villages south of the Brooks Range during late summer and fall. Harvest in Canada probably continued to be relatively high because caribou often move through the Old Crow area several times each year. During late summer and fall of both 1999 and 2000, many caribou traveled south along the Dempster Highway, where they were accessible to residents of Aklavik, Fort McPherson, and other road-connected communities.

Hunter Success. Nonlocal hunter effort and success varied among game management units depending on herd distribution (Table 5). Word travels quickly when PCH caribou are scarce in

Alaska, and few hunters travel to the PCH range. Because of their wide ranging movements and the difficulty and expense of traveling to the area, the PCH has never been subject to a substantial harvest by nonlocal hunters.

In Alaska local hunter success during this report period was generally low. Caribou left the Kaktovik area in both 1999 and 2000 before sea ice receded, and local residents were unable to travel to traditional hunting areas by boat. Caribou were available near Arctic Village for only a few weeks in late summer 2000, but in RY99 wintered in large numbers in the area. Hunters from other Gwichin communities took small numbers of caribou along the Porcupine River near the Alaska–Yukon border in fall. In most years the majority of the herd remains in Canada during the winter.

Harvest Chronology. Nearly all nonlocal harvest of the PCH in Alaska occurs during August and early September. Caribou were available during winter 1999–2000 in sparsely populated eastern Unit 25A, but there was little or no harvest by nonlocal hunters. Local harvest chronology depends on availability of caribou near villages, and harvest occurs whenever caribou are present. However, caribou may be present but inaccessible at Kaktovik during June because traveling conditions are poor.

Transport Methods. Traditionally, nonlocal hunters fly into the PCH range, and a few travel by boat up the Porcupine River. Local residents use boats or ATVs in summer and snowmachines in winter.

HABITAT

Assessment

Population density of the PCH reached approximately 1.0 caribou/mi^2 (0.4/km^2) during the late 1980s. Results of studies on the calving ground indicate calving caribou select areas with rapid plant growth, rather than specific sites or habitats. Rapid plant growth occurs in different areas annually, but tends to occur most frequently in the region identified by previous research as the primary calving area of the PCH (Fancy and Whitten 1991). This study indicates that, over time, all of the traditional calving area is important for caribou. Preserving or protecting only portions of the calving area may not adequately protect the herd.

Enhancement

No habitat enhancement programs are underway or planned on the PCH's range. Much of the herd's range within Alaska is designated wilderness, and the northern portion of the Yukon Territory is a national park. Most of the area is classified as "limited" for fire suppression, and a natural fire cycle generally prevails.

CONCLUSIONS AND RECOMMENDATIONS

Although the 1998 and 2001 population estimates were below ADF&G's objective, the actual population was likely higher than estimated, and the herd is still above levels observed in the 1970s, when it numbered 102,000–110,000. The second management objective is being met, although knowledge of local harvests and timeliness of harvest reporting could be improved. The

third objective was partly accomplished. Weather delayed a photocensus planned for 2000 until 2001, but composition surveys were completed.

The most likely cause of the initial decline in numbers following the 1989 census was reduced calf production or survival during 1991–1993 due to adverse weather, as reflected in low March calf:cow ratios. Calving surveys indicated that calf production (measured as a proportion of adult cows) from 1994–1999 was good, but declined dramatically in 2000 and 2001 (Table 3). Population modeling indicates the decline should have ended by 1998, as relatively large cohorts became adults. The continuing decline indicates that adult survival may also have been reduced during the 1990s, perhaps due to increased predation or human harvest (Arthur et al., in press). Although no change in management strategy is needed at this time, the population should be monitored closely during the next 2–3 years. A continuing decline could make it necessary to reduce harvest of females.

The PCH was lightly hunted, and harvest probably played a relatively small role in recent population changes. However, existing harvest levels will have a greater influence on population dynamics if the herd continues to decline. The generally high productivity, survival, and good physiological condition of caribou in the herd probably reflect adequate forage quality and quantity as well as generally mild climatic conditions. If mild weather continues, the herd may increase.

Existing management objectives are suitable for the next reporting period. Activities required to meet these objectives include 1) completing a photocensus every 2–3 years, 2) conducting annual calving and herd composition surveys, 3) monitoring herd movements by periodically relocating radiomarked caribou, and 4) continuing to work with local communities to improve the accuracy of harvest estimates.

The department is cooperating with US Geological Survey/Biological Resources Division, FWS, and Canadian government agencies to assess the importance of the ANWR coastal plain to the PCH. The department previously identified a portion of the ANWR coastal plain between the Hulahula and Aichilik Rivers as especially important to calving and postcalving caribou and recommended this area for special consideration in any plans to develop ANWR. However, more recent studies indicate all of the ANWR coastal plain and adjacent areas in Canada may be important to the herd over the long term (Fancy and Whitten 1991; Griffith et al. 2002). The department should continue to work with other agencies to identify factors affecting population dynamics of the PCH and evaluate potential effects of development on the coastal plain.

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Table 1 Porcupine caribou herd population estimates, 1961–2001

Year	Population estimate[a]	Type of estimate
1961	110,000	Calving ground census[b]
1972	99,959	APDCE[c]
1977	105,000	APDCE
1979	105,683	Modified APDCE
1982	125,174	Radiocensus[d]
1983	135,284	Radiocensus
1987	165,000	Radiocensus
1989	178,000	Radiocensus
1992	160,000	Radiocensus
1994	152,000	Radiocensus
1998	129,000	Radiocensus
2001	123,000	Radiocensus

[a] All estimates include calves except for the 1961 estimate.
[b] Data presented by RO Skoog at the 1962 Alaska Science Conference.
[c] Aerial photo-direct count extrapolation (Davis et al. 1979).
[d] Valkenburg et al. 1985.

Table 2 Porcupine caribou herd historical postcalving composition counts, 1971–1992[a]

Approximate survey date	Bulls:100 Cows[b]	Calves:100 Cows	Percent calves	Percent cows	Percent yrlgs	Percent small bulls (% of bulls)	Percent large bulls (% of bulls)	Percent bulls	Composition sample size
7/71	24	38	21	56	10			13	29,197
7/72	23	49	26	53	9			12	11,721
7/73	16	47	27	58	6			9	19,101
7/74	9	67	37	55	3			5	14,127
7/75	23	52	27	52	9			12	18,814
7/76	5	58	32	55	10			3	13,762
7/77	7	39	24	61	11			4	25,520
7/78	30	68	32	47	7			14	18,669
7/79	15	55	30	55	7			8	19,154
7/80	59	66	26	39	11			23	9,046
7/82[c]	95	43	15	36	15		46	34	19,718
7/83	9	73	38	52	5	61	39	5	2,583
7/86[c]	57	52	22	42	12			24	19,499
7/87[c]	72	62	24	38	10	49	51	28	33,044
7/88	28	54	27	50	10	57	43	14	6,420
7/89	17	46	25	55	11	77	23	9	23,242
7/90[d]									
7/91	36	46	28	46	10			17	16,060
7/92	27	55	27	49	10	62	38	13	18,217

[a] Beginning in 1993 composition data were obtained from observations of radiocollared cows (see Table 3).

[b] These figures do not represent overall herd composition of bulls. Accurate bull:cow ratios are usually obtainable only during or prior to the rut in October.

[c] Only these surveys sampled all portions of the herd, including bull groups.

[d] No counts completed.

Table 3 Porcupine caribou herd demographic data, 1987–2001

Birth year	June calving surveys: Cows observed[a]	June calving surveys: Parturition rate	July Calves:100 Cows[b]	March Calves:100 Cows[c]	Population estimate
1987	51	0.78	55		165,000
1988	91	0.84	55		
1989	74	0.78	58	43	178,000
1990	74	0.82	74		
1991	77	0.74	61	22	
1992	78	0.86	49	33	160,000
1993	63	0.81	45	32	
1994	98	0.91	70	40	152,000
1995	95	0.69	59	41	
1996	74	0.89	72	46	
1997	48	0.75	58	38	
1998	58	0.83	68	27	129,000
1999	39	0.84	70	56	
2000	44	0.73	44	28	
2001	70	0.84	51	31	123,000

[a] Number of radiocollared cows observed during May and June.

[b] Includes only radiocollared adult cows >3 years old.

[c] As of March of the year following birth of each cohort. Includes all cows >1 year old.

Table 4 Porcupine caribou herd harvest, regulatory years 1984–1985 through 1999–2000

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	81	11	1	93	300	n/a	n/a	
1999–2000	82	4	0	86	400	n/a	n/a	

Table 5 Porcupine caribou herd nonlocal[a] hunter success, regulatory years 1991–1992 through 1999–2000

Regulatory year/ Hunters	Unit					Total Units 25 and 26C
	25A	25B	25D	25	26C	
1991–1992						
Total hunters	62	8	2	72	22	94
Successful	43	1	0	44	7	51
% Successful	69	13	0	61	32	54
1992–1993						
Total hunters	67	23	0	90	6	96
Successful	48	11	0	59	4	63
% Successful	72	48	0	66	67	66
1993–1994						
Total hunters	45	9	1	55	28	83
Successful	33	1	1	35	19	54
% Successful	73	11	100	64	68	65
1994–1995						
Total hunters	49	13	2	64	14	78
Successful	36	2	0	38	8	46
% Successful	73	15	0	59	57	58
1995–1996						
Total hunters	57	9	1	67	21	88
Successful	32	2	0	34	10	44
% Successful	56	18	0	51	48	50
1996–1997						
Total hunters	47	20	0	67	9	76
Successful	29	16	0	45	2	47
% Successful	62	80	0	67	22	62
1997–1998						
Total hunters	56	10	3	69	17	86
Successful	34	5	0	39	6	45
% Successful	61	50	0	57	35	52
1998–1999						
Total hunters	85	12	2	4	13	116
Successful	63	3	2	1	6	75
% Successful	74	25	100	25	46	65
1999–2000						
Total hunters	80	23	146	6	6	129
Successful	55	14	5	2	3	79
% Successful	69	61	3	33	50	61

[a] Nonlocal includes Alaskans residing outside Units 25, 26B, and 26C.

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: Western half of Unit 25C and small portions of northern Unit 20B and eastern Unit 20F (3090 mi^2)

HERD: White Mountains

GEOGRAPHIC DESCRIPTION: White Mountains area north of Fairbanks

BACKGROUND

As recently as 1960, 30,000 Fortymile caribou herd (FCH) crossed the Steese Highway to calve and summer in the White Mountains (Jones 1961). As the FCH declined throughout the 1960s, they 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 discovered in the late 1970s, it numbered 100–200 caribou (Valkenburg, ADF&G, personal communication). By the time of the first Alaska Department of Fish and Game (ADF&G) annual management report (Valkenburg 1988), Bureau of Land Management (BLM) estimated its size at around 1000. However, the basis for this estimate is unknown. In a photocensus on 6 July 1992, J Herriges (BLM) counted 832 caribou but extrapolated the estimate to 1200, based on missing radios and a rough estimate of herd composition. In retrospect, it seems most likely the herd grew from about 150 in 1978 to around 900 in 1992 ($\lambda = 1.14$).

The White Mountains National Recreation Area encompasses most of the White Mountains caribou herd's range and is managed by the BLM. 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 movements and distribution of the herd. The herd also provides a low-density comparison population for the long-term Delta Herd research project.

Public use of the White Mountains is increasing, especially during late winter. The Bureau of Land Management continues to improve access and increase recreational opportunities through development of roads and 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 give people the opportunity to hunt caribou during winter. DC877 allowed motorized-access hunting, while DC878 was nonmotorized access only. Although 100 permits were issued for the first 3 seasons (50 per hunt), success was low (6 caribou). The number of permits available was increased to 250 (125 per hunt) during regulatory years (RY) 1993–1994 (RY = 1 Jul through 30 Jun; e.g., RY99 = 1 Jul 1999 through 30 Jun 2000). However, the increase 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 to 1 caribou (previously 1 bull), RC877 and RC878 were combined to create RC879 which has season dates of 1 November through 31 March and no motorized restrictions, but the area open to hunting for White Mountain caribou was reduced.

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 Objectives

- Maintain a fall bull:cow ratio of 30 bulls:100 cows.
- Develop a creative strategy to increase winter hunting opportunities, while minimizing potential for overharvest.
- Maintain a reported harvest of <75 caribou, including no more than 30 cows during the winter drawing hunts.
- Maintain at least 20 radiocollared caribou in the herd to adequately measure herd dynamics.

METHODS

We flew fall sex and age composition surveys on 30 and 29 September during 1999, 2000, and 2001, respectively. After radiocollared animals were located from a fixed-wing aircraft, a Robinson R-22 helicopter was flown to that location and an observer classified individuals into sex and age categories. The R-22 crew also classified groups of caribou that were located without the assistance of the fixed-wing aircraft. The 5 classification categories are: cow, calf, small bull (yearling or small 2-year-old—cow-like antlers), medium bull (older than yearling, but not a mature breeder, antlers larger than a mature cow, but not at their full potential), and large bull (mature, heavily antlered male).

On 7 July 2000 ADF&G and BLM cooperated to conduct an aerial count (supplemented with 35-mm photographs of 1 large group) of the White Mountains Herd from fixed-wing aircraft. Groups of caribou were located by radiotracking collared animals and by systematic searches throughout the known range.

We estimated harvest by using data from returned harvest tickets and registration permit report cards. For RY98 and RY99, caribou harvested north of the Steese Highway were considered White Mountains animals; caribou harvested south of the Steese Highway were considered FCH. To separate the White Mountains Herd from the Ray Mountains Herd's harvest in Unit 20F, caribou killed south of the Yukon River were considered White Mountains animals. For RY00 the border for delineating the White Mountains caribou and Fortymile caribou was moved west to Preacher and American Creeks for White Mountains caribou and east of these drainages for Fortymile caribou. Harvest data were summarized by regulatory year.

On 26 September 2001 we collared 9 female caribou calves, bringing the total number of active radio collars to approximately 17 at the beginning of winter 2001–2002.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

On 7 July 2000 we (ADF&G and BLM) conducted an aerial count of the White Mountains Herd. The total count of 687 caribou was well below the expected population of ≥1200.

Population Composition

Fall calf:cow and bull:cow ratios in the White Mountains Herd have been variable (Table 1). However, calf:cow ratios were high enough (>25 calves:100 cows) to allow the herd to grow in most years except for 2000, 1998, and 1991–1994. The bull:cow ratio remained relatively high. Variation in bull:cow ratios (23–62:100) for the White Mountains Herd probably reflected unrepresentative sampling because bulls were segregated after the rut (i.e., in 1991 and 1995). Early surveys (i.e., 29 Sep–6 Oct) yielded higher bull:cow ratios than later surveys. Differences in composition between years may also be attributed to the behavior of these caribou, because they are usually in small, scattered groups and are often in timbered areas. It is easy to miss groups that could affect the overall composition estimates.

Distribution and Movements

Radiocollared White Mountains caribou are located infrequently, so data concerning their movements are minimal. Limited data indicate the herd calves primarily in the higher elevation parts of the White Mountains east of Beaver Creek, including the Nome, Fossil, Cache, and Preacher Creek drainages. Some scattered calving occurs west of Beaver Creek (Durtsche and Hobgood 1990). Postcalving aggregations occur from mid-June to late July and are located east to Mount Prindle (Fig 1). In August or September most caribou cross Beaver Creek and winter in upper Hess and Victoria Creeks and the upper Tolovana River drainages. However, some White Mountains caribou winter in the Preacher Creek drainage west of Circle.

MORTALITY

Harvest

Season and Bag Limit. The general hunting season was 10 August–20 September throughout the herd's range (Units 20B, 20F south of the Yukon River, and 25C), with a bag limit of 1 bull from RY87 thru RY99. The bag limit for this season was liberalized to 1 caribou during RY00, but the area open to hunting was reduced in Unit 25C to west of Preacher and American Creeks.

Winter registration permit hunts were open for caribou hunting north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway (Units 20B, 20F south of the Yukon River, and 25C). During the RY98 and RY99 seasons, hunt RC877 was open 1–28 February and hunt RC878 was open 1–31 March, with motorized restrictions during RC878. The winter registration hunt was modified for RY00 and the hunt number was changed to RC879. Modifications included a 1 November–31 March season, no motorized restrictions and a reduction in the area open to hunting in Unit 25C. The bag limit for all winter hunts was 1 caribou.

Board of Game Actions and Emergency Orders. At the March 2000 Board of Game meeting the board approved our proposal to change the general season bag limit to 1 caribou, replaced RC877 and RC878 with a new registration hunt (RC879) having new season dates of 1 November–31 March with no motorized restrictions, and adjusted the border that delineates White Mountains and Fortymile caribou hunting in Unit 25C. Prior to this action, the border between White Mountains caribou and Fortymile caribou hunting was the Steese Highway. The new border is the east bank of Preacher and American Creeks. The White Mountains caribou herd is hunted west of the border and the FCH is hunted east of the border.

Hunts RC877 and RC878 were closed by emergency order on 16 February 2000. The emergency order was issued due to the presence of a large number of FCH animals near the Steese Highway. The adjustments to the borders for hunting the White Mountains caribou and FCH should prevent closures of this type in the future.

Hunter Harvest. Fall harvest during general season hunts was relatively low. The reported WMCH fall harvest averaged 18 (range 10–26) during RY95–RY99 (Table 2).

Permit Hunts. Participation was poor and harvests were low for drawing permit hunts DC877 and DC878. From RY90 through RY97, the total reported harvest was 10 caribou (Table 3). The low harvest occurred despite the availability of 1150 permits. The overall success rate was 5% (10 of 185) for those who reported hunting. During RY98 and RY99, 140 of the 193 individuals who obtained registration permits for RC877 and RC878 reported that they actually hunted, and 14 caribou were harvested (10% success rate). Data for RC879 (RY00) are preliminary, but to date we have issued over 300 permits and the reported harvest is 9 caribou (6 cows and 3 bulls).

To estimate a harvest quota for the winter hunt, we used a computer population model designed by P Valkenburg and D Reed (ADF&G). The model indicated the White Mountains Herd could sustain a total fall and winter harvest of 40 bulls and 25 cows.

Hunter Residency and Success. During RY98, 69% (9 of 13) of successful hunters during the general season were Alaskan residents. Of those, 89% (8 of 9) were residents of Unit 20. During the RY99 general season, 85% (22 of 26) of successful hunters were Alaskan residents. Of those, 77% (17 of 22) were residents of Unit 20. The overall success rate during the general season for RY98 was 16% (13 of 81) and 22% (26 of 118) for RY99 (Table 4).

Harvest Chronology. Since RY90 (when the winter seasons were opened) 88–100% of the harvest has occurred during the general season (10 Aug–20 Sep).

Transport Methods. The most common method of transportation used by successful hunters during general seasons during RY98 and RY99 were 3- or 4-wheelers, which accounted for 69% (9 of 13) and 65% (17 of 26) of the respective transportation use (Table 5). Because of limited participation and low harvests, transportation methods for the winter hunts have little meaning. When motorized access is allowed, the vast majority of the harvest is 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 most caribou winter in dense spruce forest, making hunting difficult.

CONCLUSIONS AND RECOMMENDATIONS

Harvests were low because of remoteness and inaccessibility, so we met our objective of harvesting <75 total caribou and fewer than 30 cows. Increased hunter effort and harvest during fall may occur because there are limited opportunities to hunt Interior caribou, and BLM has improved access in this area. However, if the FCH increases as expected, increased hunting pressure on the White Mountains Herd may be minimal.

The 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.

We met our objective to maintain a fall bull:cow ratio of 30 bulls:100 cows. During RY98 and RY99, fall ratios were 62 and 54 bulls:100 cows, respectively.

Our count of 687 caribou in July 2000 was below the expected population size of ≥1200 caribou. There were several possible explanations for the lower than expected count. The herd was scattered, and caribou may have been missed in the timber or in areas where the search effort was not adequate. The expected population was based on a 1992 population estimate and subsequent composition data. Errors in these estimates could have resulted in an inaccurate projected population. It is also possible that 687 caribou is an accurate estimate for this population. We only heard 16 of 20 radiocollared animals we expected to be active during the census.

Population data for the White Mountains Herd are limited to annual composition counts with an occasional census. To obtain a better understanding of population dynamics for the White Mountains Herd we need to allocate more funds for data collection. Relatively low hunter

participation and success, and the limited potential of this herd have made these activities a low priority compared to other Interior caribou herds.

The management goal that stated "Allow continued growth and natural regulation of the White Mountains caribou herd" was eliminated because it is inconsistent with current management practices for this herd.

By working closely with BLM, we monitored increases in recreational uses and development. We should continue attending meetings on development of BLM lands. This cooperation will help effect better management strategies for managing the White Mountains caribou herd.

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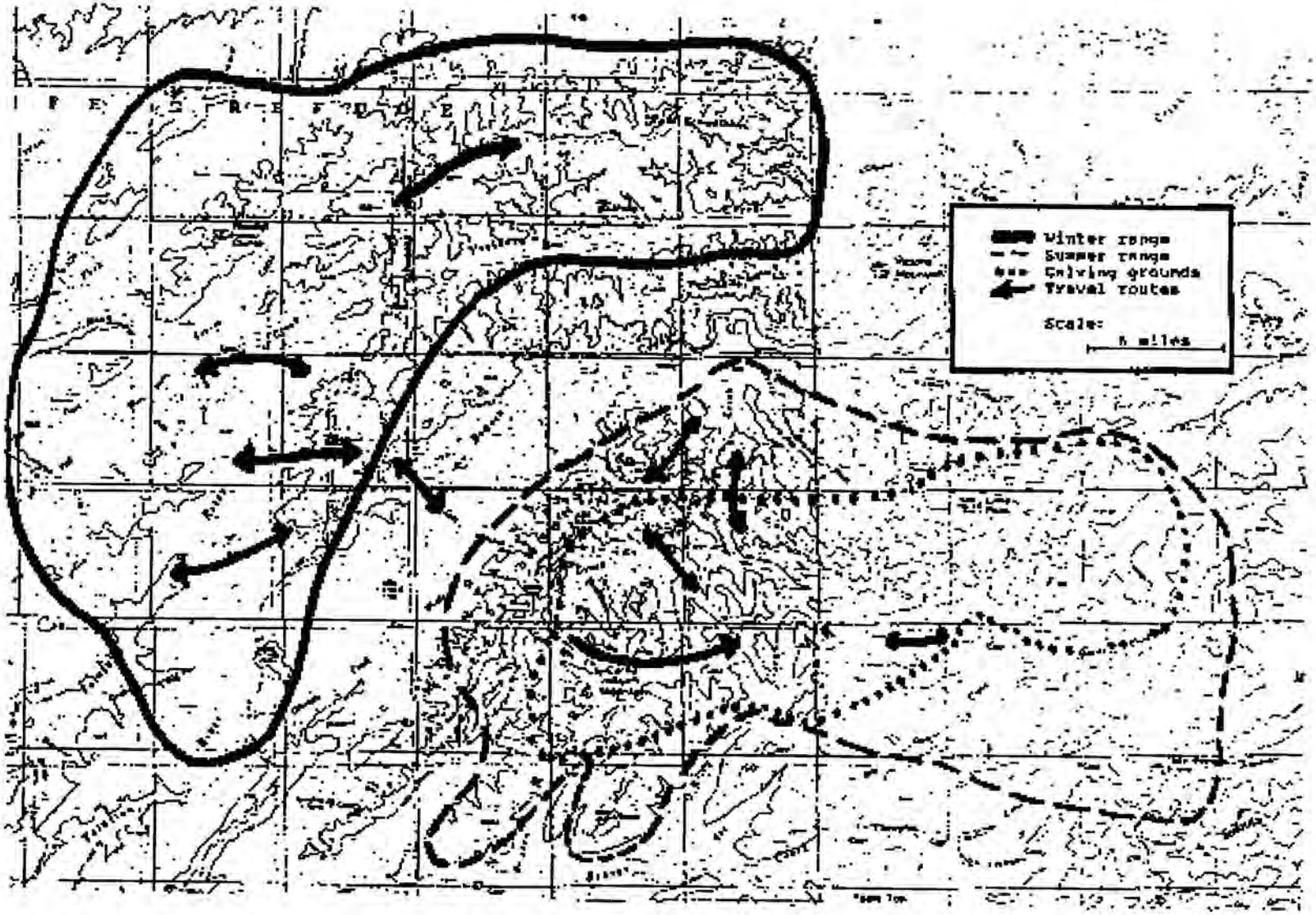

Figure 1 White Mountains caribou herd approximate range (based on Durtsche and Hobgood 1990; Hobgood, personal communication).

Table 3 White Mountains caribou herd harvest by permit hunt, regulatory years 1990–1991 through 1997–1998

Hunt number	Regulatory year	Permits available	Applicants	Permits issued	Harvest			Hunted unsuccessful	Did not hunt	Did not report
					Cow	Bull	Total			
DC877 & DC878	1990–1991	100	229	89	1	2	3	18	66	2
	1991–1992	100	409	100	0	0	0	12	88[b]	
	1992–1993	100	537	100	2	1	3	19	76	2
	1993–1994	150	615	150	0	0	0	26	120	4
	1994–1995	150	295	149	2	1	3	26	116	5
	1995–1996	150	354	137	0	0	0	37	98	1
	1996–1997	150	135	106	0	0	0	17	86	3
	1997–1998	250	90	67	0	1	1	20	46	0
RC877 & RC878[a]	1998–1999			74	1	0	1	49	25	0
	1999–2000			119	10	3	13	91	28	0
RC879[c]	2000–2001				3	6	9			

[a] Registration hunt with an unlimited number of permits available.

[b] Includes those that did not report.

[c] Preliminary data.

Table 4 White Mountains caribou herd hunter residency and success during fall general seasons, regulatory years 1985–1986 through 1999–2000

Regulatory year	Successful				Unsuccessful		Total hunters
	Resident	Nonresident	Total	%	Total	%	
1985–1986			12	20	48	80	60
1986–1987			2	33	4	67	6
1987–1988			6	12	43	88	49
1988–1989			13	17	64	83	77
1989–1990	12	2	14	23	46	77	60
1990–1991	15	3	18	18	80	82	98
1991–1992	18	1	19	12	143	88	162
1992–1993	12	3	15	13	99	87	114
1993–1994	19	2	21	18	99	82	120
1994–1995	18	0	18	12	135	88	153
1995–1996	7	3	10	8	116	92	126
1996–1997	13	4	17	17	84	83	101
1997–1998	17	8	25	16	130	84	155
1998–1999	9	4	13	16	68	84	81
1999–2000	22	4	26	22	92	78	118

Table 5 White Mountains caribou herd harvest by transport method during fall general seasons, regulatory years 1988–1989 through 1999–2000[a]

Regulatory year	Harvest by transport method								
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Other/Unk	*n*
1988–1989	4	0	0	4	0	2	2	0	12
1989–1990	0	0	0	4	0	4	4	2	14
1990–1991	1	0	1	10	0	1	4	1	18
1991–1992	3	1	0	8	0	4	3	0	19
1992–1993	2	0	0	4	0	2	5	1	14
1993–1994	4	0	0	11	0	0	5	1	21
1994–1995	0		1	13	0	1	3	0	18
1995–1996	4	0	0	4	0	0	2	0	10
1996–1997	1	0	0	12	0	1	3	0	17
1997–1998	5	0	1	14	0	2	1	2	25
1998–1999	1	0	1	9	0	1	1	0	13
1999–2000	2	0	2	17	1	2	1	1	26

[a] Excludes winter permit hunts.

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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 26A (56,000 mi^2)

HERD: Teshekpuk

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

The presence of old drive sites near Teshekpuk Lake indicates that caribou have been hunted in the area since at least late prehistoric times (Silva 1985). The area was used extensively for reindeer herding in the 1930s and 1940s, and local residents report observing caribou in the area since the 1930s. Davis and Valkenburg (1978) documented the Teshekpuk Caribou Herd (TCH) in the mid-1970s as a separate herd from the Central Arctic (CAH) and the Western Arctic (WACH) Caribou herds.

The Alaska Department of Fish and Game (ADF&G) and U. S. Bureau of Land Management (BLM) staff completed visual counts during 1978–1982, and estimated that 3000–4000 caribou inhabited the Teshekpuk Lake area (Davis and Valkenburg 1979, Reynolds 1981, and Silva 1985). In an effort to assess the size and distribution of the TCH, 12 cows and 8 bulls were instrumented with radio collars in 1980 and monitored jointly by the department and BLM. During July 1984, the first photocensus of the herd was completed using a modified aerial photo-direct count extrapolation (APDCE) technique; department and BLM staff counted 11,822 animals from photographs. Trent and Toovak made a visual count in 1985 and counted 13,406 caribou (department files). We completed photocensuses and counted 16,649 caribou in 1989 (Carroll 1992), 27,686 in 1993 (Carroll 1995), and 25,076 caribou in 1995 (Carroll, 1997).

The TCH is an important subsistence resource to hunters from several North Slope villages. Collection of TCH harvest data has been difficult because not all hunters report their harvest and because hunters from most North Slope villages harvest caribou from more than one herd.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain stable or increasing numbers of caribou in the TCH
- Provide continued hunting opportunity on a sustained yield basis

MANAGEMENT OBJECTIVES

- Determine the population size of the herd every 2 to 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 Department Subsistence Division to collect harvest information;
- Determine the hunter induced mortality rate and significant sources of nonhunter mortality;
- 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;
- Collar caribou every 1 to 2 years to maintain a sample size of around 40 operational collars. Capture caribou without the use of drugs;
- Weigh measure and collect blood, fecal, and hair samples from all captured caribou to gain information about disease, parasites, contaminants, and condition;
- Conduct composition surveys during mid-summer and fall to determine relative numbers of bulls, cows, and calves; and
- Involve students in caribou research operations, work with students to track satellite collared caribou movements, and lecture to school classes about caribou biology.

METHODS

We used a modified APDCE technique (Davis et al. 1979) to conduct a photocensus. Photographs were taken from a DeHavilland Beaver (DHC-3) aircraft with a floor-mounted camera on 11 July 1999 while TCH caribou were in insect relief aggregations. A Cessna 185 with telemetry equipment was used to detect how many radiocollared TCH animals were in the photographed groups and if there were any instrumented WAH caribou in the area. Images of caribou on the photographs were counted during the following winter.

We flew spring short yearling surveys in a Cessna 185 on 21–23 April 1999 and on 10, 11, and 25 April 2000 and fall composition surveys on 13 October 1998. We used telemetry equipment to locate radiocollared cows and counted approximately 100 adults and calves in the area surrounding the collared animal. Locating the radiocollared animals allowed us to distribute our sampling effort throughout the range of the TCH.

A Cessna 185 aircraft was used to fly calving surveys on 4–12 June 1999 and 2–14 June 2000. We flew surveys over most of the TCH range and used telemetry equipment to locate as many collared cows as possible and observed them at close range to determine the success, timing, and location of calving. For each observation we recorded whether the cow had a calf and whether it had hard antlers, soft antlers (covered with velvet), or no antlers. We continued to observe each collared cow until it was seen with a calf or it was determined that it had soft antlers and was therefore not pregnant. We used a Garmin Global Positioning System (GPS) receiver to determine the latitude and longitude of the location where we first saw each cow with a calf, and recorded this as the calving location along with the date. Calving locations of cows that calved successfully and locations of cows that either did not have calves or had calves that died before they were observed during the June 2 –16 calving season were entered in a spreadsheet and mapped using ArcView GIS.

We used a Robinson 220 helicopter on 30 June 1998 and a Hughes 500 helicopter on 10 July 2000 to conduct postcalving composition surveys. We flew transects north and west of Teshekpuk Lake and categorized caribou as cows, calves, or bulls.

Through a cooperative effort with the NSB and BLM, we captured 11 caribou north of Teshekpuk Lake on June 29, 1998 using a Robinson 220 helicopter with a hand-held net gun, and attached 2 Platform Transmitter Terminal collars (satellite radio collar transmitters or "PTT's") and 9 VHF radiocollars. We also captured 20 caribou north of Teshekpuk Lake from July 8–10, 2000 using a Hughes 500 helicopter with a skid-mounted net gun, and attached 5 PTT’s and 12 VHF radiocollars. In both capture operations caribou were restrained using blindfolds and hobble ropes. We collected blood, fecal, and hair samples and measured, weighed, and assessed the body condition of the captured caribou. The radiocollars were used to aid in population, productivity, and movement studies.

The PTT's were designed to transmit on a 6-hour per 48-hour duty cycle. We received satellite location data from the Service Argos Data Collection and Location System (ARGOS) in Landover, Maryland using 2 methods. We retrieved current location information from ARGOS,

using a computer and modem as needed. Otherwise, we used monthly summaries of all locations distributed on microcomputer files by ARGOS. In addition to receiving caribou locations from ARGOS, we completed periodic VHF radiotracking flights to collect information on caribou mortality, movements, and distribution.

In order to determine hunter harvest of TCH caribou, we examined data from harvest surveys that have been done in villages within the range of the TCH. The estimated harvest from the survey reports and the human population for the year of the survey were used to calculate the number of caribou harvested per person per year. We obtained current human population estimates from the Department of Commerce and Economic Development and multiplied this by the per capita harvest for each village to estimate the total caribou harvest for 1999–2000. Because villages harvest caribou from more than one herd we had to estimate what percentage of the caribou harvested in each village were from the TCH. VHF radiotracking and satellite collar information was used to make our best estimation of which herds were in the hunting areas of the villages when hunting was taking place in 1999–2000. We multiplied the total number of caribou harvested times the percentage of them that were most likely from the TCH to determine the total number of TH caribou harvested from each village, and totaled these to calculate the total TCH harvest for 1999–2000. We recognize that the harvest estimates (calculated above) are based on approximate proportions of caribou from respective herds in the local hunting areas. Increased confidence in the estimation procedure is possible in the future by conducting more VHF radiotracking flights and analyzing satellite collar information to determine the when caribou from the various herds are present in local hunting areas

We determined mortality rates of cows with VHF radiocollars by examining radiotracking survey data collected since 1990. The VHF transmitters were configured with MS6 mortality sensors, so they doubled their rate of transmission signals when the caribou stopped moving for over 5.5 hours (mortality mode). In addition to collars heard on mortality mode, some collars were simply not detected after some date. We assumed that these “not detected” caribou died somewhere out of the survey area during the collaring year previous to the first calving period when they were not heard. We totaled the number of caribou found on mortality mode and “not detected” caribou for each collaring year, which ran from 1 July to 30 June. We then divided this by the number of active conventional radiocollars that were on the air at the beginning of the collar year to calculate the mortality rate for each year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

From census photographs taken on 11 July 1999, we counted 28,627 caribou. Previous censuses in 1989 (16,649 caribou), 1993 (27,686 caribou), and 1995 (25,076 caribou) show the TCH increased at a rate of 14% per year during the period 1989–1993, and since then the herd has fluctuated slightly but has remained fairly stable (Table 1).

Population Composition

Calving surveys were flown on 4, 6, 10, 11, 12, and 24 June 1999. We located 36 collared cows and 24 of these had calves at heel, for 67% calving success (Table 2). Most of the calves were born between 6–11 June. In 2000, calving surveys were flown on 2, 5, 6, 7, 9, 12, and 14 June. We located 29 collared cows and 23 of these had calves at heel, for 79% calving success (Table 2). Most of the calves were born after 7 June, which was slightly later than normal. We flew fall composition surveys on October 13, 1998. Among 458 caribou, we counted 90 calves for 20% calves, or 25 calves:100 adults. Short Yearling counts were flown from 21–23 April 1999. We located 25 collared cows, 8 of which had had short yearlings at heel (32 short yearlings per 100 cows). We also classified 2040 caribou in the areas surrounding the collared animals and counted 1608 adults and 432 short yearlings. This computes to 21% short yearlings or 26 short yearlings:100 adults. The spring 1999 results were similar to the 1998 fall composition results indicating that overwinter calf survival was similar to adult survival (Table 3).

Short Yearling counts were also flown on 10, 11, and 25 April 2000. We located 21 collared cows, 7 of which had short yearlings at heel (33 short yearlings:100 cows). We also classified 1985 caribou in the areas surrounding the collared animals and counted 1591 adults and 394 short yearlings. This computes to 20% short yearlings or 25 short yearlings:100 adults. (Table 3)

During summer composition surveys, which were flown on June 30, 1998, we observed 3302 caribou and classified 1364 as cows, 1023 bulls, and 915 calves. We counted 67 calves:100 cows and 75 bulls:100 cows. We also conducted summer composition surveys on 10 July 2000 and classified 3943 caribou and saw 1858 cows, 908 bulls, and 1177 calves. We counted 63 calves:100 cows and 49 bulls:100 cows. The number of calves was in the mid-range of what we have seen in past years. The number of bulls counted has been variable over the years and is more a reflection of bull distribution at that time than actual composition (Table 3).

Distribution and Movements

Most TCH caribou move toward Teshekpuk Lake during May. During past years most of the pregnant females moved into the area northeast, east, and southeast of Teshekpuk Lake to calve in early June (Figure 1). A late snow melt-off seemed to hold the caribou farther south in 1999 and caused a greater than normal number (20 of 24) of caribou to calve south of the lake (Figure 2). In 2000 snow melt-off was even later than in 1999 and seemed to slow the eastward migration of the caribou. Calving occurred on all sides of Teshekpuk Lake, with many more calves than usual being born south and west of the lake (Figure 3).

During late June through July, caribou of both sexes seek relief from insect harassment along the Beaufort Sea coast from Dease Inlet to the mouth of the Kogru River, around the edges and on islands of Teshekpuk Lake, and on sand dunes along the Ikpikpuk River and south of Teshekpuk Lake. Fall and winter movements are highly variable, with most of the herd wintering in a different area each year.

Satellite collar information indicates that TCH caribou winter in varied locations from near Teshekpuk Lake to the Chukchi Sea coast to south of the Brooks Mountain Range (Philo et al. 1993). In 1990–1991 about half of the herd wintered south of the Brooks Range and half were on the Chukchi coast. In 1991–1992 most of the herd wintered within 30 miles of Teshekpuk Lake.

In 1992–1993 the herd was split between the northern foothills of the Brooks Range and the coastal plain. During 1993–1994 icing on the coastal plain caused most of the TCH to move into the area between Umiat and Anaktuvuk Pass with a portion of the herd moving to the south side of the Brooks Range. During 1994–1995, most of the herd was along the Chukchi Sea coast from Wainwright to Cape Lisburne. In 1995–1996 the TCH wintered on the coastal plain, mostly between Dease Inlet and Wainwright. During 1996–1997 most of the herd traveled south of the Brooks Range and were distributed between Cape Lisburne and the Seward Peninsula. During 1997–1998 most of the herd wintered in the Atqasuk and Wainwright area with some scattered as far east as the Teshekpuk Lake area.

All 3 caribou that we monitored during 1998–1999 stayed on the coastal plane. One caribou we collared in 1997 (ID 9705 and PTT 8760) summered north of Teshekpuk Lake and in the Cape Simpson area, wintered south of Admiralty Bay, then traveled back to Teshekpuk Lake in June and had a calf. We attached satellite collars to 2 caribou in 1998. Caribou ID 9808 (PTT 8761) summered north of the lake and around Admiralty Bay, wintered around Atqasuk, and traveled back to Teshekpuk Lake in June, but was not seen with a calf. Caribou ID 9809 (PTT 8762) spent most of the summer and all of the winter south of Teshekpuk Lake and had a calf there.

During 1999–2000, we monitored the movements of the 3 satellite-collared caribou and they all stayed on the coastal plain all winter. Caribou ID 9808 (PTT 8761) wintered between Wainwright and Atqasuk during 1999–2000, traveled back to Teshekpuk Lake in June, and had a calf to the west of the Lake. Caribou ID 9809 (PTT 8762) also wintered between Wainwright and Atqasuk, traveled to Teshekpuk, and had a calf to the south of the lake in early June. The satellite transmitter on caribou ID 9705 (PTT 8760) failed in fall of 1999. At the time, ID 9705 was north of Atqasuk. All three collars (PTTs 8760, 8761, 8762) were removed from the caribou during collaring operations in July 2000. Caribou ID 9705 was refitted with a VHF collar.

MORTALITY

Harvest

Season and Bag Limit. The hunting seasons and bag limits were the same for both regulatory years of the reporting period.

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 actions or emergency orders for the TCH during the reporting period.

Human-Induced Harvest. It has been difficult to determine TCH harvest because not all hunters report their harvest and because each North Slope village harvests caribou from more than one herd. However, there have been several harvest monitoring projects, which provided information on the number of caribou harvested and the human population of the villages (Table 4). We used this harvest information to calculate an average number of caribou harvested per person per year for each of the villages. This per capita caribou harvest was multiplied by the 1999 human population number to estimate the number of caribou harvested by each village. Distribution of the various caribou herds is variable from year to year, so we examined telemetry data for 1999–2000 to determine the availability of TCH caribou, compared to caribou from other herds, in the hunting area of each village and estimated the percentage of the harvest that was most likely TCH caribou. The total harvest of each village was calculated from the estimate of caribou harvested and the estimated percentage that were TCH caribou. We totaled the village harvests to produce an estimate of 2503 TCH caribou harvested in 1999–2000 (Table 5). This represents an 8.7% harvest of the herd. We will gain more confidence in this estimate as we increase VHF radiotracking flights during the periods when differing herds are present in the hunting areas around each village and as we examine satellite collar information.

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 subsistence 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. No quantitative data are available on hunter success, but we believe success rates were high.

Harvest Chronology. Caribou are harvested throughout the year, but most harvest is during July through October (Table 6 and Table 7).

Transport Methods. Caribou hunters in Unit 26A used a wide variety of transport methods. Most residents of the unit used boats and ATV's during July, August, and September; and they used snowmobiles during the remainder of the year. Some use of aircraft occurs throughout the year, primarily by nonlocal residents and nonresidents. Hunters occasionally used highway vehicles when caribou moved near the limited road systems, particularly the gas well road near Barrow.

Other Mortality

We reviewed radiotracking data beginning in 1990 and determined how many collared caribou died each year and used these figures to estimate the annual TCH mortality rate. During most years the mortality rate ranged from 11% to 19% with the average rate for all years being 15%. The highest mortality rate (28%) was 1996–1997, when much of the herd migrated south of the Brooks Range. Reasons for increased mortality may have included higher stress from the long migration, increased hunter harvest, and the increased risk of predation and other factors associated with unfamiliar territory. The lowest mortality rate was in 1998 –1999 when 6% of the collared cows died (Table 8).

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 2000–3000 caribou died in this area, but it is impossible to determine how many were from the TCH since caribou from the WACH and the CAH were also present in the area (Carroll 1992). During the winter of 1992–1993 at least several hundred, and probably over 1000, 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. Radiocollars indicated that most of these animals were from the TCH. (Carroll 1995).

HABITAT

Assessment

Results of satellite telemetry studies (Philo et al. 1993), VHF radiotracking flights, and composition surveys have indicated that the areas to the south, southeast, east, and north of Teshekpuk Lake are critical for calving, grazing, migration, and insect relief.

In 1997 BLM began the process of opening the National Petroleum Reserve-Alaska (NPRA), which encompasses much of the TCH range, to oil exploration and development. The first area to be considered was a 4.6 million-acre planning area in the northeast corner of NPRA. This area includes important TCH calving, insect relief, grazing, and migration habitats 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. However, most of the TCH critical habitat areas north and east of the lake would not be available for leasing at this time. It was also decided that there would be no surface exploration or development activity allowed in a strip of land to the west and south of the Teshekpuk Lake and around the Kogru River.

Enhancement

There were no habitat enhancement activities during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

There were no nonregulatory problems or needs identified for caribou in Unit 26A during the reporting period.

CONCLUSIONS AND RECOMMENDATIONS

We conducted a photocensus in 1999 and counted 28,627 caribou. This indicates an increase of 3.4% per year since 1995 when 25,076 caribou were counted. Previous censuses in 1989 (16,649 caribou), 1993 (27,686 caribou), and 1995 (25,076 caribou) show the TCH increased at a rate of 14% per year during the period 1989–1993, and since then the herd has fluctuated slightly but has remained fairly stable.

We examined the recruitment and mortality for each year during the last decade. Our recruitment results indicated the percentage of short yearlings ranged from 14% to 26% of the population and averaged about 20%. The mortality rate ranged from 6% to 28% with an average of about

15%. A fairly high recruitment and low mortality rate in recent years appear to have contributed to a recent growth in population.

We used the results of several harvest monitoring projects, human population numbers, and caribou distribution data to estimate that approximately 2500 TCH caribou were harvested in 1999–2000. This represents an 8.7% harvest of the herd, and the herd will need to maintain a fairly high recruitment rate to sustain this level of harvest.

We have used a helicopter and net gun to capture caribou since 1990 because local people requested that we do not drug caribou and because federal laws prohibit the use of capture drugs in areas where the hunting season is open. After netting, we used hobbles and masks to control the caribou. We were able to measure, weigh, and collect blood from the animals without the use of sedatives. We had 2 capture mortalities in 2000 and the carcasses were donated to the Senior Citizen's Center in Barrow.

Satellite radiotelemetry has been very useful in increasing our understanding of TCH movements. It has shown that TCH caribou move much more extensively than previously known. Some of these movements would have been impossible to track using standard VHF radiotelemetry. Satellite telemetry has clearly illustrated that while movements are fairly consistent during the spring and early summer there is great variability in winter movements. VHF collars have also been very useful, primarily in conducting censuses, composition surveys, and productivity studies. We need to continue telemetry studies to monitor herd status.

We have provided educational opportunities for North Slope students by allowing them to assist in caribou capture operations, collect samples from captured caribou, and help with necropsy work. In addition, we have been working with several school classes, teaching them to plot caribou locations so they can track the movements of satellite-collared caribou. We plan to continue to work with students whenever possible.

Using satellite and VHF collars, we have learned that the area to the south, east, and northeast of Teshekpuk Lake are important for calving in the spring, and the area north and northwest of the lake is important for insect relief and grazing each summer. As discussed in this report’s Habitat Assessment section, BLM began the process of opening a planning area in the northeast corner of NPRA to petroleum leasing and development, which includes these critical habitat areas. After a public review process, it was decided that 87% of the planning area would be open for leasing but that the most critical habitat areas for the TCH would not be available for leasing or surface development activity at this time. However, the critical TCH habitat area also has the highest prospects for petroleum reserves, so the issue will probably be revisited. It is important to continue surveys in this area so resource managers make informed decisions regarding the habitat of the Teshekpuk Caribou Herd.

Because the TCH population remains high, we do not recommend any regulatory changes.

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Table 1 Population estimates and average annual rate of change of the Teshekpuk caribou herd, 1978–1999

Year	Population estimate	Average annual rate of change
1978–1982	3000–4000[a]	N/A
1984	11,822[b]	N/A
1985	13,406[a]	N/A
1989	16,649[b]	7.1%[c]
1993	27,686[b]	13.5%[c]
1995	25,076[b]	-4.8%[c]
1999	28,627[b]	3.4%[c]

[a]Derived from visual estimate.
[b]Derived using aerial photocensus.
[c]Rate of change calculated using only numbers derived from photocensus.

Table 2 Teshekpuk caribou herd calving and postcalving composition counts, June–July, 1991–2000

	Calving survey[a]	Summer composition counts[b]				
Date	Calves:100 cows	Percent bulls	Calves: 100 cows	Percent calves	Percent cows	Composition sample size
1991		13	66	35	52	3673
1992		34	80	29	37	3047
1993		37	39	15	38	2959
1994	63					
1995	73	29	73	30	41	1987
1996	89					
1997	53	18	46	26	56	3771
1998	63	31	67	28	41	3302
1999	67					
2000	79	23	63	30	47	3943

[a] Surveys conducted early to mid June
[b] Surveys conducted in July

Table 3 Spring and fall composition data for the Teshekpuk caribou herd, 1990–2000

Year	Adults	Short yearlings	Total	Short yearlings:100 adults	Percent short yearlings
1990(spring)	278	74	352	27	21
1991(spring)	532	168	700	31	24
1992(spring)	635	223	858	35	26
1993(spring)	1197	265	1462	22	18
1994(spring)	1281	205	1486	16	14
1995(spring)	1382	255	1637	18	16
1996(spring)	1787	575	2362	32	24
1996(fall)*	733	191	924	26	21
1997(fall)*	895	145	1040	16	14
1998(fall)*	368	90	458	25	20
1999(spring)	1608	432	2040	26	21
2000(spring)	1591	394	1985	25	20

Table 4 Summary of community-based harvest assessments for communities within the range of the Teshekpuk Caribou Herd, 1985–1999.

Community	Survey year	Human population	Nr. of caribou harvested	Reference for harvest information
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
Barrow	1987	3016	1595	Braund et al 1991
Barrow	1988	3379	1533	Braund et al 1991
Barrow	1989	3379	1656	Braund et al 1991
Barrow	1992	3908	1993	Fuller and George 1997
Atqasuk	1994–1995	237	262	Hepa et al. 1997
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
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 5 Estimated harvest of Teshekpuk Herd Caribou during the 1999–2000 regulatory year by residents living within the range of this herd.

Community	Human population	Per Capita Caribou Harvest	Estimated total community harvest	Approximate % TCH in harvest	Estimated Nr. of TCH caribou harvested	Assessments used to estimate Per Capita Caribou Harvest
Anaktuvuk Pass	312	1.76	549	10	55	Anak. Pass 1990–1995
Atqasuk	273	1.11	302	60	181	Atqasuk 1994–1995
Barrow	4541	0.50	2270	70	1589	Barrow 1988, 1989, 1992
Nuiqsut			413	50	207	1999–2000 Harvest Survey[a]
Point Lay	217	1.3	282	20	57	Pt. Lay 1987
Point Hope	792	0.32	255	0	0	Pt. Hope 1992
Wainwright	545	1.27	690	60	414	Wainwright 1988, 1989, 1992
Total Harvest					2503	

[a]The Estimated Total Community Harvest was derived from an ADFG Subsistence Division harvest survey that was conducted in Nuiqsut in 1999–2000 (Pedersen, 2001)

Table 6 Percent and chronology of annual caribou harvest among Barrow and Wainwright residents 1987–1990[a]

Year	Mar–Apr	May–Jun	Jul–Aug	Sep–Oct	Nov–Dec	Jan–Feb	Annual harvest
Barrow							
1987–1988	5%	5%	40%	44%	1%	5%	1595
1988–1989	5%	6%	38%	41%	4%	6%	1533
1989–1990	6%	2%	49%	29%	3%	11%	1656
Wainwright							
1988–1989	2%	2%	31%	53%	9%	3%	505
1989–1990	11%	<1%	38%	31%	4%	15%	711

[a]Data from Braund et al. 1991 and 1993.

Table 7 Percent and chronology of annual caribou harvest among Nuiqsut and Atqasuk residents 1994–1995[b]

Village	Jul–Aug	Sep–Oct	Nov–Dec	Jan–Feb	Mar–Apr	May–Jun	Annual harvest
Atqasuk	40%	37%	14%	5%	1%	2%	187
Nuiqsut	38%	35%	7%	6%	8%	7%	249
Anaktuvuk Pass	50%	14%	12%	2%	15%	7%	322

[b]Data from Brower et al. 1996, 1997 and Hepa et al. 1997.

Table 8 Annual mortality for Teshekpuk Caribou Herd cows collared with conventional radiocollars, 1990–2000

Collar Year[a]	Sample Size[b]	Mortalities[c]	Mortality Rate[d]
1990–1991	13	3	23%
1991–1992	21	3	14%
1992–1993	21	4	19%
1993–1994	30	4	13%
1994–1995	29	5	17%
1995–1996	31	4	13%
1996–1997	25	7	28%
1997–1998	28	3	11%
1998–1999	35	2	6%
1999–2000	34	4	12%
Totals	267	39	15%

[a] Collar year defined as July 1–June 30.
[b] Sample Size - the total number of active conventional radiocollars at the beginning of the collar year.
[c] Number of radiocollared cows that died during the collar year
[d] Mortality rate - Mortalities/Sample Size

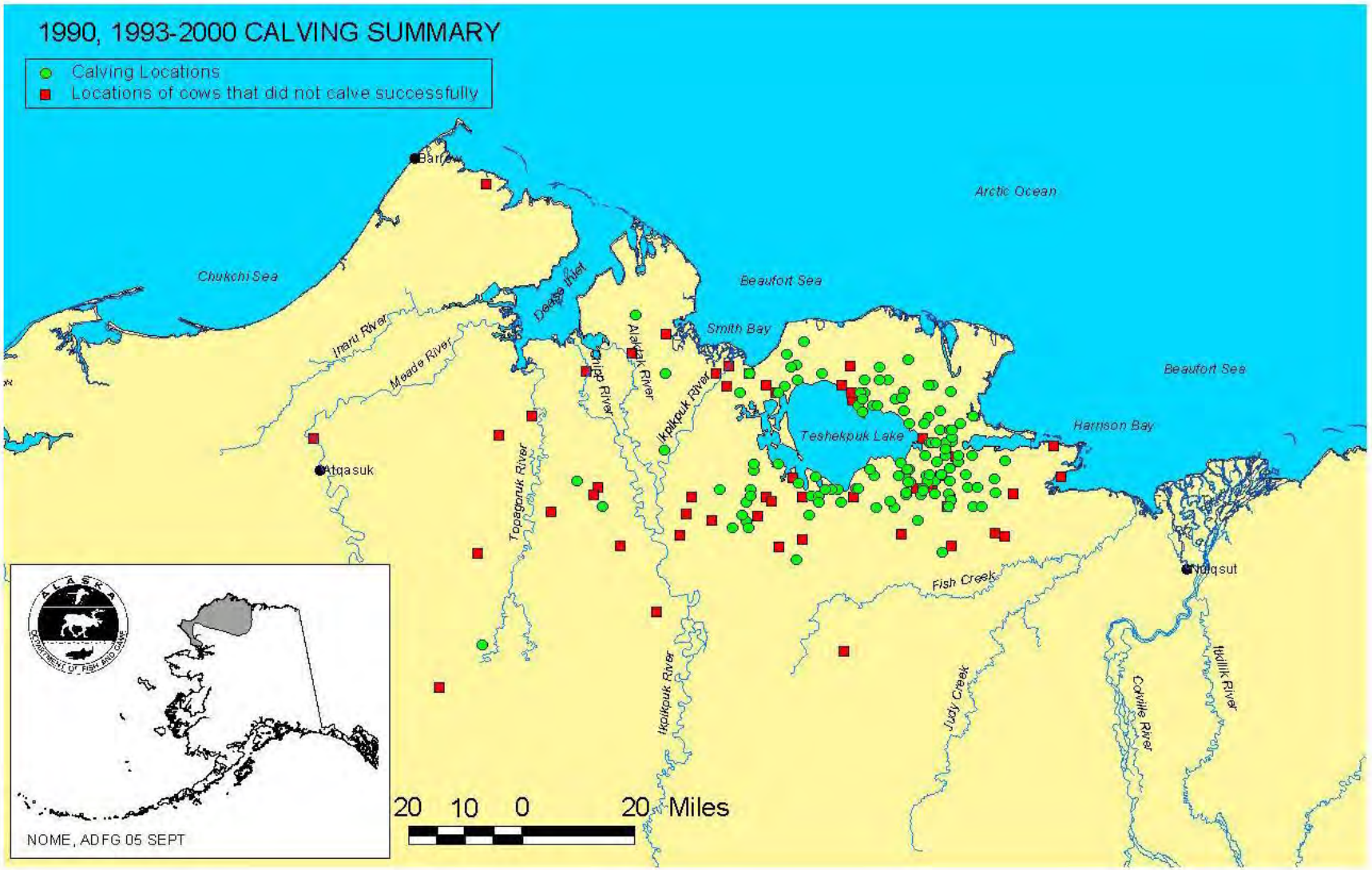

Figure 1 Calving locations of cows that calved successfully and locations of cows that either did not have calves (nonparturient cows) or had calves that died before they were observed during the June 2 –16 calving season, 1993-2000

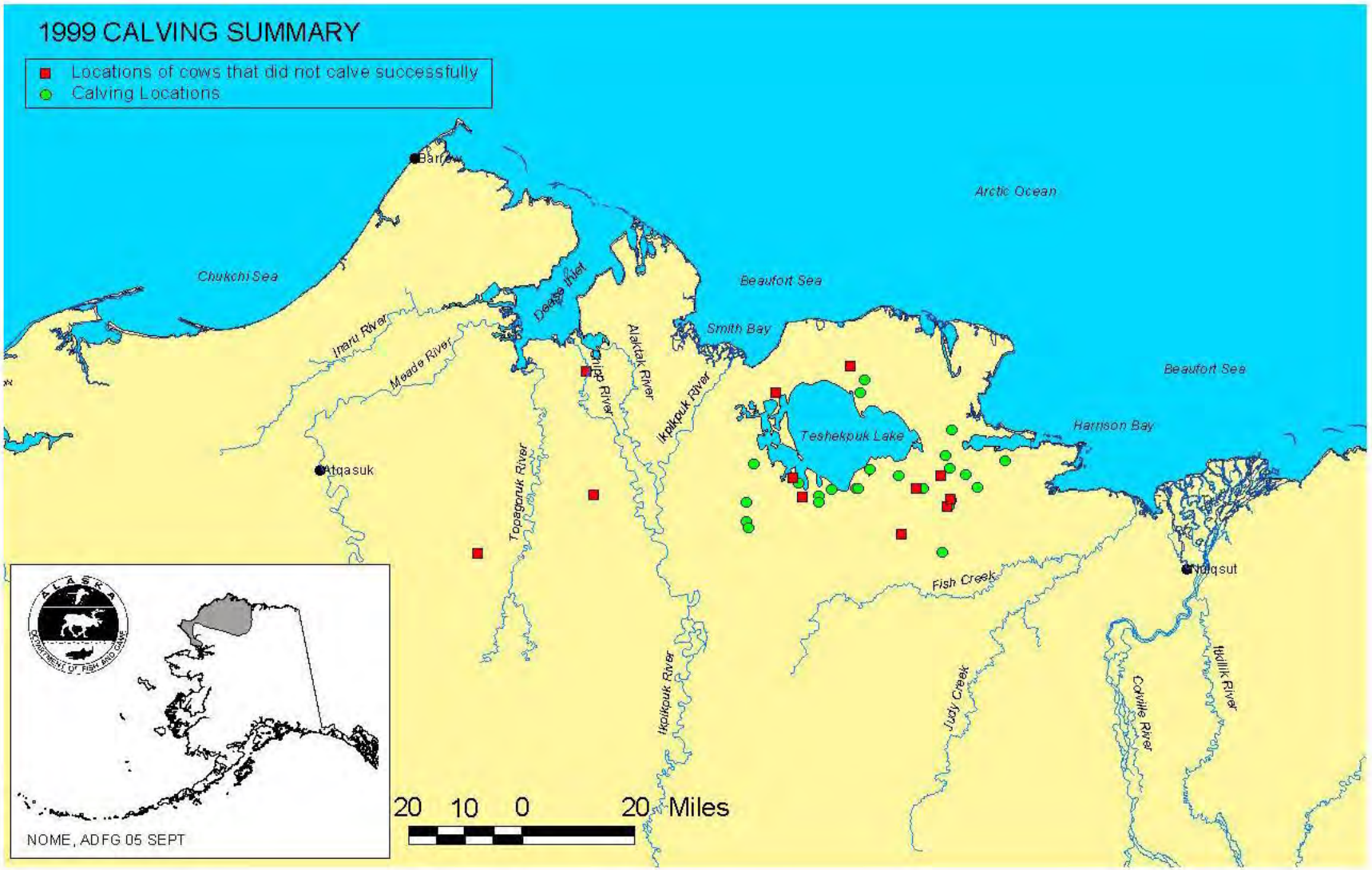

Figure 2 Calving locations of cows that calved successfully and locations of cows that either did not have calves (nonparturient cows) or had calves that died before they were observed during the June 2 –16 calving season, 1999

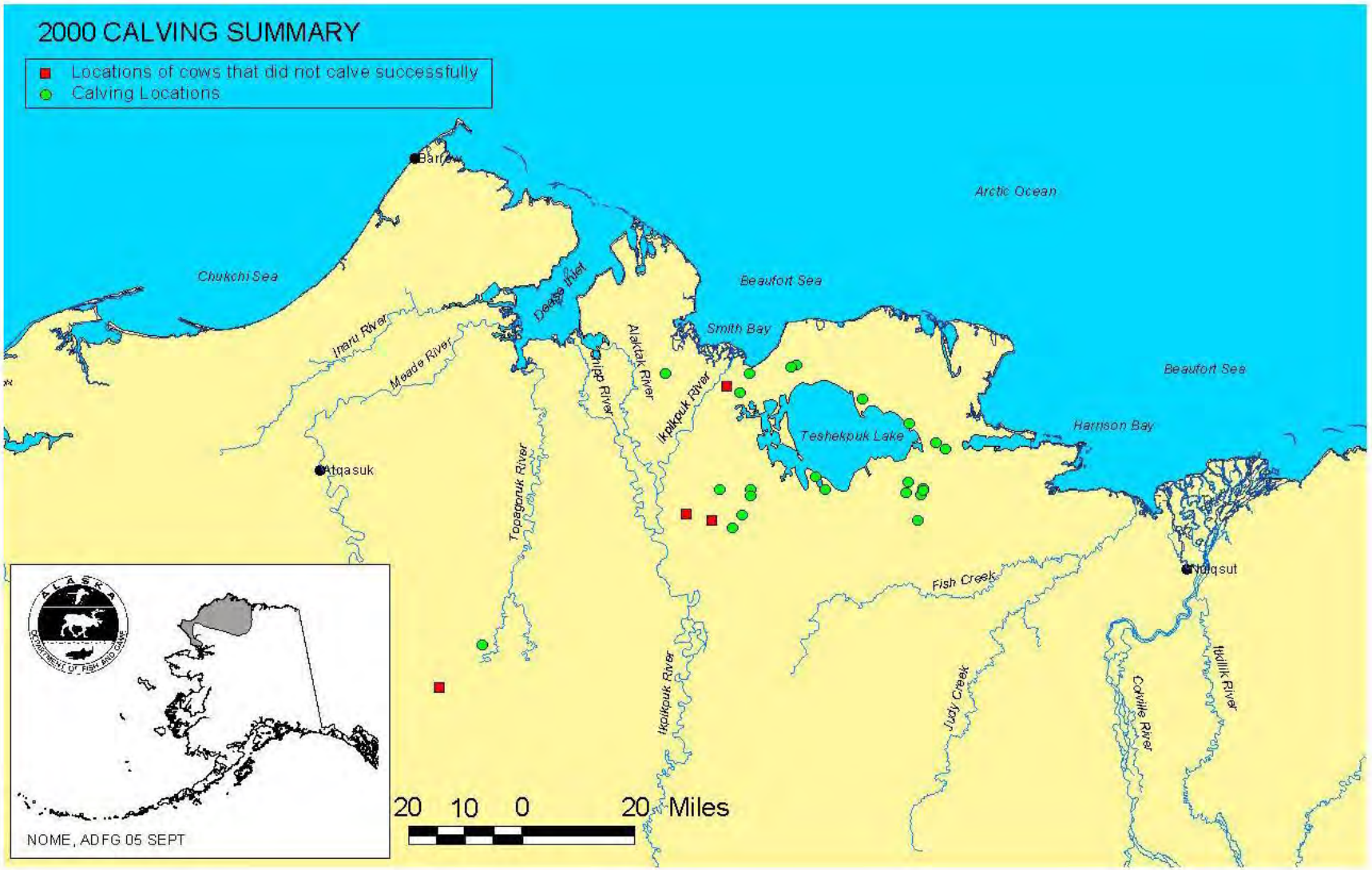

Figure 3 Calving locations of cows that calved successfully and locations of cows that either did not have calves (nonparturient cows) or had calves that died before they were observed during the June 2 –16 calving season, 2000

Alaska Department of Fish and Game
Division of Wildlife Conservation
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CARIBOU MANAGEMENT REPORT

From: 1 July 1998
To: 30 June 2000

LOCATION

GAME MANAGEMENT UNIT: 26B and 26C (25,787 mi^2)

HERD: Central Arctic

GEOGRAPHIC DESCRIPTION: Central Arctic Slope and Brooks Range

BACKGROUND

The Central Arctic caribou herd (CAH) was recognized as a discrete herd in the mid-1970s and was estimated at 5000 caribou in 1975 (Cameron and Whitten 1979). The CAH increased to approximately 13,000 by 1983 and to over 23,000 by 1992 (Valkenburg 1993). The herd declined to 18,100 in 1995 and stabilized for a few years. Herd size was estimated at 19,700 in 1997 and increased substantially during 1997–2000 to over 27,000 animals because of low adult mortality (<10%), high parturition rates and high calf survival (≥90 and ≥75% respectively, for females ≥4 years old in 1998, 1999, and 2000.

The herd's 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. Much of the summer range lies within, or adjacent to, the industrial area near Prudhoe Bay. 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 and Teshekpuk Herds on summer and winter range to the west. However, there is no record of permanent exchange of caribou among these herds.

Oil exploration and development on the North Slope began in the late 1960s and provided the impetus for long-term Alaska Department of Fish and Game (ADF&G) studies of population dynamics, distribution, movements, and effects of development on the CAH. During the 1980s calving activity was rare in the Prudhoe Bay oilfield (Whitten and Cameron 1985), where it was known to occur before development. Additionally, cows and newborn calves were underrepresented along the trans-Alaska pipeline corridor and around oil production facilities in the early 1990s (Cameron et al. 1992; Cameron and Smith 1992). By the mid-1980s, major movements of CAH caribou through the Prudhoe Bay oilfield in summer had ceased and caribou distribution and movements within the Kuparuk oilfield were altered substantially (Smith and Cameron 1983, 1985*ab*; Whitten and Cameron 1983, 1985; Curatolo and Murphy 1986). In the

mid-1990s research on the Central Arctic Herd was reduced substantially and efforts were focused on monitoring population parameters and their relationship to management objectives.

MANAGEMENT DIRECTION

Based on the hypothesis that displacement, if of sufficient magnitude, would be harmful to the CAH (Cameron 1983), ADF&G proceeded with 2 management approaches. We worked with the oil industry to minimize disturbance to caribou movement from physical barriers created by oil development. Acting on the assumption that stress is cumulative, ADF&G also reduced hunting activity in areas adjacent to the oilfield and the pipeline haul road. The current management objectives reflect these concerns.

MANAGEMENT GOALS AND OBJECTIVES

- Minimize the adverse effects of development on caribou.
    - Work with industry to ensure free passage of caribou.
    - Work with industry and other agencies to minimize disturbance to caribou in proximity to developments, except where caribou constitute a hazard.
    - Maintain necessary restrictions on caribou hunting.
- Provide for continued caribou hunting, especially in areas away from developments, at a level that does not significantly affect population dynamics of the CAH.
    - Determine the influence of current harvest levels on the CAH.
    - Minimize harvest of cows from the CAH.
    - Maintain a bull:cow ratio of at least 40:100.
- Maintain opportunities for people to see caribou along the Dalton Highway and in the oilfields.
    - Work with industry and other agencies to minimize disturbances to caribou in proximity to developments, except where caribou constitute a hazard.
    - Regulate hunting along the Dalton Highway so conflicts between hunters and nonconsumptive users are minimized and caribou are not displaced from the vicinity of the road by hunting.

METHODS

POPULATION STATUS

Population size was estimated in July 1997 and 2000 using the modified aerial photo-direct count technique (Davis et al. 1979). Postcalving aggregations of caribou were located by radiotracking collared animals. ADF&G staff conducted each census when large aggregations had formed.

These usually occurred when temperatures were >55°F and wind was <8 mph. Groups of caribou were photographed with a Ziess RMK-A 9×9-inch aerial camera mounted in a DeHavilland Beaver aircraft. Caribou were counted directly from photographs.

Initial productivity was determined by estimating parturition rates of radiocollared females ≥2 years old during the first half of June 1994, 1995, and 1997–2001. Parturition rates were estimated during 30 May–15 June in 1988–1993. We determined parturition status based on the presence of calves or the timing of antler shedding and/or udder distension (Whitten 1991). The animal was classified as parturient (calf may have been lost already) (Whitten 1991) if a caribou had hard antlers but we could not determine whether udders were distended. Observations were made from fixed-wing aircraft.

Cameron (ADF&G [retired], personal communication) estimated that 80% of CAH cows maintain fidelity to calving areas west or east of the Sagavanirktok River from year to year. Because there is some indication that 2 different geographic areas have been used for calving, parturition and early survival data were stratified as Unit 26B West (west of the west bank of the Sagavanirktok River) or Unit 26B East (east of the Sagavanirktok River). These 2 calving areas may not be totally separate, but are nonetheless somewhat distinct. Because some overlap does occur, we arbitrarily chose the line that separates Unit 26B West, where there is substantial oil exploration and development, from Unit 26B East, where little exploration and development has occurred.

Early calf survival rates were monitored by estimating calf:cow ratios (calves:100 females). Rates were based on observations of radiocollared females ≥2 years old in the last half of June 1994–2001, after most calving should have occurred. Calf:cow ratios were determined from the last half of June through mid-August during 1988–1993. 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." Data were stratified based on the location of caribou east and west of the Sagavanirktok River, as described above.

Parturition rates and calf:cow ratios were calculated for 3 categories: known–age females, females ≥4 years old, and “sexually mature” females. “Sexually mature” females were those that were known to have been parturient prior to being included in the sample. By only looking at females known to be sexually mature, variability at first age of reproduction is eliminated (R Cameron, ADF&G [retired], personal communication).

We used logistic regression to compare parturition rates and early calf survival for females ≥4 years old for Unit 26B across years and in Unit 26B West and Unit 26B East. We tested for differences due to year, area, and the year/area interaction ($P = 0.05$).

POPULATION COMPOSITION

Prior to 1994 calving surveys were conducted every year in conjunction with ongoing research. Beginning in 1994 they were conducted every 3 years.

We conducted calving surveys on the calving grounds during 10–14 June 1997 and 15–17 June 2000. A pilot and observer in an R-22 (1997) or R -44 helicopter (2000) searched for caribou along 16 3.2-km-wide strip transects oriented north-south and spaced at 10-km intervals from the

Colville River to the Canning River. Transects extended from the coast to 69°50'N and from 150°29'W to 148°57'W in the area west of Prudhoe Bay. Additional transects were added to the zone within the Milne Point road system to provide additional information in the developed area. This zone was apportioned into 1-km-wide strata with transects extending from the coast to 70°15'N and from 149°53'W to 150°02'W. To the east of Prudhoe Bay, transects extended from the coast to 69°45'N and from 148°27'W to 146°25'W. We recorded total number, sex and age composition, distance from the coast (1997), and latitude and longitude (2000) for each group of caribou located. In previous years a Bell 206B or Hughes 500D helicopter with 3 observers was used and map location or latitude/longitude was recorded. In addition, previous transects in the area west of Prudhoe Bay extended south only to 70°N. Because we observed caribou calving further south on the west side during the past few years, we extended transects to include these areas in 1997. Fall composition was estimated from a helicopter in mid-October 2000 and 2001. Caribou were classified as cows; calves; and small, medium, or large bulls. No fall composition surveys were conducted during RY97–RY99 (RY = regulatory year, e.g., RY99 = 1 Jul 1999–30 Jun 2000) because of poor weather.

MOVEMENTS AND DISTRIBUTION

Movements of the CAH were determined by relocating radiocollared females during June and July, mid-October, and late March or early April. Distribution during the calving season was determined during calving surveys, as described above.

HARVEST

Harvest and hunting pressure for Alaska residents living south of the Yukon River, and for nonresidents, were monitored using harvest reports submitted by hunters. Total harvest, residency and success, chronology, and transportation were summarized by regulatory year.

Alaska residents living north of the Yukon River were not required to obtain caribou harvest tickets/report cards. However, they were required to register with ADF&G or an authorized vendor. The Alaska Department of Fish and Game's Division of Subsistence estimated caribou harvest by residents of Kaktovik and Nuiqsut. Caribou harvested by hunters from Nuiqsut included animals from the Teshekpuk and Western Arctic caribou herds, as well as some CAH caribou.

A checkstation was operated on the Dalton highway near the Yukon River Bridge during August and September in 1991, 1992, 1993, 1996, 1997, and 1998. Checkstation reports are on file at ADF&G, Fairbanks.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We estimated 27,128 caribou in July 2000 based on a photocensus conducted during the postcalving aggregation. This represented a 37.5% increase (an average of 12.5% annually) from the July 1997 estimate of 19,730 (Table 1). Population modeling indicates this increase can be accounted for by the high parturition rates, high summer calf survival, and low adult mortality

observed during this period (Tables 2, 3, 4). In 1998, 1999 and 2000, observations of radiocollared females indicated parturition rates were greater than 90% and late June calf:cow ratios were high – greater than 75%. Adult mortality among radiocollared animals was low (<10%) in RY97, RY98, and RY99. It is likely that the CAH has continued to increase since July 2000 because parturition rates and late June calf:cow ratios in 2001 were still high and adult mortality for RY00 was <15%. A census was not conducted in 2001.

Parturition rates of radiocollared females ≥4 years old in Unit 26B increased between 1994 and 2001 (P = <0.0004, Table 2), and exceeded 90% during 1998–2001. Parturition rates for 3-year-olds were also high during 1998–2001 (≥75%), although sample sizes were small (range = 4–13; Table 4). Variability in parturition rates can be relatively high among 3-year-old cows, but a high rate is indicative of good nutritional condition (Valkenburg et al. 2000). In 1995, when the population appeared to decline somewhat (Table 1), no 3-year-old females were pregnant (n = 4) and parturition rates for females ≥4 years old was also low (56%, Table 2). No data are available for 1996, but parturition rates for females ≥4 years old increased slightly in 1997 (61%; Table 2); only two 3-year-olds were relocated and neither was parturient. Parturition rates of "sexually mature" females were similar to females ≥4 years old (Table 2).

During 1994–2001 the parturition rate was considerably higher in Unit 26B West than in Unit 26B East in some years (Table 2). However, parturition rates for females ≥4 years old during 1994–2001 did not differ between West and East (P = 0.34), and there was no significant area/year interaction (P = 0.51). A significantly lower mean parturition rate was detected in animals in the West than in the East (P = 0.003) during 1988–1994 (Cameron 1995; Cameron et al. 2002; Table 2), when the population was declining.

Although our analyses used the Sagavanirktok River to separate eastern and western areas, there are several reasons to view this approach and the results with caution. Even though density of calving caribou is lower near the Sagavanirktok River than in areas further east or west, there is not complete separation between calving concentrations, and there may be no biological reason to separate caribou based on calving areas. Also, this may not be the best dividing line if calving distribution changes. Furthermore, we may not be able to detect differences between areas because of small sample sizes in some years.

Late June calf:cow ratios for radiocollared females ≥4 years old was 75–86% during 1997–2001 (Table 3), indicating consistently high early calf survival during the past 5 years. During 1998–2001, variability in calf:cow ratios was higher for 3-year-olds than for the overall sample in the herd (33–60%, Table 5), suggesting that calves born to 3-year-olds tend to have lower survival rates. However, sample sizes were small. Late June calf:cow ratios were somewhat lower in 2000 and 2001 (75 and 79%) than in 1998 and 1999 (81 and 86%); probably because of an extremely late spring in both 2000 and 2001 which may have reduced early summer calf survival. As in the case of parturition rates, late June calf:cow ratios were considerably higher in Unit 26B West than in Unit 26B East in 1995 and 1997, but logistic regression indicated that there were no significant differences due to area (East or West; P = 0.70) or area/year interaction (P = 0.69) for females ≥4 years old during 1994–2001 (Table 3). In contrast to parturition rates, there was no significant difference in calf:cow ratios between years (P = 0.15). However, calf:cow ratios were lower (<65%) during years when the herd was declining or stable (1994–1996) than in years when the

herd was increasing (1997–2001, ≥75%). Late June calf:cow ratios for "sexually mature" females were similar to those observed for females ≥4 years old (Table 3).

High parturition rates and calf:cow ratios in 1998, 1999, and 2000 appear to be the major factors accounting for the increase in population that occurred between 1997 and 2000. Low adult mortality also contributed to the increase.

Population Composition

We estimated 72 calves:100 cows during calving ground surveys in both 1997 and 2000 (Table 1). Estimated calf:cow ratios in Unit 26B West were 69:100 during 1997 and 72:100 during 2000, and in Unit 26B East they were 81:100 in 1997 and 70:100 in 2000. Because these surveys were limited to calving areas, nonparturient cows are underrepresented and the data do not accurately reflect overall herd composition.

Fall composition surveys in October 2000 and 2001 indicated bull:cow ratios of 84:100 and 73:100 and calf:cow ratios of 57:100 and 54:100 (Table 6). These high bull:cow ratios indicate that harvest has had little effect on sex ratios. Bull:cow ratios have been high since 1976 (>50:100). The high calf:cow ratios indicate that summer calf survival rates were relatively high in 2000 and 2001. These surveys occurred in the Brooks Range in the Chandalar Shelf, Atigun Pass, and upper Sagavanirktok River areas. No surveys were conducted during 1997–1999.

Distribution and Movements

The proportion of the CAH calving southwest of the Kuparuk oilfield appeared to be higher during the early 1990s than in the 1980s, when calving was relatively common in the Kuparuk oilfied (ADF&G files). Preliminary analysis of calving survey data for 1994, 1997 and 2000, and telemetry data for 1994–2001, indicate a similar pattern. No directional shift in distribution of caribou calving east of the Sagavanirktok River was noted. However, calving survey and telemetry data for 1994, 1997, and 2000 will be analyzed further.

In 2000 and 2001, exceptionally late spring and deep snow delayed migration and many caribou calved before they reached the traditional calving grounds. In addition, calving distribution in 2001 deviated somewhat from previous years. Three radiocollared females were found west of the Colville River in the Fish Creek drainage in Unit 26A.

Movements during summer (postcalving) are influenced by insect abundance, which is largely dependent on temperature and wind speed. Generally, when temperature is >55°F and wind speed is <8 mph, caribou are found along the coast or on large gravel bars. CAH caribou were not radiotracked during July and August from 1995 through 2000 except in connection with a photocensus. Anecdotal observations indicate that postcalving distribution and movements during July did not vary significantly during 1994–2001, with caribou distribution depending on weather conditions. Caribou were concentrated along the coast during warm weather but moved inland on cool and windy days. During the 1997 and 2000 July censuses, some groups were located as far east as the Tamayariak and Katakturuk Rivers, respectively, and a dead radiocollared caribou was found on Marsh Creek, east of the Katakturuk River. In 1997, one small group (<250) ranged as far west as Fish Creek, west of the Colville River.

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. However, summer distribution during 2001 was different than in previous years. In late July an estimated 5000 Central Arctic caribou were found inland in the Fish Creek drainage in Unit 26A. Unusually warm temperatures persisted during most of September, and most of the CAH remained on the North Slope as far north as the White Hills and Franklin Bluffs until about mid-October.

During the rutting season in October, CAH caribou are frequently found on the Chandalar Shelf and Dietrich River. In October 2000 approximately 5000 caribou were located along the Chandalar Shelf and the upper North Fork Chandalar River. There were several groups between Thru Creek and Your Creek in the Chandalar drainage, about 5000 caribou were along the Middle Fork Chandalar and Wind Rivers, and approximately 350 were in Atigun Pass. Due to poor weather and budget constraints, we did not radiotrack caribou west of the Dalton Highway and north of the Brooks Range. During the 2001 rutting season, there were approximately 8000 caribou in the Atigun Pass area and 3500 in the west fork of the Atigun River. These animals were probably migrating to rutting and wintering grounds. There were approximately 6000 caribou in the Chandalar Shelf area and in the upper North Fork Chandalar River. On the north side of the Brooks Range, a group of 2000 animals were found in Accomplishment Creek, 1500 animals were in the east fork of the upper Sagavanirktok River, and approximately 1000 caribou were located in the upper Itkillik River.

Many Central Arctic caribou wintered in the Chandalar Shelf area and east into the Wind River drainage, and also in the Tinayguk and upper North Fork Koyukuk Rivers during several years prior to 1995 (ADF&G files). In late March 2001 we observed approximately 12,000 caribou while radiotracking collared females. In the area south of the Brooks Range and east of the Dalton Highway, we estimated there were approximately 1500 caribou in the upper Wind River, 2600 along the Middle Fork Chandalar River, and 3900 near Your Creek. Approximately 500 caribou wintered in the upper John River, west of the Dalton Highway, and an estimated 2750 were located in the upper Sagavanirktok River, north of the Brooks Range. We were unable to search the remaining drainages north of the Brooks Range and east of the Dalton Highway. We counted approximately 600 caribou on the North Slope, west of the Dalton Highway.

In early March 2002, winter distribution was determined by tracking radiocollared females. Approximately half of the Central Arctic Herd was on the south side of the Brooks Range with the largest concentrations in Your Creek and Thru Creek. Subsequently, the largest groups were found in the north fork of the East Fork Chandalar River, and some occurred in the Middle Fork Chandalar River. Numerous tracks were observed in the upper North Fork Chandalar River, but few caribou were observed. Few tracks or caribou were observed in the headwaters of the Middle Fork Chandalar River or in the Wind River. One collared caribou was located by Ackerman Lake and 2 were located in Glacier Creek and Hammond River (west of the Dalton Highway), but the number of caribou in these areas was not estimated. The rest of the herd was located primarily on the north side of the Brooks Range along the foothills between the Sagavanirktok and Canning Rivers. The largest concentrations were in the Sagavanirktok, and Saviukviayak and Flood Creek drainages. Caribou also occurred along Accomplishment Creek, in the Ribdon, Lupine, Ivishak,

and Echooka drainages, and near the Canning River. Although budget and weather constraints precluded thorough surveys west of the Dalton Highway, it appeared that most of the herd wintered east of the highway.

During some years, caribou from the Western Arctic Herd mixed with the CAH during fall and winter. Central Arctic caribou probably also mix with the Teshekpuk Herd during late summer, fall and winter, and their range sometimes also overlaps with the PCH during winter and summer (ADF&G files). During 1995–2000, there was little or no mixing with the PCH during summer, largely because the PCH remained on the calving ground for only a short time and returned to Canada soon after calving. Some mixing may have occurred during summer 2001 when about 10,000 Porcupine caribou inhabited the Sadlerochit Mountains and Central Arctic caribou were located near the Canning River, 10–20 miles away. During winter we detected a small amount of overlap in CAH and PCH distribution when approximately half of the PCH was thought to have wintered in Alaska near Arctic Village. One Central Arctic radiocollared caribou was found on the Junjik River near some collared PCH caribou and a hunter killed a Central Arctic radiocollared female near Arctic Village in January 2002. One collared PCH caribou was found on the Ribdon River near some CAH animals.

MORTALITY

Harvest

Most harvest occurred in Unit 26B, but some also occurred in Units 24, 25A, and 26A. Parts of the Western Arctic Herd 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 (RY96–RY00).

Unit/Location	Resident Open Season/Bag Limit	Nonresident Open Season/Bag Limit
Unit 24, except for the Kanuti drainage upstream from and including Kanuti Chalatna Creek, and the Fish Creek and Bonanza Creek drainages of South Fork Koyukuk River.	1 Jul–30 Jun; 5 caribou per day; however, cow caribou may not be taken 16 May–30 Jun.	1 Jul–30 Jun; 5 caribou total; however, cow caribou may not be taken 16 May–30 Jun.
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 caribou may be taken from 1 Jul–30 Sep and cow caribou may be taken only from 1 Oct–30 Apr.	1 Jul–30 Apr; 2 bulls; however, only 1 bull may be taken 1 Jul–30 Sep.

Unit/Location	Resident Open Season/Bag Limit	Nonresident Open Season/Bag Limit
Unit 26B, that portion north of 69°30´ and west of the east bank of the Kuparuk River to a point at 70°10´N latitude 149°04´W longitude, then west approximately 22 miles to 70°10´ latitude 149°56´W longitude, then following the east bank of the Kalubik River to the Arctic Ocean.	1 Jul–30 Apr; 10 caribou	1 Jul–30 Apr; 5 caribou
Remainder of Unit 26B.	1 Jul–30 Apr; 2 caribou; however, only bulls may be taken from 1 Jul–30 Sep and cow caribou may be taken only from 1 Oct–30 Apr.	1 Jul–30 Apr; 2 bulls
Unit 26C.	1 Jul–30 Apr; 10 caribou; however; only bull caribou may be taken 23–30 Jun.	1 Jul–30 Apr; 5 caribou

Additional state regulations that affect caribou hunting include special restrictions along the Dalton Highway. 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. The area is closed to hunting with firearms. Big game, small game, and fur animals can be taken by bow and arrow only, but hunters must possess a valid Alaska Bowhunter Education Program card or a recognized equivalent certification. In addition, no motorized vehicles except aircraft, boats, and licensed highway vehicles may be used to transport game or hunters within the DHCMA. During the March 2002 Board of Game meeting, additional restrictions were established (see below).

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.

Board of Game Actions and Emergency Orders. In RY96 the bag limit for caribou in Unit 26B outside the DHCMA (not including that area southwest of the Kalubik and Kuparuk Rivers) was changed from 1 to 2 caribou. No changes in seasons or bag limits were considered during the March 1998 and 2000 Board of Game meetings, and no emergency orders were issued during RY96–RY00.

During the March 2000 Board of Game meeting, 'Intensive Management' population and harvest objectives were established for the CAH. The population objective is 18,000–20,000 caribou and the harvest objective is 600–800 caribou (N Babbitt, ADF&G, personal communication).

During their March 2002 meeting the Board of Game considered a number of proposals related to bow hunting and the use of motorized vehicles in the DHCMA, some of which will affect CAH caribou harvest. The board established the North Slope Closed Area, which is closed to big game hunting. The area includes the portion of Unit 26B within ¼-mile of the Dalton Highway from

Atigun Pass north to the Prudhoe Bay Closed Area. The board also established a requirement that hunters using the DHCMA mark arrows with their bowhunter education certification number, extended the restrictions on the use of motorized vehicles in the DHCMA to apply to the Prudhoe Bay Closed Area, and limited the use of licensed highway vehicles in the DHCMA to publicly maintained roads. Caribou seasons and bag limits were not changed.

Hunter Harvest and Success and Residency. Reported harvest and success rate were considerably higher in RY00 than in the previous 7 years (Table 7). The change in harvest over time in the CAH probably resulted from a combination of regulatory modifications and changes in hunting pressure. Beginning in RY86, more restrictive regulations were adopted and harvest decreased substantially during the following years through RY90. In RY90 hunting restrictions were implemented on several Interior Alaska caribou herds (e.g., Delta, Macomb, Fortymile), and hunters were displaced. Because the CAH's range is accessible by road, many of these hunters began hunting it. Harvest was low in RY96, likely due to a combination of poor weather in August and September and the closure of the moose season in Unit 26B. Harvest increased in RY97 and continued to increase thereafter.

During RY98, 699 hunters reported hunting caribou in the CAH range (Table 7) and 281 hunters reported harvesting 315 caribou (45% success rate). In RY99, 722 hunters reported hunting caribou and 309 hunters reported harvesting 362 animals (50% success rate). In RY00, 808 hunters reported hunting and 415 reported harvesting 493 caribou (61% success rate). Hunter success has always been high for the Central Arctic Herd (>49%).

Bowhunters accounted for 44% of the harvest in RY00. The number of caribou harvested by archers was higher during RY96–RY00 ($\bar{x}$ = 35%) than during the previous 4 years (RY92–RY95; $\bar{x}$ = 25%; Table 7). This may reflect changes in the distribution of caribou, particularly in RY99 and RY00. The most important factor was probably the steady increase in the number of bow hunters using the DHCMA.

Harvest by nonresident hunters was small (12–17%) during RY92–RY00, although their success rate was high (60–88%). Success rate for resident hunters during the same time period was 39–54%. Harvest by local residents (residents of Units 24, 25, 26) was estimated at 200–250 caribou annually. However, it is difficult to accurately assess the harvest of CAH animals by some local residents, especially in the Nuiqsut area, because the Teshekpuk and Western Arctic Herds frequently mix with the Central Arctic Herd during periods when much of the harvest occurs.

Harvest Chronology. During RY98–RY00 most of the reported harvest occurred in August (range = 52–61%). The remaining harvest occurred primarily in September and October. The chronology of harvest was similar to previous years (Table 8). However, the proportion of harvest in August was higher during the past 5 years ($\bar{x}$ = 54%; RY96–RY00) than in the 4 years preceding that ($\bar{x}$ = 44%; RY92–RY95), probably because of the increase in new hunters hunting in August and the closure of the moose season on the North Slope in RY96 which reduced the number of hunters in the field during September. The proportion of the harvest in September was slightly higher prior to RY96 ($\bar{x}$ = 25%, RY92–RY95) than in subsequent years ($\bar{x}$ = 20%, RY96–RY00). The proportion of harvest in October was generally about 17% during RY92–RY98 but declined to 5% and 6% in RY99 and RY00, perhaps due to weather and/or caribou

distribution. A small number of caribou are taken in late winter and spring, primarily in March and April (1–5%).

Harvest by Nuiqsut residents occurred primarily in July, August, and November. During years with favorable weather, most late winter hunting occurred in March and April. When unusually cold weather persists and spring arrives late, caribou are harvested in May (S Pedersen, personal communication).

Transport Methods. Because of restrictions on the use of off-road vehicles within the DHCMA and the remoteness of Unit 26B, most hunters used highway vehicles and aircraft for access. During RY98–RY00, the proportion of hunters using highway vehicles was stable, ranging from 60 to 65%. Airplanes were the second most common transport method and were used by 18–28% of successful hunters; boats, horses, and dogs were each used by ≤15% of hunters (Table 9). Transport methods were similar to methods used in previous years, although use of boats (including airboats) on the Ivishak and Sagavanirktok Rivers has increased somewhat over the past 5 years. Residents of Unit 26 primarily used snowmachines during the winter and spring months and boats during summer months; particularly on the Colville River and Fish Creek in Unit 26A (S Pedersen, personal communication).

Natural Mortality

Radiocollared caribou were relocated infrequently during fall and winter, making it difficult to estimate adult mortality or determine causes of adult mortality. Wolves (*Canis lupis*), grizzly bears (*Ursus arctos*), and golden eagles (*Aquila chrysaetos*) are the 3 most common predators on Arctic caribou (Whitten et al. 1992). However, natural mortality of CAH caribou during calving and postcalving is relatively low because calving occurs in areas near the coast where there are few wolves, and predation by golden eagles appears to be rare compared to the Porcupine caribou herd (Murphy and Lawhead 2000). Grizzly bear numbers may have increased in the oil field, in part because of the availability of garbage associated with oil development (Murphy and Lawhead 2000), and predation by grizzly bears may have increased in recent years. 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 are probably more abundant than they are on the north side of the range. However, there have been no studies of predation rates on the CAH. During the 4 years from RY97–RY00 we confirmed 3 (3%), 1 (2%), 8 (9%), and 15 (14%) mortalities among cow caribou with functioning radio collars.

CONCLUSIONS AND RECOMMENDATIONS

High parturition rates and late June calf:cow ratios, and low adult mortality during 1998, 1999, and 2000 contributed to an increase of approximately 37.5% in the Central Arctic caribou herd between 1997 and 2000 (Tables 1, 2, and 3). These population parameters were similar in 2001, suggesting that the CAH has been stable or has increased since July 2000.

Harvest increased in RY00, but was still well below sustained yield (<2% of the herd). Most hunters living outside of Unit 26 used primarily highway vehicles as a means of access with most harvest occurring in August. Harvest by bow hunters has also increased in recent years. Hunters

residing in Unit 26 used primarily snowmachines, with most of this harvest occurring in July and August.

Although herd size has increased and harvest has remained somewhat stable with a slight increase in RY00, the CAH has provided substantial hunting opportunity. We recommend no regulatory changes but suggest revised management goals and objectives for the next reporting period as follows:

MANAGEMENT GOALS

Goal 1 Minimize the adverse effects of development on CAH caribou.

Goal 2 Maintain a CAH population level that will support a harvest of at least 600 caribou without precluding population growth.

Goal 3 Provide the opportunity for a subsistence harvest of CAH caribou.

Goal 4 Maintain opportunities to view and photograph CAH caribou.

MANAGEMENT OBJECTIVES

Objective 1 Maintain a population of at least 18,000–20,000 caribou. (Goals 1, 2, 3)

Objective 2 Maintain accessibility of seasonal ranges for CAH caribou. (Goal 1)

Objective 3 Maintain a harvest of at least 600 caribou if the population is ≥18,000 caribou. (Goal 2)

Objective 4 Limit the annual harvest of cows to a maximum of 3% of the cows in the population. (Goals 1, 2, 3)

Objective 5 Maintain a ratio of at least 40 bulls:100 cows. (Goals 1, 2, 3)

Objective 6 Reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. (Goal 3)

MANAGEMENT ACTIVITIES

- Conduct a photocensus every 2–3 years. (Objective 1)
- Radiocollar 10–20 yearling females every 1–2 years. (Objectives 1, 2)
- Estimate parturition rate and late June calf:cow ratios for radiocollared females. (Objective 1)
- Work with the oil industry and other agencies to minimize disturbance to caribou from resource development. (Objective 1, 2)
- Monitor early summer, fall, and winter distribution. (Objective 1, 2)

- Conduct annual fall composition counts. (Objectives 3, 4, 5)
- Monitor harvest through harvest ticket reports and Division of Subsistence harvest surveys. (Objectives 3, 4)
- Regulate hunting to maintain a maximum annual harvest rate of 3% of cows in the population. (Objective 4)
- Regulate caribou hunting along the Dalton Highway to reduce conflicts between consumptive and nonconsumptive uses. (Objective 6)

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Table 1 Central Arctic Herd caribou calving composition on the calving grounds[a] and estimated population size, 1978–2000

	Calving composition survey						Population survey	
Year	Month/ Date	Yearlings: 100 Cows	Bulls:100 Cows	Calves:100 Cows	Percent calves	Composition sample size	Date and method[b]	Estimated size
1978	Jun		19	68	36	950	Jul; STS	5000
1979	Jun	24	6	80	38	1865		
1980	Jun	48	4	69	31	787		
1981	Jun	22	9	87	40	3337	Jul; AC	8537
1982	Jun		20	62	34	1101		
1983	Jun		16	86	42	1879	Jul; APDCE	12,905
1984	12 Jun	25	9	89	40	2692		
1985	13–14 Jun	35	16	88	37	2357		
1986	12–13 Jun	33	7	56	29	891		
1987	13 Jun	19	4	74	37	4839		
1988	10–15 Jun	32	7	66	32	4892		
1989	11–15 Jun	16	6	48	28	2520		
1990	11–15 Jun	11	31	75	35	6543		
1991							18–20 Jun; GM	19,046[c]
1992	11–14 Jun	12	6	73	38	5556	8–9 Jul; APDC	23,444
1994	12–14 Jun	8	17	65	29	3638		
1995							13 Jul; APDC	18,100
1997	11–12 Jun	37	9	72	33	1995	19–20 Jul; APDC	19,730
2000	15–17 Jun	32	5	72	34	3097	21 Jul; APDC	27,128

[a] Many bulls and yearlings are not on the calving grounds during this time.

[b] STS = Systematic transect surveys; AC = Aerial count; APDCE = Aerial Photo Direct Count Extrapolation; GM = Gasaway Method; APDC = Aerial Photo Direct Count.

[c] Ninety-percent confidence interval was 14,677–23,414.

Table 2 Central Arctic Herd caribou percent parturition of radiocollared females ≥4 years, 1988–2001

Year	Date	Percent parturition by subunit					
		≥4 years old[a]			Sexually mature[b]		
		26B West (*n*)	26B East (*n*)	All 26B (*n*)	26B West (*n*)[c]	26B East (*n*)[c]	All 26B (*n*)
1988	2–14 Jun				73 (11)	100 (8)	85 (34)
1989	30 May–10 Jun				54 (13)	78 (9)	65 (23)
1990	31 May–14 Jun				83 (12)	100 (7)	87 (23)
1991	2–8 Jun				46 (11)	75 (12)	67 (30)
1992	6–12 Jun				73 (11)	75 (12)	77 (26)
1993	7–12 Jun				56 (9)	63 (8)	59 (17)
1994	10–14 Jun	67 (6)	78 (9)	73 (15)	67 (6)	88 (8)	79 (14)
1995	7–8 Jun	75 (4)	40 (5)	56 (9)	67 (3)	40 (5)	56 (9)
1996[d]							
1997	6–7 Jun	77 (13)	46 (13)	61 (26)	83 (12)	43 (7)	70 (20)
1998	3–4 Jun	93 (14)	90 (10)	92 (24)	92 (13)	100 (7)	95 (21)
1999	5, 9 Jun	100 (14)	100 (10)	100 (24)	100 (14)	89 (9)	100 (23)
2000[e]	6–7 Jun	89 (9)	100 (16)	96 (25)	83 (12)	100 (11)	92 (24)
2001[e]	3–9 Jun	89 (19)	94 (16)	91 (35)	92 (13)	93 (15)	91 (32)

[a] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River.

[b] The criteria for a sexually mature female is that she was determined to have been parturient before including her in the sample. Data for females that were sexually mature were stratified based on the location of caribou east and west of the Sagavanirktok River. However, they were only included in the sample if they were located on the same side during the previous and current summer. Thus, the total (All 26B) may exceed the combination of Unit 26B West and Unit 26B east.

[c] 1988–1994 data are from Cameron 1995 and Cameron et al. 2002.

[d] Survey not completed.

[e] Late spring on North Slope; some caribou still migrating during parturition estimates.

Table 3 Central Arctic Herd caribou late June and summer calf:100 cow ratios[a] of radiocollared females ≥4 years old, 1988–2001

		Late June calf:cow ratios by subunit					
		≥4 years old[b]			Sexually mature[c]		
Year	Date	26B (West) (*n*)	26B (East) (*n*)	All 26B (*n*)	26B (West) (*n*)	26B (East) (*n*)	All 26B (*n*)
1988	Jun, Jul, Aug				47 (15)	100 (7)	71 (31)
1989	Jun, Jul, Aug				55 (11)	60 (5)	55 (20)
1990	Jun, Jul, Aug				67 (9)	75 (4)	63 (16)
1991	Jun, Jul, Aug				45 (11)	75 (4)	56 (22)
1992	Jun, Jul, Aug				64 (11)	82 (11)	71 (24)
1993	Jun, Jul, Aug				56 (9)	56 (9)	56 (18)
1994	27–29 Jun	50 (6)	75 (8)	64 (14)	50 (6)	67 (9)	60 (15)
1995	27, 30 Jun	75 (4)	50 (4)	63 (8)	67 (3)	50 (4)	63 (8)
1996	15–16 Jun	50 (4)	75 (4)	63 (8)	86 (7)	100 (4)	83 (12)
1997	29–30 Jun	85 (13)	64 (11)	75 (24)	83 (12)	50 (6)	74 (19)
1998	29–30 Jun	79 (14)	85 (13)	81 (27)	85 (13)	100 (9)	88 (24)
1999	22–24 Jun	92 (12)	80 (10)	86 (22)	91 (11)	78 (9)	85 (20)
2000	17–19 Jun	79 (14)	72 (18)	75 (32)	73 (15)	79 (14)	77 (30)
2001	23–25 Jun	78 (18)	81 (16)	79 (34)	73 (15)	77 (13)	77 (30)

[a] Late June calf:100 ratio was estimated during 15 June–30 June. Summer calf:100 cow ratio was estimated during 15 June–15 August for years 1988–1993.

[b] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River.

[c] The criteria for a sexually mature female is that she was determined to have been parturient before including her in the sample. Data for females that were sexually mature were stratified based on the location of caribou east and west of the Sagavanirktok River. However, they were only included in the sample if they were located on the same side during the previous and current summer. Thus, the total (All 26B) may exceed the combination of Unit 26B West and Unit 26B East.

Table 4 Central Arctic Herd caribou known-age parturition rates (percent) of radiocollared females, 1994–2001

Year	Date	2-year-olds (*n*)	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 (2)	29 (7)	100 (2)	67 (3)
1998	3–4 Jun	0 (6)	75 (4)	0 (1)	88 (8)	100 (3)
1999	5, 9 Jun	9 (11)	82 (11)	100 (2)	100 (1)	100 (17)
2000	6–7 Jun	0 (8)	80 (10)	100 (9)		94 (16)
2001	3–8 Jun	8 (13)	77 (13)	100 (10)	78 (9)	94 (16)

Table 5 Central Arctic Herd caribou known-age late June calf:cow ratios of radiocollared females, 1994–2001

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)				64 (14)
1995	27–30 Jun	0 (6)	0 (3)			62 (8)
1996	15–16 Jun		71 (7)	50 (4)		83 (6)
1997	29 Jun		0 (1)	57 (7)	100 (3)	100 (3)
1998	29–30 Jun	<1 (7)	50 (4)	0 (1)	86 (7)	100 (5)
1999	22–24 Jun	<1 (11)	40 (10)	100 (2)	100 (1)	80 (15)
2000	17–18 Jun	0 (11)	60 (10)	82 (11)	0 (1)	75 (20)
2001	23–25 Jun	0 (3)	33 (12)	70 (10)	89 (9)	81 (16)

Table 6 Central Arctic caribou herd fall composition counts, 1976–2001

Survey date	Bulls:100 cows	Calves:100 cows	Percent calves	Percent cows	Percent small bulls (% bulls)	Percent medium bulls (% bulls)	Percent large bulls (% bulls)	Percent bulls	Composition sample size
Oct 1976	122	44	17	38				46	1223
Oct 1977	118	55	20	37				43	628
Oct 1978	96	58	23	39				38	816
Oct 1980	132	49	18	35				47	1722
Oct 1981	81	64	26	41	22	41	36	33	1712
16-18 Oct 1992	96	47	19	41	37	27	40	40	2469
22 Oct 1996	61	67	29	44	15	43	43	27	3062
12 Oct 2000	84	57	24	42	45	40	14	35	3335
13 Oct 2001	73	54	24	44	38	39	23	32	4092

Table 7 Central Arctic Caribou Herd harvest and hunter success, regulatory years 1984–1985 through 2000–2001

Regulatory year	Reported harvest					Total hunters	Percent successful hunters	Estimated unreported harvest[b]	Total harvest
	Male	Female	Unk	Total (harvest by bow)[a]					
1984–1985	313	55	0	368				100–200	468–568
1985–1986	482	177	3	662				100–200	762–862
1986–1987	311	34	0	345		287	76	100–200	445–545
1987–1988	176	2	3	181		225	77	100–200	281–381
1988–1989	179	7	0	186		255	73	100–200	286–386
1989–1990	132	8	0	140		221	63	100–200	240–340
1990–1991	96	16	0	112		173	55	100–200	212–312
1991–1992	383	24	1	408		618	57	100–200	508–608
1992–1993	391	32	4	427	(93)	655	58	100–200	527–627
1993–1994	347	23	2	372	(90)	618	54	100–200	472–572
1994–1995	320	20	0	340	(103)	584	54	100–200	440–540
1995–1996	318	18	0	336	(79)	571	53	100–200	436–536
1996–1997	200	18	3	221	(77)	384	49	200–250	421–471
1997–1998	289	18	2	309	(96)	500	54	200–250	509–559
1998–1999	292	18	5	315	(87)	699	45	200–250	515–565
1999–2000	343	17	2	362	(136)	722	50	200–250	562–612
2000–2001	464	28	1	493	(215)	873	56	200–250	693–743

[a] Harvest by bow is included in total harvest.

[b] Estimate by area biologist and Division of Subsistence.

Table 8 Central Arctic caribou herd harvest chronology, regulatory years 1992–1993 through 2000–2001[a]

Regulatory year	Month (%)																						Unk	Total
	Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun			
1992–1993	7	(2)	197	(46)	122	(29)	73	(17)	10	(2)	1	(<1)	1	(<1)	0	(0)	6	(1)	6	(1)	1	(<1)	0	(0)	3	427
1993–1994	34	(9)	152	(41)	73	(20)	78	(21)	14	(3)	1	(<1)	2	(<2)	4	(<1)	3	(1)	8	(2)	0	(0)	0	(0)	3	372
1994–1995	28	(8)	154	(45)	109	(32)	27	(8)	1		0	(0)	0	(0)	0	(0)	12	(3)	6	(2)	0	(0)	0	(0)	3	340
1995–1996	9	(3)	150	(45)	64	(19)	65	(19)	21	(6)	1	(<1)	4	(<1)	1	(<1)	9	(3)	8	(2)	0	(0)	0	(0)	4	336
1996–1997	13	(6)	108	(49)	49	(22)	35	(16)	1		0	(0)	2	(<1)	0	(0)	2	(1)	5	(2)	0	(0)	0	(0)	5	220
1997–1998	7	(2)	189	(61)	40	(13)	44	(14)	1		3	(<1)	0	(0)	0	(0)	7	(2)	14	(4)	0	(0)	0	(0)	4	309
1998–1999	18	(6)	163	(52)	59	(19)	47	(15)	5	(2)	2	(<1)	3	(<1)	2	(<1)	3	(1)	9	(3)	0	(0)	0	(0)	4	315
1999–2000	18	(5)	201	(55)	86	(24)	16	(5)	8	(2)	1	(<1)	1	(<1)	0	(0)	8	(2)	17	(5)	0	(0)	2	(<1)	4	362
2000–2001	42	(8)	262	(53)	109	(22)	32	(6)	11	(2)	0	(0)	2	(<1)	3	(<1)	4	(1)	24	(5)	0	(0)	0	(0)	4	493

[a] Includes only harvest from harvest report cards.

Table 9 Central Arctic caribou herd successful hunter transport methods, regulatory years 1984–1985 through 2000–2001

Regulatory year	Transport methods (%)																Total
	Airplane		Horse/Dog		Boat[a]		3- or 4-Wheeler		Snowmachine		Other ORV		Highway vehicle		Unk		
1992–1993	89	(23)	7	(2)	17	(5)	6	(2)	0	(0)	0	(0)	243	(64)	18	(5)	380
1993–1994	49	(15)	4	(1)	20	(6)	4	(1)	2		0	(0)	242	(73)	12	(4)	333
1994–1995	81	(25)	0	(0)	23	(7)	0	(0)	0	(0)	0	(0)	214	(67)	0	(0)	318
1995–1996	87	(28)	4	(1)	30	(10)	0	(0)	0	(0)	0	(0)	177	(58)	7	(2)	305
1996–1997	63	(28)	8	(4)	19	(9)	0	(0)	0	(0)	0	(0)	126	(57)	5	(2)	221
1997–1998	58	(19)	7	(2)	14	(5)	0	(0)	0	(0)	1	(<1)	216	(70)	13	(4)	309
1998–1999	66	(21)	4	(1)	36	(11)	0	(0)	0	(0)	1	(<1)	205	(65)	3	(1)	315
1999–2000	100	(28)	9	(9)	29	(8)	1	(<1)	0	(0)	1	(<1)	218	(60)	4	(1)	362
2000–2001	90	(18)	17	(17)	74	(15)	1	(<1)	4		0	(0)	302	(61)	5	(1)	493

[a] Includes airboats.