Caribou
Management Report
of survey-inventory activities
1 July 2000–30 June 2002

Carole Healy, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2003

Ken Whitten

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

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

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

GEOGRAPHIC DESCRIPTION: Kenai Peninsula

BACKGROUND

There were 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 Unit 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 Unit 15B. The Killey River caribou herd (KRCH) inhabits the upper drainages of Funny and Killey rivers in Unit 15B. The Twin Lakes caribou herd (TLCH) occupies the area drained by Benjamin Creek in Unit 15B. The Fox River caribou herd (FRCH) occupies the area between upper Fox River and Truuli Creek in Unit 15C.

Beginning in 2002, the number of recognized caribou herds on the Kenai Peninsula was reduced to 4. As the Killey River herd grew, their range expanded to include the range of the Twin Lakes herd. Currently, the overlap of these herds makes them indistinguishable and these herds are now recognized as the Killey River caribou herd. The 2001–02 estimated population sizes of the KMCH, KLCH, KRCH, and FRCH were 375, 135, 750, and 70 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 1972–1976, 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 instituted and remains in use. Following the 1985 population peak, the KMCH began to decline for unknown reasons. The department reduced harvest from 1987 through 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, 290 caribou were 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 350–400 caribou. During the past 5 years the mean annual success rate was 21%.

The Kenai Lowlands herd has decreased slightly after reaching its largest population size in 2000. Growth has been limited by predation rather than by habitat. Free-ranging domestic dogs and coyotes probably kill calves in summer, and wolves preyed on all age classes during winter. In addition to natural mortality, highway vehicles kill several caribou annually. The KLCH was hunted in 1981, 1989, 1990, 1991 and 1992. The department issued 5 permits the first year and 3, for bulls only, in subsequent years. Biologists believed harvests were not a significant mortality factor.

The Killey River herd has grown steadily since the reintroduction of 80 caribou in 1985 and 1986, while the Fox River reached peak numbers in 1998 and appears to have stabilized. 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 Fox River herd. 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 has been hunted since 1995.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

The management objective for the Kenai Mountains caribou herd is to maintain the posthunting herd at 350–400 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 Units 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 of 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 an estimated 500 animals and has shown a general decline since then (Table 1).

Kenai Lowlands Caribou Herd. The KLCH increased steadily from 96 animals in 1995–96 to a peak of 140 caribou counted (population estimate of 150) during spring 1999. The population declined slightly the following year and was not counted during 2001–02 (Table 2). The primary management concern is low recruitment caused by predation.

Killey River Caribou Herd. The KRCH 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 survey conducted by the Fish and Wildlife Service only revealed 380; however, animals were widely scattered and it is believed the count did not accurately assess the herd's size because 546 animals were counted in June 1999. The recorded increase to a population estimate of 750 animals in 2001–02 is misleading because it included 66 caribou counted from the herd formally recognized as the Twin Lakes herd (Table 3).

Fox River Caribou Herd. The FRCH 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, but the herd is considered to be stable or slightly decreasing (Table 4).

Twin Lakes Caribou Herd. The TLCH herd mean annual increase was 25% between fall 1992 and 1994 and remained stable in 1995. In spring 1997 the herd increased again, followed by a 9% decline by January 1998 (Table 5). These growth rates appeared normal for recently introduced herds on excellent range; however, the TLCH has been difficult to survey and may have been larger during fall surveys. The TLCH is now considered to be part of the Killey River caribou herd.

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 have not collected herd composition data since then because of budget limits, however, annual surveys were completed to determine population size (Table 1). The ratio of bulls to cows remained stable from 1990 to 1995 with a mean of 41:100 (range = 39–43:100). Observations during subsequent 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%). Surveyors counted a low of 17 calves in 1997 compared to a high of 29 young in 1999 and 2000, the counts increased from 96 to 140 caribou during the same period (Table 2). Bull-to-cow ratios were not available because fall surveys were not conducted. Incidental observations suggested the ratio was probably stable and at a minimum of 35 bulls per 100 cows.

Killey River Caribou Herd. 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. This herd has continued to grow and was estimated at 750 animals (including those from the former TLCH) in 2001–02 (Table 3). Composition data has remained relatively constant during this reporting period, however, an avalanche killed a minimum of 143 caribou during the winter 2001–02. Most of the mortalities were cows and calves and the effect on herd composition has not been determined.

Fox River Caribou Herd. Biologists completed composition surveys for 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, 81 caribou were counted, and 19% were calves. Only aerial surveys to assess the herd's population size were completed in 1997. These data indicate 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. The November 2000 survey was the last survey completed during this reporting period and resulted in a count of 70 caribou, of which 10 were calves (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, composed of 19% calves. An aerial survey completed in 1997 indicated that the herd declined by 10% to 66 animals then declined 18% in 1998 to 54. In June 1999 the herd was composed of 11(20%) calves, 37 (69%) cows and 6 (11%) bulls. The last survey for this herd was flown in November 2000 and produced a count of 65 caribou, of which 7 were calves (Table 5). Bulls were not identified during this survey.

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–Sept. 30 between 1993 and 1996. In 1997 and 1998, the season was Aug. 10–Sept. 30 and Nov. 10–Dec. 10. In 1999, the season was extended to Aug. 10–Dec. 31 and has remained there. The bag limit was 1 caribou by drawing permit only (DC001) 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 Unit 15A was 1–20 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 Units 15B south and west of Killey River in the Kenai National Wildlife Refuge was Aug. 10–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–Sept. 10 (hunt 610) and Sept. 15–Oct. 10 (hunt 612). Twenty permits, each for two caribou, were issued for each hunt for a total of 40 permits. Seasons and bag limits remained the same until 2001–02 when DC610 and DC612 were combined and changed to registration hunt RC610, with a bag limit of 3 cows and season dates of August 10–September 20. Also at this time the bag limit for DC608 was changed from 1 caribou to 3 caribou, of which only 1 can be a bull. Season dates for DC608 remained August 10–September 20.

Fox River Caribou Herd — Open season for resident and nonresident hunters in Units 15C, that portion north of Fox River and east of Windy Lake, was Aug. 10–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 and this herd is now considered to be part of the Killey River herd.

Board of Game Actions and Emergency Orders.

The Board of Game changed the season dates, hunt type, and bag limits on the Killey River caribou herd during the March 2001 meeting. Drawing hunts DC610 and DC612 were combined and changed to a registration hunt RC610, with season dates of August 10–September 20 and a bag limit of 3 cows. Also, the bag limit for drawing hunt DC608 was changed from 1 caribou to 3 caribou, of which only 1 can be a bull. Season dates for DC608 remained August 10–September 20.

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 1768 applications for 250 permits in 2000 and 1786 applications for 250 permits in 2001. The mean annual harvest for the past 5 years was 23 caribou (range = 19–27), and bulls averaged 58% (range = 46–68%) of the harvest (Tables 6 and 10). Permittees harvested 15 bulls and 7 cows in 2000 and 13 bulls and 6 cows during 2001.

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

Killey River Caribou Herd — The department received 326 applications for hunt DC608 (25 permits issued), 109 applications for hunt DC610 (20 permits issued) and 128 applications for hunt DC612 (20 permits issued) in 2000. Reported harvests included 13 bulls for DC608, 1 bull and 8 cows for DC610 and DC612 combined. For the 2001 season the department received 604 applications for DC608 (76 permits issued) and issued 158 permits for RC610. Reported harvests included 10 bulls and 4 cows for DC608 and 40 cows for RC 610 (Tables 8, 12 and 13).

Fox River Caribou Herd — The department received 143 applications in 2000 and 150 in 2001 for the 10 permits issued to hunt the FRCH. Permittees harvested 3 bulls in 2000 and 1 bull in 2001 (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 — Fifty-four percent of permittees reported they did not hunt in 2000, while 64% did not go afield in 2001 (Table 10). Twenty-two (19%) of the 114 hunters in 2000 and 19 (21%) of the 89 hunters in 2001 were successful (Tables 10 and 15). Local residents harvested 0 caribou, nonlocal residents harvested 21 caribou and nonresidents harvested 1 caribou in 2000 (Table 15). Local residents harvested 1 caribou, nonlocal residents harvested 14 caribou and nonresidents harvested 4 caribou in 2001. Unsuccessful hunters included 4 local resident and 88 nonlocal residents in 2000. In 2001, 1 local resident and 69 nonlocal residents hunted unsuccessfully.

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

Killey River Caribou Herd — The department issued 25 permits in 2000 and 76 in 2001 for hunt DC608. Twenty percent of the permittees in 2000 and 53 % in 2001 did not hunt (Table 12). The harvest was 13 caribou in 2000 and 14 in 2001. Hunter success rate was 65% in 2000 and 39% in 2001. Twelve local residents and 1 nonlocal resident were successful in 2000, compared to 8 local, 5 nonlocal residents, and 1 nonresident in 2001 (Table 16).

Forty permits were issued in 2000 for hunts 610 and 612, combined, resulting in the harvest of 3 cows. During 2001, DC610 and DC612 were combined to initiate hunt RC610. During the first year (2001) of this hunt 158 permits were issued and 40 cows were harvested (Table 13).

Fox River Caribou Herd — The department issued 10 permits in 2000 and 2001. Five (50%) permittees hunted in 2000 and harvested 3 bulls for a hunter success rate of 60%. In 2001, 4 permittees hunted and harvested 1 bull for a hunter success rate of 25% (Table 14). In 2000, all successful hunters were local residents and the 2 unsuccessful hunters were nonresidents. During 2001, the 1 successful hunter was a local resident, while the 3 unsuccessful hunters were nonlocal residents (Table 17).

Harvest Chronology.

Kenai Mountains Caribou Herd — Since 1995, essentially all of the harvest for hunt DC001 occurred during August and September (Table 18). In the past 5 years (combined), hunters harvested 56% of the take during August, 44% 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 — During the 2000 hunting season 69% (9 of 13) of the harvest occurred between September 1–15, while the harvest was more evenly distributed throughout the 2001 season for hunt DC608 (Table 19).

Fox River Caribou Herd — For the 2000 and 2001 seasons combined, 75% (3 of 4) of the harvest occurred during the first week of the season (Table 20).

Transport Methods.

Kenai Mountains Caribou Herd — In 2000 and 2001 most successful hunters used highway vehicles for access and then hiked into the areas they hunted (Table 21). In 2000, 16 (73%) successful hunters walked in, while 5 (23%) used horses, and 1 (5%) used aircraft. The following year 8 (42%) successful hunters walked in, 4 (21) relied on aircraft, 2 (11%) used horses, and 4 (21%) did not report the type of transportation they used. 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 2000 and 2001 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. Thirty-one percent of the hunters in 2000 used horses, compared to 57% the next year. In 2000 69% of hunters used boats, compared to 36% in 2001. One successful hunter did not report a mode of transportation (Table 22).

Fox River Caribou Herd —All successful hunters (n=4) used boats for access during the 2000 and 2001 seasons (Table 23)**.**

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 1997–2002, however, surveys to determine population size were. The observation of 452 caribou on 14 March 1997 indicated the herd had reached its highest number and began a downward trend. During the October 2001 survey 353 were counted. 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 350–400 caribou.

The Kenai Lowlands herd appears to have stabilized at an estimated 135 caribou during this reporting period. The opportunity for viewing by locals and tourists is also increasing. 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.

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 400–500 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 we have reached the KMCH post-season population objective of 350–400 caribou. Consequently, changes to the current regulations are not recommended at this time. 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 decreased since 1999 and may now be stabilizing. 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 rather than available range is limiting herd growth. 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 since 1998. Reduced annual recruitment and declining mean weight of female calves indicates this herd may be habitat limited. A secondary management objective is to allow hunting as this herd increases. I recommend ADF&G continue harvesting caribou in this herd to decrease the herd's growth rate. A decreased rate of growth in this herd will allow biologists time to determine the optimum density. Because of limited access, few hunters are expected to take advantage of these permits, however, several years of assessing hunter success may be necessary to properly manage annual harvests.

During the winter of 2001–02 an avalanche killed a minimum of 143 Killey River caribou. The effects of the avalanche on population parameters are not known because surveys have not been conducted since this event occurred.

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 harvesting 4 bulls over the past two years is not suspected to cause the current low numbers, if the herd declines below 60 animals, we should consider not issuing permits for DC618.

The Twin Lakes caribou herd is now considered to be part of the Killey River caribou herd and will be managed as such.

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Table 1. Kenai Mountains caribou fall composition counts and estimated population size, regulatory years 1995–2001

Regulatory year	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
Total									
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
2000–01[g]	--	--	--	--	--	--	--	378	400
2001–02[h]	--	--	--	--	--	--	--	353	375

[a] Estimated herd size postseason. [b] Surveyed Mar. 14, 1996. [c] Surveyed Mar. 14, 1997. [d] Surveyed Feb. 27, 1998. [e] Surveyed Jan. 7, 1999. [f] Surveyed Mar. 5, 2000. [g] Surveyed Mar. 31,2001. [h]Surveyed Oct. 23, 2001

Table 2. Kenai Lowlands caribou composition counts and estimated population size, regulatory years 1995–2001

Regulatory year	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
Total									
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
2000–01[g]	--	--	29(23)	--	--	18(18)	--	128	135
2001–02	--	--	--	--	--	--	--	--	135

[a] Estimated herd size in June. [b] Surveyed June 6, 1996. [c] Surveyed June 8, 1997. [d] Surveyed June 20, 1998. [e] Surveyed June 22, 1999. [f] Surveyed June 20, 2000. [g] Surveyed June 19, 2001.

Table 3. Killey River caribou composition counts and estimated population size, regulatory years 1995–2001

Regulatory year	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
Total										
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	--	--	--		--	--	--	--	--	600
2000–01[f]	42	24	87(14)		--	--	--	154(25)	607	650
2001–02[g]	--	--	--		--	--	--	--	710	750

[a] Estimated fall herd size. [b] Surveyed Nov. 28, 1995. [c] Surveyed June 11, 1997. [d] Surveyed Jan. 13, 1998. [e] Surveyed June 23, 1999. [f] Surveyed Nov. 14, 2000. [g] Surveyed Oct. 19, 2001 and includes 66 caribou from the herd previously identified as Twin Lakes herd.

Table 4. Fox River caribou fall composition counts and estimated population size, regulatory years 1995–2001

Regulatory year	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
Total										
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	--	--	--		--	--	--	--	--	70
2000–01[g]	--	--	10 (14)		--	--	--	--	70	70
2001–02	--	--	--		--	--	--	--	--	--

[a] Estimated herd size. [b] Surveyed Apr. 9, 1996. [c] Aerial survey using fixed-wing aircraft - total count only. [d] Surveyed June 3, 1997. [e] Surveyed Mar. 11, 1998. [f] Surveyed Nov. 28, 1998. [g] Surveyed Nov. 1, 2000.

Table 5. Twin Lakes caribou fall composition counts and estimated population size, regulatory years 1995–2001

Regulatory year	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
Total										
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
2000–01[d]	--	--	7(11)	--	--	--	--	--	65	65
2001–02[e]	--	--	--	--	--	--	--	--	--	--

[a] Estimated fall herd size. [b] Surveyed June 11, 1997. [c] Surveyed June 23, 1999. [d] Surveyed Nov. 1, 2000. [e] These caribou are now considered part of the Killey River caribou herd.

Table 6. Kenai Mountains caribou harvest (DC001) and accidental death, regulatory years 1995–2001

Regulatory year	Hunter Harvest								
	Reported				Estimated				
	M (%)	F (%)	Unk.	Total	Unreported	Illegal	Total	Accidental death	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
2000–01	15(68)	7(32)	0	22	--	--	--	--	22
2001–02	13(68)	6(19)	0	19	--	--	--	--	19

Table 7. Kenai Lowlands caribou harvest and accidental death, regulatory years 1995–2001

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
1999–00	No open season						--	--	--	3	3
2000–01	No open season						--	--	--	--	--
2001–02	No open season						--	--	--	--	--

[a]Caribou/highway vehicle accidents–all were adults.

Table 8. Killey River caribou harvest (DC608) and accidental death, regulatory years 1995–2001

Regulatory year	Hunter Harvest: Reported M (%)	F (%)	Unk.	Total	Estimated: Unreported	Illegal	Total	Accidental death	Grand Total
1995–96	8(100)	0	0	8	--	--	--	--	8
1996–97	12(100)	0	0	12	--	--	--	--	12
1997–98	23(100)	0	0	23	--	--	--	--	23
1998–99	26(100)	0	0	26	--	--	--	--	26
1999–00	13(93)	1(7)	0	14	--	--	--	--	14
2000–01	13(100)	0	0	13	--	--	--	--	13
2001–02[a]		4(29)	0	14	--	--	--	143	157
	10(71)								

[a] A minimum of 143 caribou died in an avalanche during the winter of 2001–02.

Table 9. Fox River caribou harvest (DC618) and accidental death, regulatory years 1995–2001

Regulatory year	Hunter Harvest: Reported M (%)	F (%)	Unk.	Total	Estimated: Unreported	Illegal	Total	Accidental death	Grand Total
1995–96	5(100)	0	0	5	--	--	--	--	5
1996–97	2(100)	0	0	2	--	--	--	--	2
1997–98	2(100)	0	0	2	--	--	--	--	2
1998–99	3(75)	1(25)	0	4	--	--	--	--	4
1999–00	1(50)	1(50)	0	2	--	--	--	--	2
2000–01	3(100)	0	0	3	--	--	--	--	3
2001–02	1(100)	0	0	1	--	--	--	--	1

Table 10. Kenai Mountains caribou harvest (DC001), regulatory years 1993–2001

Hunt No. /Area	Regulatory year	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
Percent		200	42	24	76	61	39	--	28
		200	47	19	81	56	44	--	18
		250	49	18	82	44	56	--	23
1994–95		250	52	23	78	46	54	--	27
1995–96		250	60	25	75	68	32	--	25
1996–97		250	50	19	81	46	54	--	24
1997–98		250	54	19	81	68	32	--	22
1998–99		250	64	21	79	68	32	--	19
1999–00									
2000–01									
2001–02									

Table 11. Kenai Lowlands caribou harvest (DC506), regulatory years 1995–2001

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
506/15A									
	1995–2002		NO OPEN SEASON						0

Table 12. Killey River caribou harvest (DC608), regulatory years 1994–2001

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful 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
	1997–97	50	46	85	13	23(100)	0	0	23
	1998–99	50	40	87	13	26(100)	0	0	26
	1999–00	25	24	74	26	13(93)	1(7)	0	14
	2000–01	25	20	65	35	13(100)	0	0	13
	2001–02	76	53	39	61	10(71)	4(29)	0	14

[a] This permit hunt was established in fall 1994.

Table 13. Killey River cow caribou harvest (DC610, DC612, and RC610) by permit hunt, regulatory years 1999–2001

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
DC610& DC612[a]									
	1999–00	40	40	25	75	1	5	0	6
	2000–01	40	52	16	84	0	3	0	3
RC610[b]									
	2001–02	158	53	54	46	0	40	0	40

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

[b] Registration permit cow hunt started in fall 2001.

Table 14. Fox River caribou harvest (DC618), regulatory years 1995–2001

Hunt No. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Bulls (%)	Cows (%)	Unk.	Total harvest
618/15C[a]									
	1995–96	15	47	63	37	5(100)	0	0	5
		10	70	67	33	2(100)	0	0	2
		10	60	50	50	2(100)	0	0	2
	1998–99	10	40	67	33	3(75)	1(25)	0	4
1996–97	1999–00	10	60	50	50	1(50)	1(50)	0	2
1997–98		10	50	60	40	3(100)	0	0	3
		10	60	20	80	1(100)	0	0	1
2000–01									

[a]This permit hunt was established in fall 1995.
2001–02

Table 15. Kenai Mountains caribou (DC001) annual hunter residency and success, regulatory years 1995–2001

Regulatory year	Local[a] resident	Nonlocal resident	Nonresident	Total[b] (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
	Successful				Unsuccessful				
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
2000–01	0	21	1	22(19)	4	88	0	92(81)	114
2001–02	1	14	4	19(21)	1	69	0	70(79)	89

[a] Local resident resides in Unit 7.

Table 16. Killey River caribou (DC608) annual hunter residency and success, regulatory years 1995–2001

Regulatory year	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
	Successful				Unsuccessful				
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
2000–01	12	1	0	13(65)	2	3	2	7(35)	20
2001–02	8	5	1	14(39)	14	5	3	22(61)	36

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

Table 17. Fox River caribou (DC618) annual hunter residency and success, regulatory years 1995–2001

Regulatory year	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
	Successful				Unsuccessful				
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
2000–01	3	0	0	3(60)	0	0	2	2(40)	5
2001–02	1	0	0	1(25)	0	3	0	3(75)	4

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

Table 18. Kenai Mountains caribou (DC001) harvest chronology, regulatory years 1995–2001

Regulatory year	Harvest periods				n
	8–10 to 8–31	9–01 to 9–30	10–01 to 10–31	11–01 to 12–31	
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
2000–01	11	11	0	0	22
2001–02	9	10	0	0	19

Table 19. Killey River caribou (DC608) harvest chronology, regulatory years 1995–2001

Regulatory year	Harvest periods					
	8–10 to 8–15	8–16 to 8–31	9–1 to 9–15	9–16 to 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
2000–01	1	3	9	0	0	13
2001–02	3	2	4	4	1	14

Table 20. Fox River caribou (DC618) harvest chronology, regulatory years 1995–2001

Regulatory year	Harvest periods				
	8–10 to 8–15	8–16 to 8–31	9–1 to 9–15	9–16 to 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
2000–01	2	0	1	0	3
2001–02	1	0	0	0	1

Table 21. Kenai Mountains caribou % harvest (DC001) by transport method, regulatory years 1995–2001

Regulatory year	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV[a]	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
2000–01	5	23	0	0	0	0	73	0	22
2001–02	21	11	0	0	0	5	42	21	19

[a] ORV includes mountain bike.

Table 22. Killey River caribou % harvest (DC608) by transport method, regulatory years 1995–2001

Regulatory year	Percent of harvest								
	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
2000–01	0	31	69	0	0	0	0	0	13
2001–02	0	57	36	0	0	0	0	7	14

Table 23. Fox River caribou % harvest (DC618) by transport method, regulatory years 1995–2001

Regulatory year	Percent of harvest								
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Unknown	n
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
2000–01	0	0	100	0	0	0	0	0	3
2001–02	0	0	100	0	0	0	0	0	1

Alaska Department of Fish and Game
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CARIBOU MANAGEMENT REPORT

From: July 1, 2000
To: June 30, 2002

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) from 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 local residents remember a thriving, widespread reindeer industry before the 1940s. Herds ranged from the Togiak to the Mulchatna River drainages, with individual herders following small groups throughout the year. Suspected reasons for the demise of the reindeer herds include wolf predation and the expansion of the commercial fishing industry. 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 the mid 1990s. 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 2002 provided a minimum estimate of 147,000 caribou in the MCH.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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

Additional objectives include:

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

METHODS

We 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 last photocensus conducted during this reporting period occurred June 30, 2002. ADF&G coordinates censuses out of the Dillingham area office in cooperation with staff from the Bethel, McGrath, Palmer and Fairbanks offices and 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. Since 1994 we have photographed large aggregations with an aerial mapping camera mounted in a DeHavilland Beaver (DH-2) aircraft flown by ADF&G staff 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 drug-filled darts. These are usually cooperative efforts between ADF&G and TNWR. In April 2001, thirteen 10-month old female calves were darted and radiocollared west of Iliamna Lake. In April 2002, twenty four 10-month old female calves were darted and radiocollared in the lower Mulchatna River area.

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 or until so late in the calving period that absence of a calf could possibly be attributed to predation or other loss.

We conducted periodic radiotracking flights throughout this reporting period to continue the demographics study 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. The most recent photocensus indicates the herd has continued to decline.

Population Size

We conducted a photocensus of the MCH on June 30, 2002. Based on results of that survey, the population estimate for the MCH was 147,000 (Table 1). The MCH has declined as indicated by the 2002 estimate, but at the same time caribou distribution during the summers has become more widespread. Some caribou were observed through the summers in Units 17A and 18, however surveys indicated these were mostly bulls. This population estimate includes an estimate of the number of caribou not found with the main postcalving aggregations.

Population Composition

We conducted sex and age composition surveys in the Kilbuck and Kuskokwim Mountains (Unit 18) on October 2, 2000 and in the middle Nushagak River drainage (Unit 17C) on October 9, 2000. In 2001, composition surveys were conducted between Whitefish Lake and the Fog River (in Units 18 and 19A) on October 11, near the Muklung Hills (Unit 17C) on October 14 and in the upper Tikchik River (Unit 17B) on October 15.

During the fall 2000 surveys, 44.3 bulls:100 cows were counted in the sample of 2,426 caribou in Unit 18. Only 27.7 bulls:100 cows were observed in the sample of 1,468 caribou in Unit 17. The caribou located in Unit 17 were generally subject to heavier hunting pressure in the fall than the caribou in Unit 18, which likely contributes to the disparity in the bull:cow ratio between the survey areas. Because of the great deal of mixing of the herd throughout the rest of the year, composition data for the 2000 survey was pooled for an overall bull:cow ratio of 37.6 bulls:100 cows. (Table 2).

During the fall 2001 surveys, 35.9 bulls:100 cows were counted in the sample of 2,051 caribou in Unit 18 and 19A. Only 17.8 bulls:100 cows were observed in the sample of 2,369 caribou in the Muklung Hills (Unit 17C) and 23.9 bulls:100 cows observed in the sample of 1,308 caribou in the Tikchik River area (Unit 17B). Composition data for the 2001 surveys were pooled for an overall bull:cow ratio of 25.2 bulls:100 cows. (Table 2).

The fall calf:cow ratio remained consistently greater than 30:100 until 1999 (Table 2). Unlike the 2000 and 2001 survey results for bull:cow ratios, the proportions of calves in the Unit 17 and 18 samples were typically similar. The calf:cow ratio observed on October 2, 2002 in Unit 18 was 24.3 calves:100 cows and that in Unit 17 on October 9 was 24.2 calves:100 cows. Pooled counts for both areas gave a calf:cow ratio of 24.3 calves:100 cows for the Mulchatna herd in fall 2000. (Table 2). The calf:cow ratio observed on October 11, 2001 in Unit 18 and 19A was 22.0 calves:100 cows, on October 14 in Unit 17C it was 20.6 calves:100 cows and on October 15 in Unit 17B it was 15.8 calves:100 cows. Pooled counts from all three areas gave a calf:cow ratio of 19.9 calves:100 cows for the Mulchatna herd in fall 2001. (Table 2).

Productivity Surveys

Productivity surveys were flown in May 2001 and 2002. A total of 15 radiocollared cow caribou that were of calf-bearing age, six 2-year old females (radioed as calves in spring 2000) and nine 1-year old females (radioed as calves in April 2001) were located in May 2001. Of the 15 adult cows, 7 were accompanied by calves, 4 had hard antlers but no calves, 4 had no antlers and no calf and 2 cows were not visually observed. High winds during late May 2002 precluded completing calving surveys in Unit 17 and only 13 radiocollared cow caribou of calf-bearing age were located. Of the 13 adult cows, 2 were accompanied by calves, 4 had hard antlers but no calves and 7 had no antlers and no calves. Presence of hard antlers during calving is generally considered evidence that the adult cow is pregnant. It appears that 11 of 13 radiocollared adult cow caribou in the MCH produced calves in May 2001 and a minimum of 6 of 13 radiocollared adult cows produced calves in May 2002.

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 47 caribou with radio collars that were active in June 2002. 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 Unit 18 south of the Kuskokwim River and southwestern Unit 19B in increasing numbers.

The MCH did not move into the above described traditional wintering areas en masse during this reporting period but scattered throughout their range and beyond into previously little used land. During fall 2000 and again in fall 2001, large numbers of Mulchatna caribou traveled through western Unit 17 and southwestern Unit 19B, into the Kuskokwim Mountains, and eventually into Unit 18 south of the Kuskokwim River. The greatest part of the herd wintered in Unit 18, south of the Kuskokwim River. Movement into these wintering areas has probably decreased pressure on the forage supply in the more typically utilized wintering areas. Another 10–20,000 caribou spent most of these winters in southern Unit 9B and southeastern Unit 17B. In March 2002, many of the caribou wintering in Units 9B and 17B moved south to the King Salmon and Naknek area. These caribou remained only a short time in central Unit 9C before traveling north back to the lower Mulchatna River 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 where many of them calved. Calving during spring 2000 occurred in two distinct areas; the lower Nushagak River the headwaters of the South Fork of the Hoholitna River. In May 2001, calving also occurred in two distinct areas, with at least 40,000 caribou between Kemuk Mountain and the Nushagak River and at least 60,000 caribou in the northeastern Nushagak Hills and the South Fork of the Hoholitna River. Calving in May 2002 was spread out through a vast area from southeast of Kemuk Mountain, north and northeast to the area north of the Hoholitna River and as far west as the lower ends of Klutuspak Creek and

the King Salmon River. In recent years, individual or very small groups of cows with calves have been occasionally observed scattered throughout the range of this herd.

Seasonal Movements.

The MCH does not generally move en masse as a distinct herd, nor do the individuals move to predictable places at predictable times. However during recent years, a trend has been noticed that most of the herd moves to the western side of its range during the fall, back to the middle part of its range for calving, into the upper Mulchatna River drainage for the postcalving aggregations, then becomes widely dispersed throughout its range by late summer and then forms large groups and moves west again during the fall.

In May 2000 most of the MCH had once again returned from being scattered throughout the western part of their range to calve in the middle Nushagak River area and South Fork of the Hoholitna River. By late June, most of the herd had moved into the eastern Nushagak Hills and also scattered through the upper Mulchatna River area. Throughout July, many caribou moved southeast from the Mulchatna drainage and into the lower Nushagak River area. By late July, the caribou were moving northward from the lower Nushagak River area and scattering throughout Unit 17B. Large numbers of caribou had also moved westward, into Unit 18 by mid September. During fall 2000 and winter of 2000–01, the bulk of the Mulchatna Herd was scattered throughout Unit 18 south of the Kuskokwim River, though 10–20,000 remained throughout the winter in the area west of Iliamna Lake. By late April 2001, Mulchatna caribou started moving toward the calving area for that year, in the middle Nushagak River area and northeastern Nushagak Hills. They again moved through the Nushagak Hills and into the upper Mulchatna drainage for the postcalving aggregations in late June and early July. After moving into the lower Nushagak River area by late July and early August, most of the herd became widely scattered throughout much of its range until aggregations formed for the rut in late September and early October 2001. By late fall most of the caribou were in the general areas where they would winter. In late April 2002, large numbers of Mulchatna caribou traveled eastward from Unit 18 to the areas used for calving that year. Again, the greatest part of the herd moved up through the Mulchatna drainage and by late June were forming into postcalving aggregations in the area between the Mulchatna River and Lake Clark.

In the past, several large peripheral groups appeared to be independent from the main MCH. A group of about 1300 caribou resided between Portage Creek and Etolin Point. Caribou in the Kilbuck Mountains (Seavoy 2001) and the upper Stuyahok and Koktuli River drainages (Van Daele and Boudreau 1992, Van Daele 1994) seemed distinct from the MCH. These subherds periodically intermingled with the main herd, but remained within their traditional ranges. As the MCH grew in size and seasonally moved through the areas used by these groups, they eventually ceased to exist as discrete groups of caribou.

MORTALITY

Harvest

Season and Bag Limit

	Resident Open Season	Nonresident Open Season
Unit 9A and that portion of Unit 9C within the Alagnak River drainage.		
Resident Hunters: 1 caribou	Aug 1–Mar 31	
Nonresident Hunters: 1 bull		Aug 1–Mar 31
Unit 9B.		
Resident Hunters: 5 caribou, however no more than 2 bulls may be taken during Oct 1–Nov 30	July 1–Apr 15	
Nonresident Hunters: 2 caribou		Aug 1–Apr 15
Unit 17A, all drainages east of Right Hand Point.		
Resident Hunters: up to 5 caribou	Season may be announced	
Nonresident Hunters:		No open season
Remainder of Unit 17A		
Resident Hunters: 5 caribou, however no more than 2 bulls may be taken during Oct 1–Nov 30	Aug 1–Mar 31	
Nonresident Hunters:		No open season
Unit 17B and a portion of 17C east of the Wood River and Wood River Lakes.		
Resident Hunters: 5 caribou, however no more than 2 bulls may be taken during Oct 1–Nov 30	July 1–Apr 15	
Nonresident Hunters: 2 caribou		Aug 1–Apr 15
Remainder of Unit 17C and Unit 18 south of the Yukon River.		
Resident Hunters: up to 5 caribou	Season may be announced	

Nonresident Hunters:		No open season
Unit 19A, within the Lime Village Management Area.		
Residents: 4 caribou total		
Bulls	July 1–Jun 30	
OR any caribou	Aug 10–Mar 31	
Nonresidents: 1 caribou		Aug 10–Mar 31
Remainder of Unit 19A and Unit 19B.		
Resident Hunters: 5 caribou, however no more than 2 bulls may be taken during Oct 1–Nov 30	Aug 1–Apr 15	
Nonresident Hunters: 2 caribou		Aug 1–Apr 15

Board of Game Actions and Emergency Orders. During their spring 2001 meeting, the Alaska Board of Game established a population objective of 100,000–150,000 and a harvest objective of 10,000–15,000 for intensive management purposes. The Board also established a caribou hunting season in Unit 17A that opens and closes on regular dates rather than by Emergency Order. During their fall 2001 meeting, the Board established a caribou hunting season in Unit 18, south of the Yukon River that opens and closes on regular dates rather than by Emergency Order, to become effective with the fall 2002 hunting season. Three Emergency Orders for hunting Mulchatna caribou were issued during this reporting period. An Emergency Order effective September 9, 2000 through March 31, 2001 opened caribou hunting in Unit 18 south of the Yukon River and in Unit 17A west of the Togiak River and north of Pungokepuk Creek. An Emergency Order effective February 10 through March 31, 2001 opened caribou hunting in Unit 17A east of the Togiak River and south of Pungokepuk Creek. An Emergency Order effective August 25, 2001 through March 31, 2002 opened caribou hunting in Unit 18 south of the Yukon River.

Hunter Harvest. The reported harvest from the MCH was 4,004 caribou during the 2000–01 hunting season and 3,826 during 2001–02 (Table 3). These totals and the number of hunters reporting hunting Mulchatna caribou are similar to the previous several years. As in previous years, males composed most of the harvest each year (81% and 72%).

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 Unit 18, who might be less likely to use harvest cards. Most of the unreported harvest was attributed to local and other Alaska residents. Subsistence Division household surveys conducted in local villages from 1983 to 1989 indicated an estimated annual harvest of 1318 caribou (P. Coiley, ADF&G-Subsistence, Dillingham). The number of caribou harvested by local residents has undoubtedly increased since the subsistence surveys because of increases in the size and range of the herd and number of people living in the surrounding villages. Unreported harvest by other Alaska residents is even 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. Since then however, commercial operators providing transportation to hunters have expanded into areas previously not hunted as well as basing their hunts from additional communities located within the range of this herd.

Hunter Residency and Success. Nonresidents made up 60% of the reporting hunters during the 2000–01 season and 51% of the reporting hunters during 2001–02. Nonlocal Alaska residents accounted for 31% and local residents 8% of the hunters who returned harvest reports for 2000–01. In 2001–02 nonlocal Alaska residents accounted for 35% and local residents 13% of hunters who returned harvest reports. Of the reporting hunters, 68% successfully harvested at least 1 caribou in 2000–01 and in 2001–02 74% were successful (Table 4).

Harvest Chronology. Most (82%) of the reported harvest in 2000–01 occurred during August and September, as did 72% in 2000–01. March was also an important month for harvesting caribou, accounting for 4% in 2000–01 and 9% in 2001–02 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 2000–01 (87%) and 2001–02 (79%) 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 were traditionally low, but probably increased as the herd grew and provided a more stable food source for wolves. Many local residents report increasing wolf numbers. A growing number of hunters throughout the area used by the MCH report having encounters with brown bears, including bears on fresh kills, on hunter-killed carcasses and on raids in hunting camps. It is likely that individual bears learned to capitalize on this newly abundant food supply.

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. Though the fall 2000 calf:cow ratio showed a marked improvement, it was still substantially less than that observed during the period of rapid growth. To investigate the possibility that lung worm infestation may be contributing to summer calf mortality, necropsies were performed on 10 female calves in October 2000. Of the 10, lungs of 6 showed large areas of hepatinization consistent with infestation of the lungworm, *Dictyocaulus viviparus*. However upon dissection of bronchioles, adult lungworms were not found (L. Johnson, pers. comm). Histological examination of the lung tissue revealed congestion consistent with bacterial pneumonia (R. Zarnke, ADF&G-DWC, Fairbanks). Of six fecal samples, a small number of lungworm larvae (*Parelaphostongylus spp*.) were found in only one (W. Foreyt, Washington

State Univ, Pullman). The role disease may be playing in the decline of the MCH is still unknown.

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 started using in the mid 1990s had not been used by appreciable numbers of 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 200,000 in 1996 and declined to 147,000 by summer 2002. 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 recent years have varied, but proportions of calves and bulls were generally less than during the period of rapid herd growth.

The total reported harvest and the number of hunters afield steadily increased until the late 1990s, then both appeared to remain relatively constant. Increased reported hunting effort during this reporting period indicates that harvests remained at less than 7% of the herd. However, a better assessment of unreported harvest will be important if the herd continues 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, make this herd increasingly popular with hunters. However, the mobility of the herd and the difficult access into much of its range makes 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 have recently pioneered 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 declined. Possible signs of stress in this herd include the outbreak of foot rot in 1998 and/or the low calf:cow ratios in fall 1999 (Woolington 2001). 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.

Increased harvest pressure on the MCH also affects other big game populations in the area. As caribou become more available near villages, less pressure may be put on local moose populations. Illegal moose harvests may decrease 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 and uses areas from the western slopes of the Alaska Range to the Kuskokwim River, it seasonally occupies ranges used by smaller resident caribou herds. These 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 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 Attempt to 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, regulatory years 1991 to 2001

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	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
2000–01	--	--	--	--
2001–02	June 30, 2002	--	121,680	147,000

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

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

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

Table 2 Mulchatna caribou fall composition counts and estimated population size, regulatory years 1991 to 2001

Regulatory Year	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
2000–01	37.6	24.3	15.0	61.8	46.6	32.9	20.4	23.2	3,894	--
2001–02	25.2	19.9	13.7	68.9	31.7	50.1	18.3	17.7	5,728	147,000

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

Table 3 Mulchatna caribou harvest and accidental death, regulatory years 1991 to 2001

	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
2000–01	81%	19%	0.8%	4,004	5,000[c]	--	5,000	--	9,004
2001–02	72%	27%	0.4%	3,826	5,000[c]	--	5,000	--	8,826

[a] Includes only reported harvest from harvest cards

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

[c] Includes minimum suspected unreported harvest from Unit 18

Table 4 Mulchatna caribou annual hunter residency and success, regulatory years 1991 to 2001

Regulatory Year	Successful: Local resident[a]	Successful: Nonlocal resident	Successful: Nonresident	Successful: Total (%)	Unsuccessful: Local resident[a]	Unsuccessful: Nonlocal	Unsuccessful: Nonresident	Unsuccessful: Total (%)	Total hunters[b]
1991–92	89	562	599	85%	9	136	69	15%	1,464
1992–93	82	542	651	91%	12	82	26	9%	1,391
1993–94	47	718	725	86%	5	171	77	14%	2,394
1994–95	61	812	896	85%	11	227		15%	2,954
1995–96	52	1,035	928	87%	15	188	86	13%	3,127
1996–97	56	647	824	85%	25	139	101	15%	1,822
1997–98	85	564	1,277	84%	33	178	152	16%	2,301
1998–99	178	1,130	1,877	78%	142	320	414	22%	4,131
1999–00	174	1,024	1,697	72%	120	453	553	28%	4,140
2000–01	188	817	1,713	68%	148	427	692	32%	3,999
2001–02	270	843	1,377	74%	159	351	368	26%	3,406

Resident

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

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

Table 5 Mulchatna caribou annual harvest chronology percent by month, regulatory years 1991 to 2001

Regulatory Year	Harvest Periods										
	July	August	September	October	November	December	January	February	March	April	Total [b]
1991–92		29%	43%	6%	0.4%	2%	1%	4%	12%	0%	1,573
1992–93		30%	54%	5%	1%			1%	8%	0%	1,602
1993–94		36%	50%	5%		0.3%	0.2%	1%		2%	2,804
1994–95		35%	50%	5%	0.4%	1%	1%	1%	5%	2%	3,301
1995–96		33%	50%	6%	0.4%	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	0.1%	24%	52%	5%	0.5%	1%	3%	5%	8%	2%	4,467
2000–01	0.2%	27%	55%	6%	0.3%	0.3%	2%	3%	4%	1%	4,004
2001–02	0.2%	23%	49%	3%	1%	2%	2%	4%	9%	5%	3,826

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

[b] Includes unknown harvest date

Table 6 Mulchatna caribou harvest percent by transport method, regulatory years 1991 to 2001

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%			2%	1,573
1992–93	88%	0.2%	8%	3%	3%	0.1%	0.2%	0%	1,602
1993–94	86%	1%	10%	1%	2%	0.1%	0.1%	0%	2,804
1994–95	85%	0.2%	12%	1%	2%	0.3%		0.2%	3,301
1995–96	88%	0.2%	9%	1%	2%		1%	--	4,449
1996–97	82%	0.4%	10%	2%	3%	0.1%	0.2%	1%	2,366
1997–98	86%	0.4%	8%	1%	2%	0.3%	0.1%	2%	2,704
1998–99	82%	0.1%	10%	2%	3%	0.1%	0.7%	1%	4,770
1999–00	85%	0.3%	6%	2%	5%	0.1%	0.2%	1%	4,467
2000–01	87%	0.2%	6%	1%	5%	0.2%	1%	0.6%	4,004
2001–02	79%	0.1%	7%	2%	11%	0.1%	0.7%	0.8%	3,826
						0.2%	0.1%		
							0.2%		

[a] Includes harvest by unknown transport method

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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 caribou 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 continued to decline through 2001.

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 12,000–15,000 with an October sex ratio of at least 25 bulls: 100 cows.

METHODS

POPULATION SIZE

In late June 2000 and 2001 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. 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 late May–early June, we used a 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.

RADIOTELEMETRY DATA

We scheduled capture operations in cooperation with the FWS 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 1999 we captured 11 female calves (10 were fitted with standard radio collars) and 1 adult female (fitted with a satellite collar). In April 2001 we put standard collars on 22 female calves and 1 female yearling. In July 2001 we fitted 6 adult females with satellite collars and 1 yearling female with a standard VHF collar. In October 2002 we put satellite collars on 6 adult females captured between the Naknek and King Salmon Rivers to monitor potential intermingling with the Mulchatna herd. 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.

MORTALITY

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

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Minimum counts from 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 significantly reduce harvests, the herd has continued a gradual decline through 2001 (Table 1). Similar counts in 2001 and 2002 suggest the heard may have “bottomed out.”

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 members 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 during 1999–2002, with total estimates of 8,600, 7,200, 6,300, and 6,660, respectively (Table 1).

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, but slight improvement was noted in 2001 and 2002 (Table 1). Higher productivity in 2001 may have resulted from the extremely mild weather and lack of persistent snow during the previous winter.

From 1990 to 1997, the bull:cow ratio averaged 42:100 (range 34–38); but the ratio dropped to an average of 36 bulls:100 cows during 1998–2000 (Table 1). Reductions in harvest under the Tier II permit hunt may have resulted in higher bull:cow ratios observed during 2001 and 2002.

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. No radiocollared NAPCH animals wintered north of the Naknek River during the winters of 2000–01, 2001–02, or 2002–03.

MORTALITY

Harvest

Season and Bag Limits. Since the Tier II permit hunt was instituted in 1999 the bag limit has been 1 bull. The season has been 10 August to 20 September and 15 November to 28 February in 9C, excluding the Alagnak River drainage. In Unit 9 the season ran from 10 August to 30 September and 1 November to 15 April.

Board of Game Actions and Emergency Orders. During the 2001–02 winter, virtually all the NAPCH animals remained south of the Naknek River while up to 6,000 Mulchatna caribou moved into the Naknek drainage. Given the availability of these Mulchatna caribou with very little risk to the NAPCH, the Board of Game responded favorably to a petition from several local villages and opened an emergency season for all Alaskan residents for up to 3 caribou north of the Naknek River from 19–31 March. Approximately 70 Mulchatna caribou were taken during this special hunt.

Hunter Harvest. The Board of Game authorized up to 1,500 Tier II permits, and the Federal Subsistence Board authorized an additional 10%. The state issued 600, 400, 400, and 361 permits during 1999, 2000, 2001 and 2002, respectively. Four hundred permits were available for the 2002 season, but a change in the application and scoring system may have caused some local residents to not apply, resulting in an under subscription of permits. Harvests from state hunts during 1997–2001 regulatory years are presented in Table 2. Data from federal subsistence hunt RC009 is available only from 1999 and 2000, and appears to be incomplete. Ten bulls were reported for each of these years.

Hunter Residency and Success. Under the Tier II hunts during 1999–2001, an average of 66% of those that reported hunting were successful, and local hunters took over 95% of the reported harvest (Table 3).

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

Under the Tier II permit hunt, harvests are more spread-out, with early fall and late winter accounting for most of the harvest. (Table 4).

Transportation Methods. Prior to 1999 airplanes were the most important method of transportation reported from harvest tickets, but under the Tier II most hunters used 4-wheelers or snowmachines (Table 5). 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

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 for males and 7.2 kg for females. 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 114.2 pounds. Female calves captured in 2001 averaged 120.3 pounds, and were significantly heavier than those captured in 1997 ($\bar{x}$ = 106.4, $P < 0.001$) or 1995 ($\bar{x}$ = 108.4, $P < 0.001$). The extremely mild and snow-free winter of 2000–01 may have influenced spring calf weights more than improved forage conditions.

Age-specific productivity has also been monitored since 1997. This work has been reported by Valkenburg et al. (1996) 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 = 32) 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 provide a measure of natality rate (K. R. Whitten, memo dated 3 January 1995). 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.

A few encouraging signs of improved nutrition were noted in 2001 and 2002, including improved survival rates, higher body weights of calves captured in April 2001, higher calf:cow ratios, and renewed fidelity to traditional winter range. Additionally, post-calving counts in 2002 showed a slight increase over the previous year for the first time in 10 years.

CONCLUSIONS AND RECOMMENDATIONS

The decline of the NAPCH may have reached bottom in 2001, and monitoring efforts should continue to verify whether body condition, productivity and survival are improving. The NAPCH has been designated a population important for high levels of human consumption, and under 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. The number of Tier II permits was reduced from 600 in 1999 to 400 in 2000–2002, although only 361 people applied in 2002. If the 2003 post calving count verifies that the herd is no longer declining, the number of permits should be increased to at least 600 for 2003.

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Table 1 NAP caribou fall composition counts and estimated population size, 1970–2002

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						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[22]	26	1,536	17,000
1988	49	48	26	51	46	34	20	25	1,156	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
2001	49	28	16	57	61	24	15	28	2,392	6,300
2002	46	24	14	59	57	19	24	27	1,007	6,600

Table 2 NAPCH harvest, regulatory years 1997–2001

Regulatory YEAR	Hunter harvest: Reported M (%)	F (%)	UNK.	TOTAL	Estimated UNREPORTED	Estimated TOTAL
1997–98	446 (92%)	36 (8%)	0	482	900–1,000	1,300-1,400
1998–99	453 (94%)	31 (6%)	6	490		1,000
1999–00	147 (95%)	8 (5%)	0	155		200
2000–01	76 (93%)	6 (7%)	0	82	500	112
2001–02	87 (93%)	7 (7%)	0	94	45	124
TOTAL					30	
					30	

[a] Estimated total is rounded off.

Table 3 NAP caribou annual hunter residency and success, regulatory years 1997–2001

Regulatory year	Successful: Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Unsuccessful: Local resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
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
2000–01	80	2	0	82 (60%)	48	6	0	54 (40%)	136
2001–02	86	8	0	92 (69%)	41	1	0	42 (31%)	134

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

Table 4 NAP caribou annual harvest chronology percent by month, regulatory years 1997–2001

Regulatory year	Harvest periods									
	August	September	October	November	December	January	February	March	April	*n*
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
2000–01			1		4		18		18	77
2001–02		22	0	5			19		24	85
	14	12		8		9		8		
	14					6		11		
					7					

Table 5 NAP caribou harvest percent by transport method, 1997–2001

Regulatory year	Percent of harvest						
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle
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
2000–01	5	0	27	44	19	1	4
2001–02	1	0	18	42	25	6	8

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

HERD: Southern Alaska Peninsula

GEOGRAPHIC DESCRIPTION: Southern Alaska Peninsula

BACKGROUND

The range of the Southern Alaska Peninsula caribou herd (SAPCH) extends from Port Moller to False Pass. Even though there have been numerous reports of caribou moving between Unimak Island and the mainland, including what may have been a substantial emigration in 1976, caribou on Unimak Island have been determined to be genetically isolated enough with fidelity to calving areas on the Island to be designated a separate herd. Historically, the size of the 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 severe icing conditions and ash from frequent volcanic activity affect food supply and availability. Recent herd history includes growth from 1975 to 1983 and decline from 1983 to 1996.

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). A survey by Izembek National Wildlife Refuge (INWR) staff early in 1997 showed a substantial increase in numbers, and a federal subsistence season was opened that fall. The herd continued to grow slowly, and in 1999 a general state hunt was opened.

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 conduct fall sex and age composition surveys with a helicopter in October. Occasional radiotracking flights are used to monitor herd distribution. Staff of 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 ADF&G/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.

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 radio collars. A partial survey by FWS in February 2002 only counted 1700 caribou, but a more complete FWS survey in November 2003 counted over 3900.

Population Composition

Calves comprised 26% and 24% of all caribou seen during the 1999 and 2000 postcalving counts, respectively. In June 2000, calves comprised 28% of caribou seen on the Caribou River Flats (n = 1077) and 22% of 1780 caribou found elsewhere.

Fall composition surveys in 2000, 2001 and 2002 showed a decline in calf:cow ratios and except for 2001, a decline in bull:cow ratios (Table 1).

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 2002, none of these caribou has moved from the unit where captured. Genetic testing for interbreeding among caribou in 9E, 9D, and Unimak Island also confirms relatively little genetic interchange between these herds. Exchange of caribou between Unimak Island and the mainland has not been documented in recent years.

MORTALITY

Harvest

Season and Bag Limits. There was no state hunt in Unit 9D 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 10–25 September, with a quota of 50 bulls. The 2000 fall season was expanded until 25 September for residents, and a general season was established for nonresidents from 10–30 September. In 2001, fall seasons were again lengthened for residents (10 August–30 September) and nonresidents (1–30 September). The bag limit since 1999 has been 1 caribou for residents and 1 bull for nonresidents.

Board of Game Actions and Emergency Orders. See preceding section.

Federal Subsistence Board Actions.

Following the Board of Game's action in March 1999 to establish a general resident state season, the Federal Subsistence Board dropped the federal subsistence hunt in 9D and later opened federal lands to nonlocal hunters. However, in 2000, another federal registration hunt was opened with a longer fall season (1August–25 September).

Hunter Harvest.

The reported harvests for state hunts is presented in Table 1.

A federal subsistence registration permit hunt (RC091) was established in 1997 with a bag limit of 1 bull. This season has continued since then, except in 1999 when it was suspended because of the open state hunt. Harvests under this federal hunt were 25 in 1997, 20 in 1998, and 14 for 2000, although the reporting rate averaged only 56%.

Hunter Residency and Success. Nonresident hunters have averaged 89% success but have only accounted for 25% of the reported harvest (Table 3). The harvest by local residents is undoubtedly under reported in Table 3 both because of non-compliance with state harvest tickets and use of federal permits.

Harvest Chronology. Timing of the harvest (Table 4) is influenced primarily by season dates and availability of caribou on the Cold Bay road system.

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

Other Mortality

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. Annual survival rates beginning in June for 1999 were 0.83 and 2000 were 0.76. Too few radiocollared caribou remained on the air during 2001 to calculate a meaningful survival rate.

HABITAT

Assessment

The pregnancy rate in 2000 for cows ≥2 years old was 74% (n = 341), and none of the radiocollared 2-year-old cows (n = 5) were pregnant. Combining parturition surveys in 2000 and 2001, only 55% of 3-year-old collared cows (n = 11) were pregnant.

CONCLUSIONS AND RECOMMENDATIONS

The rapid decline of the SAPCH was neither unusual in terms of the history of this herd nor was 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, the SAPCH began a period of recovery during the late 1990s. However, high mortality of neonatal calves documented in 1999 and reduced calf:cow ratios during 2000–2002 indicate herd growth may be somewhat sporadic. Past experience of overpopulation indicates that management actions should ensure that this herd does not exceed 5000 animals; and now that the herd is approaching the lower end of the management objective (4000), harvests should be increased modestly. It appears the federal subsistence bag limit will be increased to 2 caribou for 2003. The effects of this liberalization and herd performance should be monitored carefully.

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. Following the protocol for caribou management, we recommend that future collaring efforts be directed at female calves, and that a collaring effort be planned for April 2004. Given the high incidence of lungworm detected in 1995–98 in the NAPCH, it might be worth collecting 10 calves during fall composition surveys in 2003.

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Table 1 Southern Alaska Peninsula caribou composition and survey results, 1983–2001

Regulatory year	% Calves		Fall composition							Postcalving survey results	INWR[a] counts
	Summer	Fall	Bulls: 100 cows	Calves: 100 cows	Cows (%)	Small bulls (% bulls)	Medium bulls (% bulls)	Large bulls (% bulls)	sample size		
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	
2000	24	21	42	37	56	50	24	26	982		
2001		19	57	38	51	57	26	17	1,313		
2002		10	38	16	65	44	34	23	932		

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

Table 2 SAP CARIBOU harvest, regulatory years 1999–2001

Regulatory Year	Hunter harvest: Reported M (%)	Reported F (%)	Reported Unk.	Reported Total	Estimated Unreported	Estimated Total[a]
1999–00	46 (85%)	7 (13%)	1	54	30	84
2000–01	49 (93%)	2 (4%)	2	53	30	83
2001–02	45 (92%)	4 (8%)	0	49	30	79

[a] Estimated total is rounded off.

Table 3 SAP CARIBOU annual hunter residency and success, regulatory years 1999–2001

Regulatory year	Successful: Local[a] resident	Successful: Nonlocal resident	Successful: Nonresident	Successful: Total (%)	Unsuccessful: Local resident	Unsuccessful: Nonlocal resident	Unsuccessful: Nonresident	Unsuccessful: Total (%)	Total hunters
1999–00	27	19	7	54 (77%)	8	6	2	16 (23%)	70
2000–01	20	10	21	53 (79%)	5	8	1	14 (21%)	67
2001–02	22	13	12	49 (71%)	10	2	2	20 (29%)	69

[a] Local residents are residents of Subunit 9D.

Table 4 SAP caribou annual harvest chronology percent by month, regulatory years 1999–2001

Regulatory year	Harvest periods								*n*
	August	September	October	November	December	January	February	March	
1999–00	0	46	2	17	19	7	2	7	54
2000–01			0				2		50
2001–02	2	60 43	2	16 11	4	16	4	0	47
	4				13	23		0	

Table 5 SAP caribou harvest percent by transport method, regulatory years 1999–2001

Regulatory year	Percent of harvest						
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle
1999–00	20	0	17	22	0	2	37
2000–01	36	0	17	13	0	9	25
2001–02	27	0	18	29	0	4	22

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

HERD: Unimak Island

GEOGRAPHIC DESCRIPTION: Unimak Island

BACKGROUND

There have been numerous reports of caribou moving between Unimak Island and the mainland, including what may have been a substantial emigration in 1976. Based on this interchange, caribou on Unimak Island were considered a segment of the Southern Alaska Peninsula caribou herd. But fidelity to calving grounds on the island and recent evidence from genetic sampling show that there is enough distinction between caribou on the island and mainland to classify these as 2 different herds. Numbers of caribou on Unimak Island have varied substantially, ranging from 5000 in 1975 to 300 during the 1980s. Emergency Orders closed both state and federal hunts on Unimak Island in 1993. The federal subsistence season reopened in 2000 and the state general season reopened in 2001.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

No formal management objectives are in place for caribou on Unimak Island, and practically speaking there is little opportunity to actively manage this herd given the formidable logistics involved in reaching the island that will keep hunting effort extremely low. Given this problem and the relatively limited habitat, the herd ideally should be kept at 1000 to 1500 animals.

METHODS

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.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Following a peak of over 5000 caribou in 1975, the Unimak herd began a precipitous decline, apparently initiated by a sizable emigration. By the early 1980s the herd numbered in the just several hundred animals. By 1997 the herd had grown to at least 600, and has continued to grow through 2002.

Population Size

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

Fall composition surveys in 1999 showed a ratio of 46 claves:100 cows on Unimak, but only 126 caribou were classified. In 2000, 406 caribou were classified and ratios were 40 bulls and 21 claves per 100 cows. Large bulls made up 33% of all bulls. In 2002, 392 caribou were classified with ratios of 54 bulls and 31 calves per 100 cows. Large bulls made up 29% of all bulls.

Distribution and Movements

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

MORTALITY

Harvest

Season and Bag Limits. There was no state or federal hunt on Unimak Island during 1993–99. In 2000 a federal subsistence hunt was resumed. In 2001 a general state hunt was established with a 1 caribou bag limit and dates of 1 September–30 September for nonresidents and 10 August–30 September and 15 November–31 March for residents.

Board of Game Actions and Emergency Orders. The Board of Game restored the general hunt for 2001.

Federal Subsistence Board Actions. The fall season was extended from 25 September to 30 September for 2002.

Hunter Harvest. The reported harvests from the 2001 general season was 19 bulls and no cows. Of seven nonlocal Alaskans, 5 were successful. All 14 nonresidents were successful. All 19 caribou were killed in September and all hunters used aircraft to access the island.

Other Mortality

Too few caribou were radiocollared to allow calculation of survival rates.

HABITAT

Assessment

No data are available.

CONCLUSIONS AND RECOMMENDATIONS

Caribou on Unimak Island should be considered a separate herd, even though it is recognized that we will be unable to manage this herd to dampen population fluctuations. Hunting regulations should be manipulated to provide for local subsistence uses and to provide quality hunting experiences for other Alaskans and nonresidents.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

HERD: Chisana

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

BACKGROUND

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

Little is known about population trends before the 1960s. Scott et al. (1950) estimated herd size at 50 animals in 1949 but Skoog (1968) thought his estimate was low due to sampling problems. Skoog (1968) estimated the CCH at 3000 animals in 1964. 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 by 1988.

Since 1988 the herd has steadily declined. Weather and predation have been the primary causes for the decline. Harvest has had a minor effect on population fluctuations. 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. Hunting will remain closed until the bull:cow ratio exceeds 30 bulls:100 cows for 2 years and productivity is high enough to compensate for hunter harvest. By fall 2001 the herd numbered 325–350 caribou and adult and calf mortality continued to be high. Modeling

current herd mortality and productivity indicated if these patterns continued the herd would decline to 100–150 caribou (Farnell and Gardner 2002).

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

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. Use of the area and herd by tourists is 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 Environment (YDE) in October 1987. Initially, 15 adult female caribou were radiocollared to monitor movements and to facilitate spring and fall censuses and composition surveys. Subsequently, from 1990 through 2002, 57 adult females and 33 4-month-old female calves were radiocollared. Radiocollaring and herd monitoring costs are shared between ADF&G, NPS, and YDE.

A cooperative draft CCH Management Plan was developed in 2001 and a Yukon CCH Recovery Plan in 2002. Both plans were designed to aid herd recovery.

MANAGEMENT DIRECTION

During 2000–2002, CCH management and research was cooperatively developed to aid herd recovery. Activities that met the different mandates and philosophies of ADF&G, NPS, and YDE were assigned.

The current Chisana caribou management goal and objective are:

MANAGEMENT GOAL

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

MANAGEMENT OBJECTIVE

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

METHODS

Herd size was estimated in late June 1992, 1993, 1995, 1997, 1999, and 2002. 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 are the primary components of the model.

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 attempt to classify >90% of the herd each year.

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 from 2000–2002 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 (Whitten 1995). In 1994, 1995, 2000, and 2002 we captured 30, 20, 28, and 24 adult cows, respectively, and collected blood to determine pregnancy using a serum progesterone assay testing technique (Russell et al. 1998). We assessed body condition using a subjective measure of body fatness and estimated age by tooth wear. In fall 1998, 1999, and 2000, we captured and radiocollared 3–9 female calves to monitor calf weight, size, and condition, and determine age of first reproduction and movement patterns. In 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 in 1994, 1995, 2000, and 2001.

To assess whether wolf numbers had increased during the Chisana Herd decline we estimated wolf numbers within the CCH range in 2001 using aerial snow-tracking methods (Stephenson 1978). Two experienced teams using 2 Super Cubs searched the area. Wolf trails were

followed until the wolves were observed. If we could not see the wolves, we estimated numbers based on tracks.

Hunting for CCH has not been allowed since 1994. Technically, there is a hunting season, however no permits were issued during 1995–2002. Harvest data since 1989 were included in this report to help explain herd population and composition trends. Hunting seasons are based on a regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY01 = 1 Jul 2001 through 30 Jun 2002).

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. During 1988 through 2000, herd size declined by an average of 11.8% annually. The rate of decline was 8.6% between 2000 through 2002, and by fall 2002 it was estimated at 315 caribou (Table 1). The initial cause of the herd's decline was severe winter and summer weather that affected productivity and calf and adult survival. Since 1993 low survival of calves to 5-months of age (0–14 calves/100 cows) was probably due to predation based on the timing of calf mortality. Many of the small mountain herds in Interior and Southcentral Alaska and western Yukon experienced low calf survival during the early 1990s. However, none was as low as the CCH.

Population Composition

By May 2000, after 11 years of poor recruitment, the herd was composed of an estimated 71% old-age (teeth worn to gum line) animals (Farnell and Gardner 2002). In contrast, most stable woodland caribou herds in Yukon contain about 50% middle-aged animals (R Farnell, Yukon Department of Environment, unpublished data). Between 1 October 2000 and 1 October 2001, 33% of the radiocollared cows (11/33) died, of which 6 (55%) were ≥10 years old. In 2002 the estimated percentage of old-age cows and middle-aged cows was 29% and 38%, respectively. The higher proportion of younger cows reflects the die-off of the older aged cohorts. Based on the age structure, if recruitment remains poor (≤5/100), herd size will decline to 200–225 caribou during the next 3 years.

The genetic separation between the CCH and other Yukon and Alaska caribou herds indicates that the CCH was distinct from all herds tested including the adjacent Kluane and Mentasta Herds and the Fortymile Herd (Zittlau et al. 2000). Skoog (1968) hypothesized that the CCH was created by emigration from the Fortymile Herd. Zittlau (University of Alberta, unpublished data) also compared the genetic diversity between calves and adults to determine whether or not reduced bull numbers in the herd caused 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. This study found that the genetic variation for calves and adult cows was 80.1% and 81.6–82.2%, respectively, indicating that genetic diversity has not been lost.

Since 1990 the calf:cow ratio in the CCH has been 0–14 ($\bar{x}$ = 3.6:100, s = 4.48). We classified calves during 1999–2002 and found that females predominated, ranging between 56–82%. The bull:cow ratio declined during 1990–2000 (Table 1). Modeling demonstrated that the herd's declining bull:cow ratio was primarily a function of low calf recruitment. Bull numbers continued to decline during 2000–2002 but the bull:cow ratio increased because of the large die off of old cows. Most likely, now that the herd's age structure is more balanced, if calf recruitment remains low the bull:cow ratio will cease to grow and eventually decline.

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 alive on 31 May had little effect on the number of calves that were alive by 21 June (Table 2).

Estimated numbers of calves on 31 May were low (<40:100) in 1993, 1996, 1998, 1999, 2000, and 2002. 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. In 2002 the pregnancy rate for cows ≥3-years old was 95–100%, the 31 May calf:cow ratio was 25–29:100, and the percent calves in the herd was 19.8. On 23 June and 30 September, the percent calves in the herd was 10.8% and 9.7%.

During 1990–2002 fall composition data demonstrated that pregnancy and birth rates had no influence on fall calf:cow ratios, indicating late May and June calf mortality is the factor that most influences recruitment (Table 1).

Since 1995 the CCH pregnancy rate for cows ≥3-years old exceeded 90% except during 1997. Based on female calf weights, Chisana caribou were in excellent condition, at least going into the rut. However, no 2-year-olds have been documented pregnant ($\bar{x}$ = 11).

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 in 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. In years of average snow before 1991, most of the herd remained on sedge-grass range primarily in Alaska and used the eastern portion of its range only 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 (US Department of Agriculture 2000) and the herd wintered in the spruce forest along the White River. In 2001 and 2002, most of the herd wintered between the White and Generc Rivers. Since 1993 over 92–97% of the calving has occurred in Alaska. Since 1995 the herd formed its postcalving aggregations from Ophir Creek west to the Chisana Glacier, however most of the cows that still had a calf at heel in June did not join the postcalving groups but remained sequestered throughout the herd's Alaskan range.

The CCH does not have a core calving area. Instead, Chisana cows sequester themselves throughout the calving period. Calving was limited to higher elevations (4800 and 6600 ft) in 1993 but occurred in spruce to alpine habitats (3400–6600 ft) during 1994–2002. During 1995 and 1996, more cows calved below treeline (30–38%) than in previous years (0–10%); however, they still calved apart. In 1997 and 1998–2002, 25% and <10% of the calving took place below tree line. The largest calving groups observed in 1993 and 1994, after a minimum of 10 days of monitoring, consisted of 3 and 4 cows with calves. Between 1996 and 2002, radiotracking surveys conducted 3–5 days after peak calving found ≤5% of the calving cows in a group of >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

Alaska Board of Game Actions and Emergency Orders. In spring 1993 the Alaska Board of Game created a registration permit hunt for Chisana caribou. To ensure against 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. Since RY94 the harvest quota has been zero and no permits have been issued. To

reduce confusion to hunters, the season and bag limit description has been listed as no open season in the Alaska Hunting Regulations.

The Yukon Fish and Wildlife Management Board adopted regulations in 1994 that stopped all licensed hunting for Chisana caribou in Yukon, Canada. Hunting by the First Nations was not affected by this action and some harvest occurred (L LaRocque and D Drummond, Haines Junction YDE, personal communication). In 2002 the CCH was designated as a species at risk in Yukon under Specially Protected Wildlife regulation of the Yukon Wildlife Act. This action stopped all legal harvest of Chisana caribou.

Human-induced Mortality. There has been no legal harvest of Chisana caribou in Alaska or by licensed hunters in Yukon since RY94 (Table 3). Reports from local residents and incidences of radiocollared caribou that were shot indicate an illegal harvest in Alaska of 0–3 caribou annually. In Yukon, between 1996 and 1999, First Nation members killed 3–20 Chisana caribou annually along the Alaska Highway. In 2001, Yukon First Nation members voluntarily did not harvest Chisana caribou. Because the herd is inaccessible most of the year in Alaska, illegal or incidental harvest is not a concern. During years the herd winters along the Alaska Highway in the Yukon, illegal harvest could affect herd population trend. The regional biologist and protection officer in Haines Junction, Yukon have almost eliminated illegal harvest through patrols and public education.

Other Mortality

During 1996–2002 the annual mortality rate for radiocollared adult females was 8–33%. Since 1994, causes of death have been determined for 19 radiocollared females; predators killed 17, 1 died in an avalanche, and 1 was illegally shot.

Based on the percent cows in the herd and on herd pregnancy rate, 200–225 calves were born in May 2002. By 30 September, 30–35 calves remained (83–87% reduction). During 1994–2001, 83–95% of the calves died each year by 1 October. Most calf mortality occurred between the end of May and 26 June. Predation was probably 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, 2000; Valkenburg et al. 1999).

Since 1998, overwinter mortality of calf and yearling females has been 15–25%, which is high compared to the Delta Herd (Valkenburg et al. 2002) but comparable to the mortality rates of older Chisana cows. The second year of the herd's decline, between October 1990 and June 1991, 64% of radiocollared female calves died. Of the 9 collared caribou that died, 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 be attributed to wolves based on the timing of death (midwinter).

Wolf predation was the primary cause of calf mortality in the nearby Aishihik Herd, which is a small mountain caribou herd in Canada with behavior similar to the CCH (Hayes et al., in press). Spence (1998) estimated that each wolf killed about 8 calves/summer and that wolves were the primary limiting factor to Aishihik Herd growth. In 2001 there were 10 wolf packs (30–36 wolves, late winter count) that overlapped the CCH's summer range in Alaska. Five of

these packs resided in the area where most of the calving occurs. There are 7 additional packs (37–40 wolves) in Yukon that overlapped the herd's winter range. Wolf numbers were comparable in 2001 to 1987 (Sumanik 1987).

Grizzly bears could also be important predators on calves as the timing of Chisana calf loss coincides with the time period that grizzly predation was high in other calf mortality studies (Adams et al. 1995; Boertje and Gardner 2000). We have observed golden eagles killing Chisana calves but have no measure of frequency. 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 were effective only during the first few days of the calves' lives and kill fewer calves than wolves or grizzly bears. Based on incidental sightings, coyotes may be important predators when their numbers are high. During 1990–1992 and 1998–2000, coyotes were abundant within the Chisana's range. During those years, there were several reports of coyotes killing caribou calves and Dall sheep lambs (Urban Rahoi, personal communication). However, calf survival has been poor in years when coyote numbers were low indicating that coyotes are not a primary predator.

During the early 1990s the Chisana Herd formed large postcalving aggregations during June and most of the herd would be accounted for in 2–4 groups. After 1992, during the time of rapid herd decline, it was apparent that predators killed many calves as the herd formed these postcalving aggregates. Sightings of wolves and grizzly bears were common during this period in the area the herd traditionally used for postcalving. Since 2000 it appears that most of the cows that still had a calf at heel in late June did not join large groups but remained sequestered away from the main herd.

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 winter 2002–2003, wolf trappers in Yukon have increased their efforts and preliminary reports indicate several packs have been reduced. Little trapper effort has occurred on the calving grounds in Alaska where wolf reduction is most needed.

Summers were warm and slightly dry during 1989–1995, and winters 1991, 1992, 1999, and 2000 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 in 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 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, 1997, 2001, and 2002. Pregnancy rates were high but calf survival continued to be very low (4–13:100 cows), indicating that predation was the

primary limiting factor. The CCH increased during the 1980s when climate conditions were favorable and predation numbers 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. Considering the herd's age structure and the high rates of mortality, it is conceivable the CCH could decline to a low enough level that a environmental event could cause extirpation. 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 primary reason these small herds existed or increased was that wolf control was widely practiced from the 1920s through most of the 1980s. 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 if continued, allow the herd to recover.

Between June 1999 and December 2002, agency representatives from ADF&G, YDE, and NPS and the public met 3 times to discuss CCH management options. In Alaska, one of the most difficult problems is landownership. Most of Chisana Herd's calving range is within Wrangell–St Elias National Park and Preserve. NPS is mandated to manage for healthy animal populations including predators. NPS has interpreted this to mean that predator management is out of the question. However, there are other federal policies that recommend that cooperative management with states and other nations should occur to prevent species from declining to levels that would be considered threatened or endangered under the Endangered Species Act. To ensure Chisana Herd recovery, some management actions to increase calf survival in Alaska must be implemented. Unfortunately, this decision is primarily up to NPS.

Even though most CCH calving occurs in Alaska, because the Chisana Herd is currently listed as a species at risk, YDE will attempt a captive rearing program in spring and summer 2003 to improve calf survival. The plan is to temporarily hold pregnant cow caribou within a 50-acre enclosure on their natural range during April through July or August to protect their calves from predators. Twenty cow caribou will be captured, radiocollared, and placed in the enclosure. Behavior and calving success will be monitored. Calf survival will be compared between captive-reared and free-ranging calves. The first year will test the efficacy of the technique. The project will be expanded to 60–65 cow caribou/year and continue for 3–5 years if it proves to be safe and increases calf survival.

If Yukon's captive rearing program is successful, NPS should consider allowing similar temporary enclosures in Alaska. This would comply with federal policies recommending cooperative management to prevent species from declining to threatened or endangered status.

HABITAT

Assessment

Before the 1990s the most frequently used range in both winter and summer was predominantly grass–sedge habitat with few lichens. During 1991, 1993–1996, and 2000–2002 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, 2000, and 2001 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 and 2001 most of the herd wintered along the White River. Lichen availability was low (28–32% lichen, 51–55% moss, and 6–11% 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 the CCH experiences.

Data collected since 1991 indicate that nutrition of Chisana caribou has been variable. Summer range quality determines body size and body condition in the fall, as well as pregnancy and natality rates. 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 was adequate except during periods of unfavorable weather. Another indicator of summer range quality is autumn weights of female calves (Valkenburg et al. 2000). During 1998–2000, 19 five-month-old female calves were captured and weighed. Average weights only varied by 7% annually and the overall average weight was 141 pounds indicating excellent nutritional status.

Enhancement

The entire range of the CCH is located in the Wrangell–St Elias National Park and Preserve or within Yukon, Canada. It is currently against NPS policy to conduct wildlife habitat improvement projects. Therefore, no habitat improvement projects are being considered. Habitat enhancement will depend on 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

Since 1988 the CCH declined by 83% from poor calf recruitment and since 1992 from 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 2002. Predation was the cause of 89% of the documented mortality among radiocollared cows ≥4-months-old since 1991. Hunting was allowed during the herd's initial decline (1989–1994). Harvest 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 subsistence 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 may have contributed to higher overwinter adult mortality during 1994 and 1995. Lichen availability on winter range in Yukon is lower compared to other caribou herds but herd body condition is comparable except following severe winters. For the herd to stabilize, the calf recruitment rate must increase to 25 calves:100 cows while maintaining the cow mortality rate at 12–15% and the bull mortality rate at 21–25%. In order for calf survival to increase, pregnancy and natality rates must remain high and mortality caused by predators must decline.

The low recruitment rates experienced by the CCH over the past 13 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 YDE has allocated money to purchase radio collars and continue supporting the genetics study. The NPS 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.

We met our management objective. The Alaska Department of Fish and Game, NPS, and YDE developed a draft Chisana caribou management plan. YDE will begin a captive rearing program in spring 2003 in an attempt to improve calf survival. ADF&G will continue to monitor pregnancy and parturition rates and calf survival, as well as assist with the captive rearing project. NPS has not yet decided on its role in the recovery effort.

Based on management direction that will be implemented in spring 2003, the management objective will be changed for the next reporting period to: Cooperatively, with YDE and NPS, develop and implement management strategies to increase calf recruitment to 25 calves:100 cow by 2005.

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TABLE 1 Chisana caribou fall composition counts and estimated population size, 1987–2002

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]									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	09	0[c]		34	43	23	24	1142	1270
10/5/93	24	2	2	79	30	45	24	19	732	869
9/29/94	27	11	876	72	20	44	35	20	543	803
9/30/95	21	4	4	80	30	23	47	17	542	679
9/30/96	16	5	4	83	40	18	42	13	377	575
10/1/97	24	14	10	72	3	68	28	18	520	541
9/28/98	19	4	3	81	49	14	37	15	231	493
10/1/99	17	7	6	81	57	16	27	14	318	470
9/30/00	20	6	5	80	52	25	23	15	412	425
10/01/01	23	4	3	79	42	23	34	18	356	375
9/30/02	25	13	10	72	28	23	49	18	258	315

[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, 1989–2002

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
6/23/02	11 (33)	89 (272)	305

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

TABLE 3 Chisana caribou harvest and accidental death, regulatory years 1989–1990 through 2002–2003

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
2000–2001	0	0	0	0	0	1	1	0	1–3	2–4
2001–2002	0	0	0	0	0	1	1	0	1–3	2–4
2002–2003	0	0	0	0	0	1	1	0	0	1

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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 (Alaska Department of Fish and Game 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 of 1000 animals. 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 5-year 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 objective of 30–50 caribou annually by the year 2002. Although these harvest objectives remain in place, the plan expired without wolf control occurring.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVE

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

METHODS

We used a Robinson R-22 helicopter in late September–early November 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).

Fall radiotracking flights were flown in August and September to determine Macomb caribou distribution during the hunting season and to determine if any Delta Herd caribou were in

Unit 20D. Flights were flown in a Piper PA–18 Super Cub. Radio collars from both herds were monitored from a high altitude while flying over the Delta River from the mouth of Jarvis Creek to Black Rapids Glacier for 2–3 passes of the river, and then a thorough search was made of the area between McCumber Creek and the Delta River. Herd distribution was monitored in the remainder of Unit 20D by flying a single high altitude pass along the Alaska Range from the Delta River to the Robertson River. General locations were obtained by recording the approximate latitude and longitude of the radiocollared caribou.

Hunting was conducted by registration permit. Within 2 days of harvest, hunters were required to report the kill date and location, transportation mode, and commercial services used. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The MCH was below the herd size objective in RY01. A poor quality survey in RY02 did not result in a population estimate of sufficient accuracy to determine compliance.

RY01. We conducted a census on 9 October 2001 and counted 467 caribou (Table 1) and observers estimated herd size to be 500–550 caribou. Survey conditions were marginal with patchy snow conditions and high wind (Table 1).

RY02. We conducted a census on 2 November 2002 in poor survey conditions and counted only 234 caribou. The late timing of the count also resulted in the herd being dispersed and no longer in rutting aggregations. Due to poor surveys conditions it was not possible to estimate population size (Table 1). The census was conducted late because of very poor survey conditions during October.

Population Composition

During the previous 3 years (2000–2002) the bull:cow ratio in the MCH has averaged 45:100 and 26% of all bulls were classified as large bulls (Table 1). It is apparent that hunting is having a minor effect on population composition or age structure.

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

RY01. During the MCH fall 2001 census, most radiocollared caribou were located on the Macomb Plateau, and in the Bear Creek and Berry Creek drainages. One radiocollared caribou was located in the Granite Mountains.

A fall radiotracking flight was flown on 18 September 2001 to determine the distribution of Macomb and Delta caribou during the hunting season. Sixteen of a possible 24 Macomb caribou were located. Two radiocollared caribou were located in the Jarvis Creek drainage where most hunting has occurred in recent years, with 1 in upper McCumber Creek and 1 in the Granite Mountains. Eleven were located east of the Johnson River in the Macomb Plateau–Bear Creek–Berry Creek area. One was located on the east side of the Gerstle River and 1 was located in upper Bradford Creek.

One caribou in each of the Macomb and Delta herds have radio collars with the same frequency and visual collar. A caribou with this frequency was located on the Macomb Plateau and was assumed to be the Macomb caribou. No other Delta caribou were located in Unit 20D. Therefore, during the fall hunting season, no radiocollared Delta caribou were in Unit 20D.

RY02. During the MCH November 2002 census, caribou were widely dispersed. Fifty-one percent of caribou counted were in southwestern Unit 20D in the McCumber and Jarvis Creek drainages, 26% were in the Upper Little Gerstle River drainage, and 23% were in the vicinity of the Macomb Plateau.

A fall radiotracking flight was flown on 25 August 2002 to determine the distribution of Macomb and Delta caribou during the fall hunting season. Fifteen of a possible 24 radiocollared Macomb caribou were located. No Macomb caribou were located west of the Delta River and no Delta Herd caribou were located in Unit 20D. One caribou in each of the Macomb and Delta herds have radio collars with the same frequency and visual collar. A caribou with this frequency was located on the Macomb Plateau and was assumed to be the Macomb caribou. Eight of the 15 radio collars were located in the Macomb Plateau area, 4 were located between the Delta River and McCumber Creek, 1 was in the Little Gerstle River drainage, and 1 was located in the Sheep Creek drainage.

MORTALITY

Harvest

Season and Bag Limit.

RY01 — The RY01 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 in an attempt to reduce incidental caribou harvest by moose hunters during most of the moose hunting season and to make large, mature bulls more accessible to hunters. This was an attempt to make harvest more compensatory rather than additive.

RY02 — The RY02 hunting season was conducted as registration permit hunt RC835 (Table 2) from 15–25 August with a harvest quota of 25 bulls. The season was changed from September to August because moose hunters were taking caribou incidentally resulting in harvest that exceeded quotas and necessitated frequent EOs to close the season.

Alaska Board of Game Actions and Emergency Orders. At the March 2002 Alaska Board of Game meeting the board considered a proposal from the Delta Fish and Game Advisory Committee to establish a predation control implementation plan for the MCH that would involve

a wolf sterilization program; the proposal failed. The board considered a proposal from the public to eliminate the Macomb Plateau Controlled Use Area; the proposal failed. The board also considered a proposal from the department to modify the boundary of the Delta Controlled Use Area (DCUA) to benefit Macomb caribou. This change, combined with changing registration permit hunt RC835 season dates to August, restricted hunters from using motorized vehicles in the DCUA portion of the RC835 hunt area. These changes were an attempt to reduce RC835 harvest rates and to eliminate incidental harvest by moose hunters during the September moose hunting season; the proposal passed.

In RY01 the department issued an EO to close the 10–20 September hunting season at midnight on 12 September because we expected the harvest quota to be met by that date. In RY02 we issued an EO to close the 15–25 August hunting season at midnight on 20 August because we expected the harvest quota to be met by that date.

Hunter Harvest.

The RY01 harvest unintentionally met the harvest objective of 30 caribou, but exceeded the harvest quota of 25 caribou. The 30 caribou harvest objective was not met during RY02, but the harvest quota of 25 caribou was met.

Permit Hunts.

RY01 — Macomb caribou were hunted under registration permit hunt RC835 (Table 2). Permits were issued to 255 hunters (Table 2), and 174 (68%) hunters actually hunted (Table 3), killing 43 caribou (Table 4).

RY02 —Permits were issued to 158 hunters (Table 2) for registration permit hunt RC835, with 91 reporting hunting (Table 3) and killing 25 caribou (Table 4).

The decrease in permits issued, number of hunters, and harvest during FY02 was accomplished by changing the season from 10–20 September to 15–25 August, with no motorized vehicles allowed in the DCUA portion of the hunt area. However, it was still necessary to close the season by EO.

Hunter Residency and Success.

RY01 — Most hunters (55%) were nonlocal residents (Table 3). Nonlocal hunters had a 31% success rate compared to local hunters who had a 17% success rate. All hunters had a 25% success rate that was similar to the previous year (Table 3).

RY02 — Most hunters (56%) were nonlocal residents (Table 3) and they had a slightly higher success rate (29%) than local hunters who had a 25% success rate.

Harvest Chronology.

RY01 — An opening day kill of 34 caribou exceeded the harvest quota of 25 (Table 5) and the department began the process for issuing an EO, and informing hunters that the harvest quota

had been exceeded. The harvest rate then decreased to 4 and 5 on 11 and 12 September respectively. The season was open for only 3 days and the harvest quota was exceeded by 72%.

RY02 — With the opening day changed from 10 September to 15 August, the opening day kill of 11 equaled 44% of the harvest quota, rather than exceeding the quota as in RY01 (Table 5). With 4 and 5 caribou killed each day on 16 and 17 August respectively, EO proceedings were begun, and 5 additional caribou were killed by the time the season closed on 20 August.

Changing the season from September to August accomplished the objective of slowing the rate of harvest during RC835, but it did not accomplish the objective of managing the hunt without the necessity of EOs.

Harvest Location.

RY01 — Most caribou (56%) were taken in the Upper Jarvis Creek drainage, which includes the Coal Mine Road (Table 6). Thirteen caribou (31%) were taken within the MPCUA, and 1 (2%) was taken in Unit 12.

RY02 — Harvest increased substantially within the Upper Jarvis Creek drainage–Coal Mine Road area with 80% of caribou taken there (Table 6). Only 2 caribou (8%) were taken within the MPCUA, and 1 was taken in Unit 12.

Transport Methods.

RY01 — The most commonly used modes of transportation for successful hunters were 3- or 4-wheelers, other off-road vehicles, and highway vehicles (Table 7).

RY02 — The most commonly used modes of transportation for successful hunters were 3- or 4-wheeler, other off-road vehicles, and highway vehicles (Table 7).

Other Mortality

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

HABITAT

Assessment and Enhancement

During 1995–2002 both the Delta Herd and the MCH have used winter range in the western Granite Mountains and the Jarvis Creek drainage. In total, about 500–1000 caribou used this range continuously during RY00–RY01. How long winter food supplies will last in this area is unknown. However, a large amount of potential winter range for the MCH exists north of the Tanana River and sporadic radiotracking flights during the mid-to-late 1990s indicated that MCH caribou used this range. Because calves are relatively large in fall (Valkenburg et al. 2002), it does not appear that summer range is limiting herd growth, and it is therefore most likely that herd growth is primarily limited by predation or limited availability of habitats where MCH caribou can successfully avoid predators.

CONCLUSIONS AND RECOMMENDATIONS

The MCH size objective of 600–800 was not met during RY01 and compliance was unknown for RY02. The MCH was hunted during RY01–RY02 with a harvest quota of 25 caribou each year, which is below the minimum harvest objective of 30 caribou. The harvest objective was unintentionally met during the RY01 hunting season when the harvest quota was exceeded with a kill of 43 caribou. Hunting has a negligible effect on herd growth and a minor effect on population composition and age structure of bulls. 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. MCH population and harvest goals were drafted as part of the Wolf Control Implementation Plan. These goals should be reevaluated because the plan has expired.

Conducting the MCH hunt as a registration permit hunt with a small harvest quota is proving difficult for the department and frustrating for hunters because the season must be managed by EO. The hunting season was changed during RY02 to 15–25 August when DCUA regulations restricted motorized vehicles for much of the RC835 hunt area. Although this change resulted in a slower rate of harvest, it was still necessary to close the season by EO. The ideal solution would be to conduct RC835 as a short hunt of 3–5 days during August. However, a short hunting season raises concerns about providing reasonable opportunity for harvest on this herd, which has a positive customary and traditional use determination. Therefore, the hunt will be monitored for the next few years to determine if the change in season dates allows for a 10-day hunting season, and the season will continue to be closed by EO as necessary. Intensive management activities to increase caribou calf survival and stimulate herd growth would allow a larger harvest quota and thus a longer hunting season.

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TABLE 1 Macomb caribou fall composition counts and estimated population size, 1982–2002

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

[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 2002–2003

Hunt	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	9	31	12 (100)	0 (0)	0 (0)	12
Regulatory		100	6274	269	7417	10 (100)	0 (0)	0 (0)	109
						9			
570[b]	1986–1987	15	5360	147	8633	1 (100)	0 (0)	0 (0)	1
530[a]	1987–1988	150	53	7622	2425	53 (100)	0 (0)	0 (0)	53[c]33[c]
						33			
1986–1987		150	57	5524	4519	36 (100)	0 (0)	0 (0)	36[d]
		150	47	5528	4525	44 (100)	0 (0)	0 (0)	44[d]42[d]
						42			
535[e]	1990–1991	351	42	2112	7944	42 (100)	0 (0)	0 (0)	4243
						43			
1988–1989	[f]	317	33	16	50	48 (96)	0 (0)	2 (4)	50
1989–1990	[f]								
	1994–1995[f]								
	1995–1996[f]								
	1996–1997[f]								
1991–1992									
RC835[e]	[g]		34	15	50	22 (100)	0 (0)	0 (0)	22
1992–1993									
1993–1994		167	32	19	49	32 (100)	0 (0)	0 (0)	32
	[f]								
1997–1998	[g]	143	274	31	8	60	22 (100)	0 (0)	0 (0)	22
	[g]			32	17	51	43 (100)	0 (0)	0 (0)	43
	[g]			41	16	42	25 (100)	0 (0)	0 (0)	25
1998–1999									
Totals for	1985–1986	255	140	61	229	7831	12 (100)	0 (0)	0 (0)	12
1999–2000									
all permit	1986–1987	158	115	6170	249	7619	11 (100)	0 (0)	0 (0)	1110
2000–2001							10			
2001–2002									
hunts	1987–1988		150	53	7622	2425	53 (100)	0 (0)	0 (0)	53[a]33[a]
2002–2003							33			
			150	57	5524	4519	36 (100)	0 (0)	0 (0)	36[b]
			150	47	5328	4825	44 (100)	0 (0)	0 (0)	44[b]42[b]
							42			
1988–1989									
1989–1990									

Hunt	year	Permits issued	Percent did not hunt	Percent successful hunters	Percent unsuccessful hunters	Harvest			Total harvest
						Bulls (%)	Cows (%)	Unk	
		351	42	2312	7744	42 (100)	0 (0)	0 (0)	4243
Regulatory		317	33	16	50	43 48 (96)	0 (0)	2 (4)	50
	[f]								
	[f]								
1990–1991	1994–1995[f]								
	[f]								
1991–1992	1996–1997[f]								
1992–1993	[g]	143	34	15	50	22 (100)	0 (0)	0 (0)	22
1993–1994		167	32	19	49	32 (100)	0 (0)	0 (0)	32
1995–1996	[f]								
	[g]	274	31	8	60	22 (100)	0 (0)	0 (0)	22
1997–1998	[g]	255	32	17	51	43 (100)	0 (0)	0 (0)	43
1998–1999	[g]	158	41	16	42	25 (100)	0 (0)	0 (0)	25
1999–2000									
2000–2001									
2001–2002									
2002–2003									

[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] No reported 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 2002–2003

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]		36	0	57	(61)	15	21	1	37	(39)	94
1988–1989[b]		18	0	33	(54)	4	22	0	28	(46)	61
1989–1990[b]		20	0	38	(54)	8	24	0	32	(46)	70
1990–1991[c]	21	28	14	0	42	(23)	80	64	0	144	(77)	186
1991–1992[c]	15		27	0	50	(24)	77	81	0	158	(76)	208
1992–1993[d]	18											
1993–1994[d]												
1994–1995[d]	23											
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
2001–2002[c]	13	30	0	43	(25)	65	66	0	131	(75)	174
2002–2003[c]	10	15	0	25	(28)	30	36	0	66	(73)	91

[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 2002–2003

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
2001–2002	42	1	0	43	0	0	0	0	43
2002–2003	25	0	0	25	0	0	0	0	25

[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 2001–2002, and 15–25 August in 2002–2003

Regulatory year	Harvest date: August 15	16	17	18	19	20	21	22	23	24	25	September 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
2001–2002												34	4	5	0	0	0	0	0	0	0	0	43
2002–2003	11	4	5	1	1	3	0	0	0	0	0												25

[a] Hunt cancelled.

TABLE 6 Harvest location for caribou killed in Unit 20D registration hunt RC835, regulatory years 1997–1998 through 2002–2003

Uniform coding unit	General location	Harvest by regulatory year					
		1997–1998	1998–1999	1999–2000	2000–2001	2001–2002	2002–2003
Unit 20D							
901	Lower Jarvis Creek	1	0	0	0	0	0
902	Upper Jarvis Creek–Coal Mine Road	7	16	0	18	24	20
984	Richardson Highway	0	0	0	0	0	2
1000	Granite Mountain	0	0	0	0	1	0
1001	Granite Creek–Sawmill Creek	0	1	0	0	2	0
1100	Gerstle River	0	0	0	0	0	0
1201	Little Gerstle River	3	2	0	2	0	0
1401	Horn Mountain	9	9	0	0	12	2
1402	Plateau Lake	1	0	0	0	1	0
1403	Fish Lake	0	0	0	0	0	0
1500	Robertson River	0	2	0	0	0	0
1502	Robertson River	0	1	0	0	0	0
Unit 12		0	0	0	0	1	1
Unk		1	1	0	2	2	0

TABLE 7 Macomb caribou harvest percent by transport method, regulatory years 1986–1987 through 2002–2003

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
2001–2002	0	12	0	56	0	7	16	0	9	43
2002–2003	0	4	0	0	0	8	40	0	48	25

[a] Includes permit hunt harvest.

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

[c] Hunt canceled.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

GEOGRAPHIC DESCRIPTION: Nelchina Basin

HERD: Nelchina Caribou Herd

BACKGROUND

The Nelchina caribou herd (NCH) contained 5,000–15,000 caribou in the late 1940s. The herd increased during the early 1950s, aided by intensive predator control conducted by the Federal Government. The NCH continued to grow and peaked at about 70,000 caribou by the mid 1960s. A dramatic decline began in the late 1960s, and the herd 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 declined between 1996 and 2000.

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 2,500 to more than 10,000 caribou. After the herd declined, the bag limit was reduced to one caribou in 1972 and seasons were dramatically curtailed. In 1976 the season was closed by emergency order after hunters killed 800 caribou in only 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. Since 1990, Nelchina permits have been issued only for state and federal subsistence hunts, except for a very limited drawing hunt in Unit 14. Both the number of permits and the allowable harvest have fluctuated, depending on herd status. During the last 12 years (1989–01) there have been over 40,000 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 3,000–6,000 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, or a traditional census using hand-held cameras and direct field estimates made from the 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. Extrapolated fall post hunt population estimates are then calculated from the spring counts and fall composition data. Population data are modeled to determine future population trends and allowable yearly harvest rates.

Radiocollared caribou are located seasonally to delineate herd distribution, determine seasonal range use, and mortality rates. To accomplish this, a minimum of 40 and 60 radiocollared cow caribou are maintained in the herd each year. Collars are also placed on four-month-old female calves to obtain survival and parturition data for known age females. Radiocollared cows are located every other day during the calving period to determine pregnancy rates and the mean calving date.

Female calves are captured 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 increased 16% from 29,601 caribou in 2000 to 34,380 in 2002 (Table 1). The estimated density was 0.8 caribou/km^2 in 2002 based on an approximate range of 44,200 km^2 (Lieb et al. 1988).

Population Composition

Herd productivity in 2002 was the highest in 4 years with 52 calves:100 cows observed during the spring postcalving survey. This was the second consecutive year of improved productivity. Calf production in 1999 and 2000 was 32 and 31 calves:100 cows respectively, the lowest ever

observed in the NCH and 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 (from 2 to 3 or 4 years of age) and a reproductive pause in many 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 during the first 4 months of life is monitored by comparing changes in calf:cow ratios between summer and fall. Calf mortality in the first 4 months of life during 1999 and 2000 was very high with a loss of 9 and 11 calves:100 cows respectively, to 23 and 20 calves:100 cows (Table 1). Survival improved in 2001 and 2002 with fall calf:cow ratios of 40 and 48 calves:100 cows dropping only by 4 calves:100 cows from spring to fall in both years. Fall calf ratios historically ranged from 38 to 48 calves:100 cows.

The bull:cow ratio during the 2001 fall composition count was 37:100 and 31:100 in 2002. Fall bull ratios have been below the management objective of 40 bulls:100 cows since 1995. Bull:cow ratios during the 1980s when the herd was increasing were often in the range of 50–60 bulls:100 cows. The reduction in the bull:cow ratio was caused in part by increased bull harvests. Subsistence permittees select for large bulls. As more subsistence permits were issued, not only did the number of bulls decline, but the age structure of the bull population became skewed toward younger animals. Additionally, increased wolf predation because of higher wolf numbers in the late 1990s also contributed to the decline in large bulls. Older bulls are more susceptible to wolf predation than younger cohorts (Colman et al. 2003). 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. With bull harvests reduced the last 2 years, and declining wolf numbers, the percent of large bulls has increased to 23% in 2002.

Distribution and Movements

Calving takes place in the eastern Talkeetna Mountains from Fog Lakes southeast to the Little Nelchina River. The core calving area extends from the Little Nelchina River to Kosina Creek. This area is also used during the postcalving and early summer period. During summer and early fall, caribou 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 2001, the rut occurred in the eastern portion of 13B from the Alphabet Hills to the Tangle Lakes, while the rut in 2002 was dispersed from Lake Louise in 13A east to the slopes of Mt. Drum in Unit 11. Between 1995 and 2000 there was little use of traditional wintering areas in Unit 13. During the winter of 2001, much of the herd remained in Unit 13. In 2002, most of the herd wintered in northern Unit 11, Units 12 and 20E. 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 2001–2002 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 2001–2002 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 and 514) during 2001–2002 were 10 August to 30 September and 21 October to 31 March. The federal bag limit was 2 bulls. The Unit 13 federal subsistence hunt is a registration hunt administered by the Bureau of Land Management; only residents of Units 11, 13, or along the Nabesna Road in Unit 12 and Unit 20 residents from Delta Junction were eligible. A Unit 12 federal subsistence hunt (RC 512) for residents of Tetlin and Northway was opened by emergency order when the NCH migrated through Tetlin during November 2000. This hunt was not held in 2001.

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 NCH 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 NCH subsistence hunting was again by Tier II permit only. The 2000 and 2001 NCH Tier II hunt was for bulls only. The 2001 season was closed on 21 November by emergency order.

Hunter Harvest. The reported harvest in 2001–2002 for the combined state and federal hunts for the NCH was 1,500 caribou, down 39% from the 1999–2000 take of 2,456 (Table 2). The current combined NCH harvest has declined 73% since 1996, when the combined NCH harvest peaked at a reported 5,601 caribou.

Illegal and unreported harvests of Nelchina caribou are an additional source of mortality. The most common type of illegal harvest occurs when a permittee fails to validate the permit after taking a caribou. Once a permittee transports a caribou from the field without validating the permit, there is minimal chance of citing them for taking additional caribou on the same permit. Individuals also transfer permits to family members or friends. After 1997, the estimated illegal and unreported take (Table 3) was reduced because of the large decrease in hunting pressure after closure of the Tier I registration hunt.

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

Permit Hunts. Nelchina caribou were harvested by 5 separate permit hunts. Permit and 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, 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 2001–2002, 2000 permits were issued and hunters reported a harvest of 977 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. A decline in calf production coupled with the increase in harvests brought the size of the NCH to within 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. Overall harvests under this hunt were not much higher than reported in the prior two seasons under a Tier II hunt and were well below the expected kill. The observed impact of this hunt was only a slight reduction in herd size.

The federal registration hunts (RC513 & RC514) in Unit 13 are for residents of Units 13, 11, and residents along the Nabesna Road in Unit 12 and Delta Junction in Unit 20. The number of participants and the harvest have increased in recent years. The 2001–02 harvest was 501 caribou (Table 2). The highest reported harvest under this hunt was 647 caribou that occurred in 1991 when the 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 closed to federal subsistence hunting. The potential for a high harvest under this hunt still exists, however, because the fall caribou migration route between Paxson and Sourdough along the Richardson Highway is still on federal land 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 registration hunt (RC460) in Unit 12 is opened when the NCH migrates into Unit 12, but the Mentasta and Forty-Mile Caribou herds are not yet mixed in. 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. Historic harvests were low and fluctuated between 155 and 361 bulls however, in 1998 the hunt was for cows only and 380 were harvested (Table 2). The hunt was very popular and has the potential for a high harvest if held when caribou migrate into the area in large numbers. This hunt has not been held since 1998.

The federal registration hunt (RC512) 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 administers this hunt on the Tetlin National Wildlife Refuge. The hunt was held in 2000 and the harvest was very low with only 43 bulls reported taken (Table 2).

The state drawing permit hunt (DC590) 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. Bulls predominate the harvest, but the overall take has been very low ranging from 9–19 animals during this reporting period (Table 2).

Hunter Residency and Success. Only Alaska residents are allowed to hunt Nelchina caribou in Units 12 and 13. Nonresident hunters are allowed to hunt the NCH only in 14B under a drawing permit hunt, but there were no nonresident permittees during this report period. Table 4 lists hunter residency for local (Units 11, 13 and along the Nabesna road in Unit 12) or nonlocal hunters and their success for the state Tier II hunt only. Most of the Tier II permits were issued to nonlocal Alaska residents. Local hunters comprised 13% of the total Tier II hunters and took 10% of the total harvest. Both federal hunts (RC512 and RC513) are open only to residents of defined subsistence zones thus only federally defined 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 4 and 7 days hunting to get a caribou, while unsuccessful hunters averaged 7 to 15 days in the field. Federal subsistence hunters reported approximately the same hunting effort.

Hunter success for all NCH hunts increased from 11% in 1997–98 to 32% in 2001–2002. The increase in hunter success was primarily attributable to the dramatic decline in the number of permits issued – the number went from 37,726 in 1997 to 4,703 in 2001. Fluctuations in hunter success between years with similar hunting effort are usually attributed to fall caribou distributions away from the road system or winter migrations out of the unit. Another factor that affects hunter success in all Tier II hunts is the way permits are issued to the same high scoring individuals every year. Because the same individuals get the permits every year, a Nelchina Tier II permit is not the valued prize it was under the old drawing system when an individual was fortunate to get drawn for a permit once every 3 or 4 years and success rates often exceeded 60%.

Harvest Chronology. The fall caribou season occurs in August and September and is the most popular time to hunt caribou. Sixty to 100 percent of the yearly TC566 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, winter seasons have been important, with high harvests in those years when caribou remain in Unit 13. However, the winter season is subject to emergency closures in those years when the harvest quota is reached before the season ends on 31 March.

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 both the length of the

winter hunt and the availability of caribou. Highway vehicles have been the most important transportation method in the Unit 13 federal subsistence hunt (RC513) and the Unit 12 state registration hunt (RC460), with 40–70% of successful hunters reporting their use. Aircraft were the most important transportation method in the Unit 14B drawing hunt (DC590).

Other Mortality

The mortality rate for radiocollared yearling and adult cows during 2000 and 2001 was 11% and 10% respectively, down from the 20% mortality observed during 1999. The high mortality rate in the late 1990s was attributable to increased predation from high wolf numbers. Wolves are present throughout the NCH range, and predation by wolves is thought to be an important source of mortality. Ballard et al. (1987) reported that Unit 13 wolves preyed on caribou whenever they were available. 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, and annual mortality rates on radiocollared caribou typically were at or below 10%. Since 1988 wolves have increased over most of the Nelchina caribou range, especially in Subunit 13A where recent 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. High wolf harvests the last 3 years have reduced wolf numbers on the core calving area, thus the observed increase in caribou survival. A wolf survey in 2002 resulted in a density estimate of 7 wolves/1000 km^2 in 13A (Golden, ADF&G files).

An important factor limiting winter predation on caribou by wolves in Unit 13 is the migratory pattern of the NCH. In most years, a large percentage of the caribou in the NCH leave Unit 13 in October and do not return from wintering areas in Units 11, 12 and 20 until April, and thus are unavailable to Unit 13 wolves. Predation rates during the winter depend on the number of wolves present in these other units. Mortality rates include overwinter loss as part of the yearly total mortality.

Grizzly bears are present and considered numerous throughout the NCH summer range. Grizzlies are also known to be important predators of caribou (Boertje and Gardner 1998); however, predation rates and their effects on the NCH have not been studied.

Winter snow accumulations were severe in Units 13, 12, and 20E in 2000, and were above average in 2001. In winters with deep snow pack, caribou are most vulnerable to wolf predation and are more nutritionally and energetically stressed, impacting future productivity.

HABITAT

Assessment

Between 1955 and 1962 ADF&G established 39 range stations, including exclosures, throughout much of the Nelchina caribou range. Biologists examined these stations at approximately 5- to 6-year intervals from 1957 through 1989. A complete description of the Nelchina caribou range, range station locations, and results of long-term monitoring 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 a diet 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 Mulchatna Caribou Herds (Pitcher 1991). Since 1992, female calves have been captured and radiocollared or collected to assess body condition and future age specific productivity data. Four-month fall and ten-month spring weights have ranged between 103 and 129 lbs. These represent the lightest and most variable weights for the Interior herds (Valkenburg, ADF&G Files).

Variations in summer weather conditions that influence plant growth, forage quality, and nitrogen levels may be responsible for much of the variation in the fall body condition. Insect harassment may also be an important factor in influencing body condition (Colman et al. 2003). This may be especially important for the NCH because traditional calving grounds and summer range have been heavily grazed for years, allowing annual variations in weather to significantly impact foraging conditions. Unfortunately, the same hot dry conditions that limit forage production also favor high insect harassment. Increased stress from low forage availability combined with insect harassment minimizes summer weight gain and some of the lowest calf weights have been observed following hot dry summers. Alternately, cool cloudy summer conditions minimize insect activity as well as increase forage quality in terms of higher nitrogen levels in vascular plants (Lenart 1997). During this reporting period, lowest four-month old calf weights (106.5 lbs.) were observed after a dry summer in 1996 and the highest (129.0 lbs.) in 2001 following a summer with a wet, cold July. The NCH has the genetic potential to produce heavier caribou provided adequate nutrition is available. Female calves weighed in Kenai, which were the 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.).

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 four-month old calves. Since 1992, no two-year old cows have produced a calf. In years with conditions favorable to good forage production and availability, 65% of the three-year old cows had calves, but during years with drought or deep snow conditions, no three-year old cows calved. Pregnancy rates in 2002 were high, with 65% of the three-year-old and 87% of the four-year-old and older radiocollared cows pregnant. Productivity

increases when favorable weather patterns result in high annual forage growth that allows cows to improve their overall body condition going into the rut.

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 35,000–40,000 caribou on the range and monitor the results. Because a herd reduction occurred only in the last four years, more time is needed to fully evaluate the impact of the current decline 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 preferred 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 availability for caribou. In spite of the current fire management plan and the benefits of wildfire, Unit 13 has had only one significant fire (5,000 acre Tazlina lake burn) since 1950 as most wildfire ignitions have been suppressed. A separate plan 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 Unit 13 has increased and may be disrupting normal caribou behavior patterns.

CONCLUSIONS AND RECOMMENDATIONS

The fall 2002 NCH herd estimate of 34,380 caribou indicates the size of the herd has increased from the 2000 low of 29,601 but is still below the population management objective of 35,000–40,000 caribou. The large declines in herd size observed between 1998 and 2000 were attributed to both low productivity and increased wolf predation. Calf production in 1999 and 2000 was the lowest ever observed, but increased in 2001 and 2002. Calf survival to fall also increased during the last two years as high wolf harvest in 13A appreciably reduced the number on wolves

on the core calving ground. Also, caribou remained on the calving ground until later in the summer and did not expose themselves to higher wolf densities in other parts of Unit 13.

Declines in herd productivity are often attributed to lower pregnancy rates due to reduced forage production or availability because of severe winter conditions, summer droughts, late spring or early fall snow conditions. Similar to Cameron and Ver Hoeff (1994) conclusions, declines in body condition of NCH cows in 1998 and 1999 may have caused caribou to skip a calving interval until body condition improved, explaining record low calf numbers in 1999 and 2000. 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. Heavy harvest on the bull segment during the fall seasons by subsistence hunters may be partly responsible 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. Wolf predation also decreases the number of large bulls as they are vulnerable to predation when isolated after the rut. 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, adequate numbers of 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 annual recruitment, bull:cow ratios, and the population trend. Harvest objectives for the NCH can be successfully attained by adjusting the number of Tier II permits issued 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 and habitat 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 and maintaining 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 but well above herd lows, over a prolonged number of years has

never been accomplished on a large herd. A major benefit of this management strategy is to provide a more stable and predictable harvest of caribou from the herd over the long term. Historic harvests, when the NCH peaked in the 1960s, averaged 3,600 caribou a year (range 360–10,100), then dropped dramatically after the crash in the 1970s. 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, regulatory years 1997–2002

Regulatory year	bulls: 100 cows	Calves: 100 cows	Calves (%)	Cows (%)	Total bulls (%)	Composition sample size	Total adults	Estimate of herd size	Postcalving[a] count
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
2001–02	37	40	22	57	21	3,949	26,159	33,745	35,106
2002–03	31	48	27	56	17	1,710	25,161	34,380	35,939

[a] Spring census.

Table 2 Nelchina caribou harvest data by permit hunt, regulatory years 1997–2001

Hunt No. /Area	Regulatory year	Permits Issued	Percent did not hunt	Percent Successful Hunters	Percent Unsuccessful hunters	Bulls	(%)	Cows	(%)	Unk.	Total Harvest
TC566[a]	1997–98	10,000	27	21	48	2,078	(100)	2	(0)	17	2,097
	1998–99	10,020	53	25	18	2,454	(99)	14	(1)	6	2,474
		8,015	31	25	40	1,422	(71)	589	(29)	6	2,017
		2,000	18	38	41	760	(99)	4	(1)	1	765
		1,996	16	49	31	977	(99)	4	(1)	1	982
RC567[b]	1997–98	25,376	71	6	15	438	(28)	1,151	(72)	12	1,601
RC	1997–98	1,618	22	10	38	105	(64)	58	(35)	1	164
1999–00[c]	1998–99	2,413	31	17	42	230	(55)	185	(44)	3	418
513/514		2,631	24	15	39	207	(53)	181	(47)	1	389
2000–01		2,367	32	12	51	193	(71)	79	(29)	1	273
2001–02	2001–02	2,607	24	19	37	492	(98)	3	(1)	6	501
RC460[d]		632	14	25	60	150	(98)	3	(2)	2	155
		920	10	43	47	16	(4)	380	(96)	1	397
1999–00	1997–98 1999–02	No hunts									
2000–01											
RC512[c]	1997–98	No hunt									
		47	34	23	43	11	(100)	--	--	--	11
		207	26	18	27	38	(100)	--	--	--	38
1998–99		192	21	22	33	43	(100)	--	--	--	43
	2001–02	No hunt									
1998–99											
1999–00											
2000–01											

Table 2 Continued

Hunt No. /Area	Regulatory year	Permits Issued	Percent did not hunt	Percent Successful Hunters	Percent Unsuccessful hunters	Bulls	(%)	Cows	(%)	Unk.	Harvest
DC590[f]	1997–98	100	57	10	29	7	(70)	3	(30)	0	10
	1998–99	100	42	19	36	13	(68)	6	(32)	0 Total	19
	1999–00	100	56	12	28	6	(50)	6	(50)	0	12
	2000–01	100	63	9	27	5	(56)	4	(44)	0	9
	2001–02	100	51	17	30	7	(41)	10	(59)	0	17
Totals for all permit hunts	1997–98	37,726	56	11	25	2,778	(70)	1,217	(30)	32	4,027
	1998–99	13,500	46	25	25	2,724	(82)	585	(18)	10	3,319
	1999–00	10,953	29	22	39	1,673	(68)	776	(32)	7	2,456
	2000–01	4,659	26	23	46	1,001	(92)	87	(8)	2	1,090
	2001–02	4,703	21	32	34	1,476	(98)	17	(1)	7	1,500

[a] Tier II subsistence drawing permit.

[b] Tier I subsistence registration permit.

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

[d] A winter registration hunt for Alaska residents, held in Unit 12.

[e] Subsistence registration for Unit 12 residents, administered by Fish and Wildlife Service as Federal Hunt RC512.

[f] A drawing hunt.

Table 3 Nelchina caribou harvest and accidental death, regulatory years 1997–2001

Regulatory	Reported						Estimated			Accidental	Grand
Year	M	(%)	F	(%)	Unk.	Total	Unreported	Illegal	Total	death	total
1997–98	2,778	(70)	1,217	(30)	32	4,027	500	300	800	200	5,027
1998–99	2,724	(82)	585	(18)	10	3,319	200	100	300	200	3,819
1999–00	1,673	(68)	776	(32)	7	2456	200	100	300	200	2956
2000–01	1,001	(92)	87	(8)	2	1,090	200	100	300	200	1,590
2001–02	1,476	(98)	17	(1)	7	1,500	200	100	300	200	2,000

Table 4 Nelchina caribou Hunt TC566 annual hunter residency and success, regulatory years 1997–2001

	Successful				Unsuccessful				
Regulatory year	Local[a] resident	Nonlocal resident	Nonresident	Total	Local[a] resident	Nonlocal resident	Nonresident	Total	Total hunters
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
2000–01	74	691	--	765	128	698	--	826	1,591
2001–02	99	883	--	982	110	508	--	618	1600

[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, regulatory years 1997–2001

	Harvest Periods														
	Weeks (fall)								Months (winter)						
Regulatory year	1	2	3	4	5	6	7	8	Oct.	Nov.	Dec.	Jan.	Feb	Mar.	n
1997–98	4	5	5	8	9	9	12	10	10	24	2	0	0	1	2,052
1998–99	6	8	9	10	9	16	13	11	11	8	--	--	--	--	2,434
1999–00	6	16	15	12	23	15	12	--	--	--	--	--	--	--	2,002
2000–01	0	5	10	6	9	14	17	12	8	7	3	1	2	5	760
2001–02	9	7	5	11	12	17	12	0	7	20	--	--	--	--	955

Table 6. Nelchina caribou Hunt TC566 harvest percent by transport method, regulatory years 1997–2001.

	Percent of harvest									
Regulatory year	Airplane	Horse	Boat	3 or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Airboat	Unk.	n
1997–98	9	1	10	28	22	9	19	0	1	2,097
1998–99	6	1	11	38	4	11	27	1	1	2,478
1999–00	8	1	17	41	0	15	15	1	1	2,017
2000–01	6	1	11	33	18	12	18	2	1	765
2001–02	6	1	7	38	8	12	26	1	1	980

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

HERD: Kilbuck Mountain and Mulchatna Herds

GEOGRAPHIC DESCRIPTION: Yukon–Kuskokwim Delta

BACKGROUND

Historically, caribou ranged throughout the Yukon–Kuskokwim Delta, including Nunivak Island, and populations probably peaked during the 1860s (Skoog 1968). By the early 1900s, there were few caribou in the lowlands of the Delta. From the 1920s to the 1930s, reindeer herds ranged throughout much of the area but declined sharply in the 1940s (Calista, 1984). Since the decline of the reindeer herds, the abundant caribou habitat throughout Unit 18 was only lightly used until the regular seasonal arrival of large numbers of caribou from the Mulchatna Caribou Herd (MCH) beginning in 1994.

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

Caribou from the Western Arctic Caribou Herd (WAH), the largest herd in Alaska, occasionally venture into the northern part of Unit 18. Hunting regulations north of the Yukon River are liberal to allow hunters to take advantage of these infrequent hunting opportunities.

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

Since 1985, ADF&G 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. A technical paper detailing this effort is pending.

In 1990, we initiated cooperative management planning for the KCH and ADF&G joined with local residents and FWS to develop the Kilbuck Caribou Herd Cooperative Management Plan. Due to the assimilation of the KCH by the MCH, the plan is no longer followed, however, the Cooperative Planning Group continues to provide a 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 number of caribou,
- Improve compliance with caribou hunting regulations, and
- Better understand the interaction between the KCH or other caribou in Unit 18 and the MCH.

MANAGEMENT OBJECTIVES

We no longer follow the specific management objectives outlined in the Qavilnguut (Kilbuck) Caribou Herd Cooperative Management Plan which were reported in previous management reports. Our current objectives are:

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

METHODS

Since December 1990, we have met and corresponded with representatives from local villages and other agencies to discuss caribou management in Unit 18. More recently, we've also discussed the status of the KCH and the future of the working group.

We continued the cooperative caribou study and completed multiple flights using fixed-wing aircraft to monitor radiocollars deployed among KCH and MCH caribou and recorded 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 fall sex and age composition counts in the Kilbuck Mountains during October 2000 and October 2001. As in previous years, large numbers of MCH caribou were present and our results were pooled with other MCH data. Two observers and a pilot used an R44 helicopter to sample caribou for composition. A fixed-wing Cessna 185 aircraft equipped with radiotelemetry equipment was used to locate groups of caribou throughout the area.

We conducted spring calving and sex and age composition counts throughout the western, northern, and southern drainages of the Kilbuck Mountains. We used a fixed-wing Husky aircraft during 5 flights between May 16 and early June 6 in 2001 and 3 flights between June 7 and June 11 in 2002. Classification by age and sex from a fixed-wing aircraft would typically be difficult. However, the population was composed largely of bulls in bull groups that were easily identified by antler conformation. Multiple passes with the airplane were necessary only for cows and cow-like animals and because there were few such animals, this type of survey was possible.

We flew a Cessna 172 with members of the working group into the Kilbuck Mountains during June 2001 to show them the composition of the caribou in the area. This flight was instrumental in explaining our interpretation that the KCH was assimilated by the MCH.

Caribou harvest reporting has been minimal and deficient. In 1999–2000, we began an incentive program to increase compliance with harvest reporting requirements and we have continued this program through this reporting period. We offer prizes through a drawing to hunters who properly report their harvest. We utilized public service announcements and paid advertisements to educate the public about harvest reporting requirements and to encourage hunter participation in this program.

We conducted a single caribou reconnaissance flight north of the Yukon River during June 2002 but no caribou were located.

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. There have been annual influxes of approximately 15,000 to 40,000 Mulchatna caribou ever since.

We located a calving group of approximately 150 caribou in the Heart Lake area along the border between Units 17 and 18 in June of 2000. This was the last time a significant number of caribou were found calving in a traditional KCH area. Nine radiocollars were deployed among yearling females within or near this group. We did not find any of these or other radiocollars in Unit 18 during subsequent calving area searches of 19.8 hours and 18.0 hours in spring of 2001 and 2002 respectively. Further, we did not find any groups of caribou larger than 10 that included calves. We found only 1 to 3 calves in any group and these were scattered from the southernmost portion of Unit 18 to just south of Eek Lake. Since June 2000, we have not found any obvious fidelity to any calving area. These data support our interpretation that the KCH has been assimilated by the MCH.

Population Composition

We conducted fall sex and age composition counts among MCH caribou in Unit 18 during October 2000 and again in October 2001 (Table 1). Complete MCH composition data can be found in the MCH caribou management report.

We conducted spring sex and age composition counts during calving throughout the eastern portions of Unit 18, including the former range of the KCH, to assist herd identity interpretations. We found few calves scattered throughout the area with the largest group (3 calves) found near Nanvak Bay, south of the southernmost portion of Unit 18 and outside the former range of the KCH. We also found that over 90% of the caribou in this area were bulls (Table 2). The overwhelming number of bulls in our samples suggests that the caribou in Unit 18 are part of a much larger population and supports our interpretation that the KCH has been assimilated by the MCH.

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 the eastern lower Kuskokwim River and Kuskokwim Bay drainages, extending from the Whitefish Lake area near Aniak to the southernmost portions of Unit 18 and stayed through late March to early April when they moved westward into Units 17A, 17B, and 19B.

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 surmise that KCH caribou followed the thousands of MCH caribou that migrated through traditional KCH calving areas and that this was an important mechanism for the assimilation of the KCH by the MCH.

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

Caribou from the Western Arctic Caribou herd (WAH) occasionally use portions of Unit 18 north of the Yukon River. The number of WAH caribou using this area is small relative to the size of the entire herd. Unit 18 is on the periphery of the WAH's range and use of this area is occasional and intermittent. We did not find any evidence of WAH caribou in Unit 18 during a reconnaissance flight conducted in June of 2002.

MORTALITY

Harvest

Season and Bag Limit

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season

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 opened the season by emergency order only when enough Mulchatna caribou were present in Unit 18 to overwhelm the Kilbuck herd. The 2000–2001 season was open from 9 September–31 March and the 2001–2002 season was open from 25 August–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.

The Board of Game adopted 2 public proposals to change caribou regulations in Unit 18, south of the Yukon River during their November 2001 meeting. The resident season was changed from a season to be announced by emergency order to a 1 August–31 March season and a nonresident season of 1 September–1 October with a bag limit of 1 bull was added. These changes become effective during the 2002–2003 regulatory year and reflect a shift toward managing Unit 18 caribou for MCH rather than KCH caribou.

Hunter Harvest. In 2000–2001, 178 hunters reported killing 138 caribou including 104 bulls, 31 cows, and 3 of unknown sex. In 2001–2002, 208 hunters reported killing 383 caribou including 267 bulls and 116 cows.

Harvest reporting continues to be poor. We're addressing this issue through a harvest report prize drawing incentive and other public information and education tools. However, the value of our reported harvest data is still limited. Coffing, et al. (2000) report that Akiachak residents (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.

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

Hunter Residency and Success. All caribou hunters in Unit 18 are residents because there was no open season for nonresidents during this reporting period. In 2000–2001, 80.7% of the hunters who reported were successful taking at least one caribou. In 2001–2002, 76.4% reported taking at least one caribou.

Harvest Chronology. Harvest occurs throughout the season. Typically, most of the harvest is unreported and occurs during the winter months when snow conditions are favorable for travel by snowmachine. Harvest is generally greatest during February and March.

Transport Methods. During the open water months of September and October, most hunters use boats to access hunting areas. Only a small proportion of hunters use airplanes. Most hunters use snowmachines after snow conditions improve enough to permit safe travel. Only rarely are other transportation methods used.

Other Mortality

Little direct information is available regarding other mortality of caribou in Unit 18. Caribou are an important prey species for wolves and predation by wolves has 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. 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 since the 1940s (Calista Professional Services and Orutsararmuit Native Council, 1984).

Enhancement

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

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

Cooperative Management Plan

After extensive agency and public input, the KCH Cooperative Management Plan was developed in 1994, revised in 1995, and again in 1997. The plan provides guidelines for management of the KCH. Now that the KCH no longer exists as a separate herd, this management plan is in limbo. However, members of the working group are still consulted for public input regarding caribou in Unit 18.

CONCLUSIONS AND RECOMMENDATIONS

Since 1986, the FWS and ADF&G have cooperatively studied the KCH and other caribou in Unit 18. Estimated at a minimum of 4220 animals in 1994, the KCH was a distinct resident herd 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.

We conducted extensive searches during composition counts in spring of 2001 and 2002 but we did not locate any radiocollared caribou. However, researchers in Unit 17 found caribou with radiocollars in Unit 18 among calving MCH caribou. Further, our searches did not reveal significant calving in Unit 18. In fact, well over 90% of the caribou located were bulls. The most parsimonious explanation for these findings is that the KCH no longer exists as a separate herd.

The assimilation of the KCH by the MCH is a significant event because it changes our management direction. We recommend that management of caribou in Unit 18 focus on MCH caribou rather than KCH caribou. However, we should continue to monitor the Kilbuck Mountains for caribou calving and gather additional information about Mulchatna caribou in Unit 18 including: sex and age composition data, location information, seasonal range use, and number estimates.

We need to improve harvest reporting. The harvest report prize drawing incentive has increased interest and educating the public about reporting requirements is important. This incentive provides a platform for education and should be continued.

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Table 1 Fall composition of caribou from the Mulchatna Caribou herd (MCH) in Unit 18, 1999–2001

			Bulls			
Year	Cows	Calves	Small	Medium	Large	Total
1999	3277	462	594	261	137	4731
2000	1439	350	329	168	140	2426
2001	1299	286	223	153	90	2051

Table 3 Spring composition of caribou in Unit 18, 2000–2001

Year	Bulls	Cows/hard antlers	Cows/no antlers	Calves	Unknown	Total
2000	1132	22	23	4	46	1227
	(92.3%)	(1.8%)	(1.9%)	(0.3%)	(3.7%)	
2001	1095	0	27	4	5	1131
	(96.8%)	-	(2.3%)	(0.4%)	(0.4%)	

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNITS: 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 the McGrath area. During the 1800s caribou occurred sporadically in far greater numbers over a greater range than at present. Discussions with village elders and reports of early explorers corroborate this, although documentation is poor (Hemming 1970). The Mulchatna caribou herd once roamed throughout the Kuskokwim Basin, but as numbers dwindled, this herd retreated south to better range (Whitman 1997). As the Mulchatna Herd increased during the 1990s, it expanded its winter range northward into portions of Unit 19.

Small caribou bands have apparently existed in the Kuskokwim Mountains, which divide Unit 19 from Unit 21, 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. In areas where reindeer were herded, animals were occasionally lost. Some people believe the *Rangifer* herds in the Kuskokwim Mountains today are descendants of feral reindeer or reindeer–caribou hybrids. This theory is supported by the fact that the Beaver Mountains caribou herd calves much earlier than many other caribou herds (early-to-mid May), although this may be due to abundance of food rather than the influence of reindeer genes.

The Beaver Mountains Herd and Sunshine Mountains Herd are the only 2 herds in the Kuskokwim Mountains north of the Kuskokwim River (Pegau 1986). Previous reports described these herds as the Kuskokwim Mountains Herd/Herds or the Beaver Mountains Herd and Sunshine (Sunshine/Nixon) Mountain Herd (Shepherd 1981; Pegau 1986). In the early 1980s Pegau (1986) radiocollared caribou in the Beaver and Sunshine Mountains. Range overlap was

not documented during the 4-year study. However, radiocollared caribou from the Beaver Mountains ranged south almost to Horn Mountain. Caribou in that vicinity were previously called the Kuskokwim Mountains Herd, but are now considered Beaver Mountains Herd animals.

Herds presently recognized south of the Kuskokwim River include the Tonzona, Big River–Farewell (previously called Big River), Rainy Pass, and Mulchatna herds. Radiotelemetry data 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) radiocollared caribou in the Big River–Farewell Herd near Farewell in the early 1980s. During the first year of the study, these caribou remained in the Farewell area, but some moved near the Swift River the following year and did not return for at least 2 years. These observations raised as many questions as they answered, and the discreteness and extent of the range of the Big River–Farewell Herd is still poorly understood.

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

Hunting effort on these 5 caribou herds has decreased over the past decade, probably because the herd populations have decreased. Most local residents (residents of Unit 19A) harvest Mulchatna herd caribou, although changing migration patterns affect each village's annual use of caribou. Nonresident and nonlocal residents also primarily harvest Mulchatna caribou migrating into Unit 19.

Hunter effort is low on the Beaver Mountains and Sunshine Mountains herds. Local residents stopped hunting them since the winter season was closed in the 1990s. Travel in winter was the only affordable access to these herds' ranges. Nonresidents hunt these herds in low but stable numbers, mostly in combination with moose hunts in adjacent Unit 21A. Total harvests for these herds has been <15 caribou annually since the winter season was suspended. The Tonzona Herd is used by local hunters from Nikolai and Telida when the herd moves near those villages during the late fall and winter. Nonresidents and nonlocal residents harvest the greatest proportion of this herd. Residents of Nikolai periodically hunt the Big River–Farewell Herd during winter. Nonresidents and nonlocal residents hunting for moose, sheep and bison take the majority of animals harvested from this herd. The Rainy Pass Herd is hunted entirely by nonlocal and nonresident hunters primarily hunting moose and sheep.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

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 compiled harvest data annually. Harvest data were summarized by regulatory year (RY = 1 Jul–30 Jun; e.g., RY00 = 1 Jul 2001 through 30 Jun 2002) and do not include Mulchatna Herd animals taken in Unit 19. In RY98, ADF&G's Information Management Section began to send out reminders to hunters who failed to report their harvests, resulting in higher reporting rates. While data with higher reporting rates are more precise, they must not be interpreted necessarily as increases in harvests. Also, some harvest reports are difficult to code to specific location because hunters provide ambiguous information. This causes difficulty in discerning which herd the harvested animal was from, especially in Unit 19C where there are 3 different herds.

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 (Eagan 1993).

Five-month-old female calves in the Rainy Pass Herd were captured and fitted with radio collars in October 1999 and 2000 to facilitate composition counts and general monitoring. These caribou were captured using the helicopter darting technique (Valkenburg 1997). Composition counts were conducted during the October 1999 and 2000 capture operations. During RY00–RY01, we did not complete a population census of any McGrath area herds. However, we did conduct a single aircraft search of the Beaver Mountains Herd's range during June 2001 and composition counts of the Rainy Pass caribou herd during October 2000.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Overall, the McGrath area caribou herds probably declined or remained stable during this reporting period (RY00–RY01), based on survey flights, composition counts, hunter information and mortality of radiocollared caribou.

Population Size

The current population estimate for the Beaver Mountains Herd is 150–200 caribou. The Beaver Mountains Herd has declined since the early 1960s. In 1963 Skoog (1963) estimated 3000 animals, Pegau (1986) estimated 1600 in 1986, Whitman (1995) estimated 865 in 1992, and 536

animals in 1994 (Whitman 1997). In early summer 1995, Whitman counted about 400 animals concentrated on the calving area. The normal herd range was searched in June 2001 and we observed 86 caribou in a single group. A second group of caribou of more than 50 animals was observed in an adjacent area by a member of the public.

The current population estimate for the Sunshine Mountains Herd is 100–150 animals. This herd has also declined in recent years. Whitman (1997) estimated the population was 700 animals in 1994 and 500 in 1995. This herd seems to mirror the population dynamics of the Beaver Mountains Herd and other small mountain herds like the Chisana and Mentasta, where predators probably have a major impact on calf survival (Jenkins 1996; Whitman 1997; Mech et al. 1998). In July 2000 a search of the Sunshine Mountains was conducted from the Cloudy Mountains north to Von Frank Mountain, mostly along ridges and open hillsides. No caribou were observed, however, Sunshine Mountains caribou were observed calving in the Nixon Fork of the Takotna during 2001 and 2002. Based on these summer observations and the July 2000 search, it is possible that Sunshine Mountains caribou use lower elevation areas during summer, contrary the habits of most Interior caribou herds.

The Rainy Pass Herd probably numbers 1500–2000 caribou. The Rainy Pass Herd probably also declined during RY00–RY01. 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 at that time but were not counted.

The current estimate for the Big River–Farewell Herd is 750–1500 animals. Whitman (1997) estimated the Big River–Farewell Herd at 1000–2000 animals. The herd has probably declined since that estimate, including during RY00–RY01, based on information collected from the adjacent Rainy Pass Herd.

The current estimate for the Tonzona Herd is 750–1000 animals, based on hunter observations and extrapolation of information collected on the adjacent Rainy Pass Herd. The Tonzona Herd has probably declined during this reporting period. 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 in Denali National Park and Preserve.

The Mulchatna Herd is not a subject of this report. However, this herd of approximately 147,000 caribou has extended its range into the Kuskokwim drainage. The ranges of the Beaver Mountains, Sunshine Mountains, and Big River–Farewell herds currently overlap the periodic dynamic winter range of the Mulchatna Herd.

Composition

Herd composition counts were conducted on the Rainy Pass caribou herd during October 1999 and during this reporting period in October 2000 (Table 1). During the October 1999 survey, 441 caribou were classified and a large part of the suspected winter range was searched. 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. Because of bad weather, half of the area searched in 1999 was searched in 2000. During this survey the calf:cow ratio was 12:100 and the bull:cow ratio was 115:100 (Table 1). Two explanations may account for the apparently skewed bull:cow ratio

for the October 2000 composition count. The first is error in classifying cows as small bulls, which would account for the disproportionate number of small bulls observed and the skewed the bull:cow ratio. The second is that a disproportionate number of males were found due to the small sample size and limited search area. To further evaluate the questionable results of the 2000 survey, composition surveys were planned in 2001 and 2002 but were not conducted because of bad weather.

Distribution and Movements

Beaver Mountains. The Beaver Mountains Herd ranges from the Beaver Mountains in the north to Horn Mountain near Red Devil in the south (Pegau 1986). Calving is in the Beaver Mountains, but postcalving groups occur throughout the herd's range. Wintering areas include the north side of the Kuskokwim Mountains from the Iditarod River 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, mostly 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 these caribou are found predominately in the Sunshine Mountains, and small groups were observed in summer 2001 and 2002 in the Nixon 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 lower elevation areas from Telida up the Swift River and north to the Otter Lake area (Del Vecchio et al. 1995).

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

Rainy Pass. The 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. Identified wintering areas of radiocollared individuals are in the Post Lake area, upper South Fork and upper Ptarmigan Valley. However these areas do not constitute the entire winter range of this herd.

MORTALITY

Harvest

Season and Bag Limit.

Unit/Bag limit	Resident open seasons	Nonresident open seasons

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 without 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
Note: In 2002 a nonresident closed area was established in Unit 19A. See description in Alaska Hunting Regulations #43. This area is closed to all nonresidents for caribou hunting.		
Unit 19C		
RESIDENT AND NONRESIDENT HUNTERS: 1 bull.	10 Aug–20 Sep	10 Aug–20 Sep
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

Alaska Board of Game Actions and Emergency Orders. During the March 2002 meeting, the Board of Game passed a proposal to restrict caribou hunting by nonresidents in Unit 19A. A nonresident closed area was created which encompasses a 4-mile wide corridor along the mainstem and tributaries of the Kuskokwim River in Unit 19A from and including the Holitna River to Kalskag. The board also passed a proposal to include the Aniak drainage into the Holitna–Hoholitna Management Area, which requires hunters entering Unit 19B by aircraft to fly all big game taken in Unit 19B out of the area by aircraft. This prohibits hunters who float rivers in Unit 19B from transporting big game carcasses from Unit 19B into Unit 19A by boat or raft. The object was to reduce meat spoilage by shortening travel distance and time spent in the field with harvested big game.

Hunter Harvest. The reported harvest of local caribou herds declined in Unit 19 during RY00–RY01. During RY90–RY94 the average reported caribou harvest was 172. Harvest declined between RY95 and RY99 to an average of 97 caribou. These declines in harvest can be attributed to population declines in the Rainy Pass, Big River–Farewell, and Tonzona herds (Table 2). Harvests have declined further since RY99. The average reported Unit 19 caribou harvest during RY00–RY01 was 76 and <1% were females (Table 3).

Hunter Residency and Success. During RY89–RY99 and RY00–RY01, local hunters took <4% of the reported harvest of local caribou herds (Table 4). However, local users are less likely to report hunting activities than nonlocal residents and nonresidents. During RY00–RY01, nonlocal residents harvested about 33%, and nonresidents harvested 66% of harvested animals. Historically (RY89–RY99) nonlocal Alaskans took 43% of the total harvest.

Harvest Chronology. The majority of caribou harvested were taken during August and September. During RY00–RY01, about 33% of the harvest was during August, 63% was in September, and 1% was in 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 area caribou herds. During RY00–RY01, 71% of caribou hunters used aircraft, 22% used 3- or 4-wheelers, <2% used horses, <3% used snowmachines, and zero percent used highway vehicles or boats (Table 6).

Other Mortality

No specific data were collected concerning natural mortality rates or factors during RY00–RY01. However, wolf predation may be high within most McGrath area herds. The early calving dates noted during survey flights in the Beaver Mountains and the low percentage of calves (<1%) in the fall suggest the Beaver Mountains Herd is highly productive but suffers from high neonatal mortality. The Sunshine Mountains Herd may also suffer 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 on record, based on snow-depth data collected in McGrath by the National Weather Service.

HABITAT

Biologists have not investigated caribou range conditions in Units 19 and 21 in recent years, but range is probably not limiting. Lichens appear abundant on winter ranges, and these areas supported 4–5 times as many caribou during the 1960s. Adult body size was also relatively large when radio collars were deployed in the 1990s. Early calving is another indicator that body condition is good, suggesting good habitat.

CONCLUSIONS AND RECOMMENDATIONS

We met our management objectives for all caribou herds in the McGrath area. The objective for the Big River–Farewell Herd was to provide for a harvest of up to 100 bull caribou. The average reported harvest during RY00–RY01 was 28. The objective for the Rainy Pass Herd was to provide for a harvest of up to 75 bull caribou, and the average reported harvest was 21. The objective for the Sunshine and Beaver Mountains herds was to provide for a combined harvest of up to 25 caribou, and the average reported harvest was 5 caribou. The objective for the Tonzona Herd was to provide for a harvest of up to 50 caribou and the average reported harvest was 7 caribou.

Caribou harvests from the Big River–Farewell, Tonzona, and Rainy Pass herds decreased during RY00–RY01 and we estimate that herd size has also declined. Reasons for the decline are unknown but predation may be a key factor, based on Rainy Pass Herd data that shows heavy calf weights and low calf numbers in the fall. A second factor may be the decline in sheep hunter numbers in Unit 19C, which would reduce incidental caribou harvest.

All the herds in the McGrath area are small and exhibit special challenges in developing cost-effective and efficient survey–inventory programs. Some changes were implemented to enhance survey and inventory during this reporting period and plans are being developed to enable better herd monitoring. Research is needed to develop more efficient techniques directed at management applications of these small caribou herds.

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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 2001–2002

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
2000–2001	3	0	25	26	8	20	82
2001–2002	2	4	31	16	6	10	69

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

TABLE 3 McGrath[a] area caribou harvest by sex, regulatory years 1989–1990 through 2001–2002

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
2000–2001	78	(93)	4	(5)	2	84
2001–2002	65	(92)	6	(8)	0	71

[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 2001–2002

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
2000–2001	0	20	44	64	69
2001–2002	2	21	38	61	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 2001–2002

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
2000–2001	0	31	49	0	0	0	0	0	0	80
2001–2002	0	19	46	1	0	0	0	0	5	71

[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 2001–2002

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
2000–2001	50	2	0	10	0	2	0	0	64
2001–2002	39	0	0	17	3	2	0	0	61

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

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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 1980s, the department recognized a small group of caribou in the Yanert drainage as a separate herd. The growing Delta Herd eventually mixed with the Yanert Herd, and after 1986 the Yanert caribou adopted the movement patterns of the larger herd (Valkenburg et al. 1988).

By the mid 1970s the 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) and Valkenburg et al. (1996, 2002) provide summaries and citations.

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

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 Alaska Board of Game suspended hunting in 1992 in response to declining numbers, and the herd remained closed to hunting through regulatory year (RY) 1995 (e.g., RY95 begins 1 Jul 1995 and ends 30 Jun 1996). Hunting has been by drawing permit for bull caribou only since the hunt was resumed in RY96.

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 5000–7000 caribou.
- Sustain an annual harvest of 300–700 caribou.

METHODS

POPULATION STATUS AND TREND

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. Caribou in photographs were counted with an 8× magnifying glass.

In 2001 the herd was counted on 10 July using 4 fixed-wing aircraft including the DeHavilland Beaver. Due to weather and pilot availability, the 4 fixed-wing flights were flown over a 2-week period between 27 June and 10 July. The first flight searched for caribou on the south side of the Alaska Range between the Susitna Glacier and the Parks Highway. During that flight, 229 caribou were located that were believed to be Delta Herd animals (no radio collars were located). On the second flight, on 3 July, we concentrated search effort on the north side of the Alaska Range between the Granite Mountains and the West Fork of the Little Delta River. During that flight, 113 Delta Herd caribou were counted, including 6 radiocollared animals. Two flights, including the photography flight with the Beaver, were flown on 10 July in clear, windy conditions in the general vicinity of the Wood River. A fixed-wing aircraft searched peripheral areas for caribou, but strong winds prevented an effective search, and only 2 additional caribou were observed. The crew of the DeHavilland Beaver photographed or counted 9 major groups consisting of 2046 caribou and 48 radio collars. Most of these were located in the upper Gold King/Mystic/Moose Creek drainages with the remainder of the herd scattered in small groups across their range. Windy conditions prevented searching the western drainages of Unit 20A, including Healy and Moody Creeks, and the Yanert River drainage.

In 2002 the herd was counted on 28 June using 6 fixed-wing aircraft including the DeHavilland Beaver. The crew of the DeHavilland Beaver photographed 7 major groups consisting of 1678 caribou. Seven hundred and thirty-two caribou in numerous smaller groups were photographed or counted from 5 fixed-wing aircraft. The majority of caribou photographed and counted were located in upper Mystic Creek and along the divide between the upper Wood and Yanert Rivers, although caribou were scattered across their entire range. Three radiocollared Delta Herd caribou, associated with 514 caribou, were located in the upper Nenana River and Butte Lake areas. Assuming 1 Delta Herd radio collar represented about 50 caribou, we estimated that approximately 150 of the caribou found on the south side of the Alaska Range were Delta Herd animals and, therefore, were included in the census. All other groups of caribou located during the census were believed to be composed entirely of Delta Herd caribou. We were able to search all appropriate habitat between Jarvis Creek on the east and the Parks Highway on the west because conditions were good with clear skies and light winds.

Population Composition

We conducted composition surveys using R-22 or R-44 helicopters and Bellanca Scout or Piper Super Cub aircraft. Biologists in the fixed-wing aircraft located the radiocollared caribou. Observers in the 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.

In 2000 we classified 1010 caribou on 3–4 October under adequate conditions. During the survey, several hundred Nelchina and Delta Herd 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 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.

In 2001 we classified 1378 caribou in 19 groups on 30 September. Weather conditions consisted of a heavy overcast with some light rain and snow and moderate winds. The majority of the caribou were located in the West Fork of the Little Delta River and Yanert River drainage near Dick Creek. Although snow cover was incomplete during the survey, sightability was adequate.

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

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The Delta Herd declined from over 10,000 in 1989 to less than 4000 in 1993 (Table 1). The decline resulted from interrelated effects of adverse weather and predation and also occurred in neighboring herds (Valkenburg et al. 1996). However, the Delta Herd declined more than the neighboring Denali and Macomb herds. The Delta Herd existed at a much higher density than Denali and Macomb herds, indicating that density-dependent food limitation might have influenced the magnitude of the decline (Valkenburg et al. 1996). Since the decline, estimates of the size of the herd have varied. Survey data indicated the herd increased slightly in 1994 and 1995, but subsequent data indicated a declining trend. The minimum herd size declined from 4646 caribou in 1995 to 3227 caribou in 2000.

In 2001 we counted 2390 caribou in the Delta Herd and accounted for 54 of 67 active collars. Given the number of caribou counted and the proportion of radio collars found, we estimated the herd at approximately 2965 caribou (Table 1). That was a decrease of approximately 262 caribou from the 2000 census. Given the relatively low calf:cow ratios observed during composition counts the past 5 years, this decrease was not unexpected.

In 2002 we counted 2410 caribou in the Delta Herd and accounted for 49 of 57 active radio collars. Given the number of caribou counted and the proportion of radio collars found, we estimated the herd at approximately 2800 caribou (Table 1). This is a decrease of approximately 160 caribou from the 2001 census. Again, given the relatively low calf:cow ratios seen the past 5 years, this decrease was not unexpected. The slightly higher calf:cow ratio observed in 2002 (24:100) will likely result in a stable or slightly increasing herd between 2002 and 2003.

Population Composition

Bull:cow ratios have varied considerably since 1990, ranging from 24:100 to 46:100, 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.

In general, calf:cow ratios have been relatively low and declining through the 1990s and that trend continued into the early 2000s (Table 1). Ratios in 2000 and 2001 were the lowest observed since 1993. Calf mortality studies conducted during 1995–1997 indicate this was primarily due to predation by wolves, grizzly bears, and golden eagles (Valkenburg et al. 2002). Analysis of fecal samples collected in late winter 1989 and 1993 indicated depletion of 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 and the Little Delta Rivers in southeastern Unit 20A (Davis et al. 1991). However, as the herd increased, the area used for calving extended to the foothills between Dry Creek and the Delta River (Valkenburg et al. 1988). After 1993, the herd also used the upper Wood River, Dick Creek, upper Wells Creek, and the upper Nenana and Susitna drainages for calving (Valkenburg et al. 2002). During the remainder of the year, the herd is generally distributed among the northern foothills from the Delta River to the Nenana River. However, during fall and early winter 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

Alaska Board of Game Actions and Emergency Orders. In response to a proposal at the March 1996 meeting, the board 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–RY01 in response to proposals to increase the number of permits. No emergency orders were issued during this reporting period.

Permit Hunts. Since RY98, when the department first issued 100 permits for DC827, both the number of hunters and success rate have declined (Table 2). During that period, slightly more than 1 in 3 permittees reported not hunting. Success rate declined sharply between RY99 and RY00 to 35%, the lowest recorded since the hunt began in RY96. Success rate improved in RY01, but remained lower than those reported in RY97–RY99. Declining hunter participation and success rate may be a function of the herd being more widely dispersed and a larger portion of the herd being distributed across the eastern portion of their range during recent hunting seasons. 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 RY00–RY01 (Table 3). This may simply be a function of local hunters holding the majority of the permits. Sixty-seven percent of the hunters reporting from RY97 through RY01 were local hunters. In addition, local hunters have advantages over nonlocal hunters, such as proximity to the hunt area and local knowledge of access, herd distribution and movements, which may result in differential harvest rates. Whereas local residents harvested the most caribou, nonresidents on the other hand had the highest success rates (67%). A likely explanation is that nonresidents are more inclined to participate in guided hunts, which typically have higher success rates than nonguided hunts preferred by resident hunters. In RY00 and RY01, 42% (5/12) of the nonresident hunters reported using a guide compared to 0% (0/113) for resident hunters.

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

Transport Methods. Overall, the most common mode of transportation used by successful hunters (RY96–RY01) was 3- or 4-wheelers followed by aircraft, ORVs, highway vehicles, horses, 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 in, Sep $\bar{x}$ = 0.95 in; National Weather Service) during August (2.59 in) and September (1.28 in) 2000 and water levels in local rivers and creeks were correspondingly high, which may explain this apparent anomaly. It is also worth noting that RY01 was the first year since RY96 that horses were not reported as a method of transport used by successful hunters.

Other Mortality

Research staff conducted calf mortality studies during 1995–1997, and wolves, grizzly bears, and eagles were primary predators of caribou in the unit. 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; consequently, the

board adopted a wolf predation control implementation plan in Unit 20A to reduce wolf numbers in order to rebuild the caribou population. In addition, Valkenburg (1997) and Valkenburg et al. (2002) tested a diversionary feeding program that addressed predation by a wolf pack in the Wells Creek area.

HABITAT

Assessment and Enhancement

Research and management staff members periodically collect fecal samples on the 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. Currently, wolf numbers are moderately high (ca. 31 wolves/1000 mi^2; or ca. 12 wolves/1000 km^2) due to the abundant moose population. The degree to which high wolf:caribou ratios will influence predation rates on caribou is unknown. While high ratios seem 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 5000–7000 and to sustain an annual harvest of 300–700 caribou. Continued research on the Delta Herd, including analysis of fecal samples and condition of caribou will help to determine if the current population objective is still too high. However, even with favorable weather, meeting the management objectives will be unlikely without more effective management of predation.

Because hunter participation has been declining and the harvest of bulls has been below the estimated annual harvestable surplus, I will recommend to the board that the maximum number of drawing permits the department may issue for hunt DC827 be increased from 100 to 200. The proportion of large bulls in the population has remained high, and our estimates indicate that additional bulls can be harvested from the population without affecting herd dynamics. We will continue to monitor sex ratios during fall surveys to ensure that our management objectives concerning bull:cow ratios continue to be met.

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TABLE 1 Delta caribou fall composition counts and estimated population size, 1983–2002

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]	
10/05/87	32	8	31	19	61	53	23	24	20	1682	7780[b]	
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	10,69027	18
10/4/90	38	6	17	11	65	45	39	16	24	2411	7886[c]22	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]		7	5	3	72	45	33	22	25	1525	3661	42
10/3–6/94[d]		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 3625	27	9	18	12	69	48	20	32	19	1598	3699	43
10/1/98	44	9	16	10	62	31	49	20	27	1519	3829	40
10/2/99	44	10	19	11	62	37	40	23	27	674	3625	19
10/3–4/00	46	10	11	7	64	41	37	22	30	1010	3227	31
9/30/01	39	9	13	8	66	46	30	24	26	1378	2965	46
9/28/02	50	17	25	14	57	43	23	34	29	924	2800	32

[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[a] (%)	Successful hunters[a] (%)	Bulls (%)	Cows (%)	Unk (%)	Harvest	3-Year $\bar{x}$
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	39
	1999–2000	100	37 (37)	25 (40)	38 (60)	37 (97)	0 (0)	1 (3)	38	44
	2000–2001	100	31 (31)	45 (65)	24 (35)	24 (100)	0 (0)	0 (0)	24	37
	2001–2002	100	38 (38)	29 (47)	33 (53)	33 (100)	0 (0)	0 (0)	33	32

[a] Unsuccessful and successful hunters includes only permittees that hunted.

TABLE 3 Delta caribou annual hunter residency and success, permit hunt DC827, regulatory years 1996–1997 through 2001–2002

Regulatory year	Local[a] resident	Nonlocal					Unsuccessful					Total hunters
		Nonresident	Unk	Total (%)			Local[a] resident	Nonlocal	Nonresident	Unk	Total (%)	
1996–1997	19	3	0	0	22	(50)		4	1	0	22 (50)	44
1997–1998	32	11	1	0	44	(71)	17	2	0	0	18 (29)	62
1998–1999	32	13	5	0	50	(70)	16	4	1	0	21 (30)	71
1999–2000	28	7	3	0	38	(60)	16	8	2	0	25 (40)	63
2000–2001	17	2	5	0	24	(35)	15	15	0	0	45 (65)	69
2001–2002	24	6	3	0	33	(53)	30	14	4	1	29 (47)	62
Successful							10					

[a] Residents of Unit 20.

TABLE 4 Delta caribou annual harvest chronology percent by harvest periods, permit hunt DC827, regulatory years 1996–1997 through 2001–2002

Regulatory year	Harvest periods				Unk	*n*
	8/10–8/20	8/21–8/31	9/1–9/11	9/12–9/20		
1996–1997	27	18	27	27	0	22
1997–1998	27	18	14	41	0	44
1998–1999	34	14	26	26	0	50
1999–2000	29	37	16	16	2	38
2000–2001	33	17	38	13	0	24
2001–2002	21	18	48	12	0	33

TABLE 5 Delta caribou harvest percent by transport method, permit hunt DC827, regulatory years 1996–1997 through 2001–2002

Regulatory year	Percent harvest							
	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	9	0	52	11	11	2	44
1998–1999	20	8	0	52	14	6	0	50
1999–2000	29	8	0	45	5	13	0	38
2000–2001	17	13	8	33	21	8	0	24
2001–2002	39	0	0	45	9	3	3	33

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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, and is an important herd for consumptive and nonconsumptive uses in Interior Alaska and southern Yukon. Like other caribou herds in Alaska, the FCH has displayed major changes in abundance and distribution. 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 (Valkenburg et al. 1994). Due to decreased herd size between 1966 and 1975, the FCH reduced its range size and changed its seasonal migration patterns. The herd stopped crossing the Steese Highway in significant numbers in 1963, and by 1973 few animals moved into the Yukon each year. During the early 1970s to 1998, the herd's range 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. Population growth ceased due to high adult mortality, unusually poor pregnancy rate in 1993, and low to moderate calf survival during this period (Boertje and Gardner 2000*a*). During 1996–1999 the herd increased 4–19%, 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, Alaskan and Yukon mining camps, and 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.

Harvest was further restricted during the 1990s to ensure little impact on herd growth. Harvest regulations also became increasingly complex due to a change in Alaska's subsistence law that initiated federal management of the herd on federal lands. Competition increased among Alaska hunters because of the reduced quotas and complex regulations. During this period, many residents within the herd's range were unhappy with the ineffectiveness of dual federal and state management in administering the hunts and bringing about a herd increase. In response, the Upper Tanana/Fortymile Advisory Committee, the Tr'ondëk Hwëch'in First Nation, and other public groups requested that ADF&G, the federal agencies, and Yukon Department of Renewable Resources (YDRR, now called Yukon Department of Environment) 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.

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, specifically, to reduce wolf predation on calves. Harvest management recommendations required the state and federal management boards to develop new harvest regulations. The Alaska Board of Game, the Federal Subsistence Board (FSB), and the Yukon Fish and Wildlife Management Board endorsed the plan, developed new harvest regulations that satisfied the plan, and guided regulatory decisions during 1996 through 2000.

The Team sunsetted in December 2000. The 5 Fish and Game advisory committees within the herd's range recognized the need to cooperatively develop harvest regulations that would benefit hunters and carry on the goals of the Fortymile Caribou Herd Management Plan. During this report period, the harvest plan developed by these advisory committees was enacted.

MANAGEMENT DIRECTION

A review of Fortymile caribou herd management direction during 1970s–1993 was presented in Gardner (2001). In brief, agencies and the public supported Fortymile caribou herd recovery but a number of management programs failed to meet this goal because of inadequate public process or disagreements between ADF&G and federal subsistence management.

The Fortymile Caribou Herd Management and Harvest Plans changed management direction. The Team was able to develop effective management recommendations that minimized public and political objections and were effective. The harvest system that was developed by public Fish and Game advisory committees and the Eastern Interior Regional Subsistence Council continues to be the best joint state–federal program in the state, benefiting the user and the herd. The Harvest Plan had the public support to withstand a number of state and federal proposals that would have caused higher harvests or a return to the traditional dual management methods, to the detriment of the herd and users.

Following are management goals and objectives for regulatory years (RY) 2001–2002 through 2006–2007 (RY = 1 Jul through 30 Jun, e.g., RY01 = 1 Jul 2001 through 30 Jun 2002). They were developed by the 5 advisory committees (Central, Delta, Eagle, Fairbanks, and Upper Tanana/Fortymile) within the herd's range and were endorsed by the Alaska Board of Game. Population and harvest objectives were developed by the advisory committees and the board to meet both the Fortymile Caribou Herd Management and Harvest Plan goals and to satisfy the intensive management law.

MANAGEMENT GOAL

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

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

ACTIVITIES

- Minimize the impact of human activities on caribou habitat.

- Work with land agencies, landowners, and developers to mitigate developments detrimental to Fortymile caribou.

- Maintain a near-natural fire regime.

METHODS

POPULATION CENSUS

We attempted photocensuses of the FCH between late June and mid July 1988–2002, excluding 1993. We used 3–5 spotter planes (Super Cub PA-18 or Bellanca Scout), 1 radiotracking airplane (Cessna 185 or 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. During 2001 and 2002, caribou were too scattered to effectively census the herd, so estimates were based on population models developed by P. Valkenburg and D. Reed (ADF&G unpublished data, Fairbanks) and by R. Boertje (Boertje and Gardner 2000*b*).

FALL COMPOSITION SURVEYS

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

SPRING COMPOSITION SURVEYS

We have not conducted spring composition surveys since 1993 because similar data were collected during the 1994–2002 calf mortality studies. 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. Although the calf mortality study ended in May 2003, we will only fly a postcalving composition survey if fall calf survival declines and we need to determine the timing of mortality.

HERD AND RANGE CONDITION

During RY01–RY02 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 during 1991–2002. 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 percent lichen fragments in relation to the percent moss in Fortymile caribou fecal samples (Boertje 1984).

RADIOTELEMETRY DATA

We obtained herd distribution, movements and estimates of annual mortality by radiotracking 50–70 radiocollared adults. From May 1994 to May 2002 an additional 50–80 newborn calves were also collared. Calves were located daily in May, weekly during June, July, and August, and at least once every month thereafter. Adults were located approximately once every month throughout the year. We retrieved radio collars from dead caribou as soon as possible after detection to determine cause of death.

HARVEST

Harvest was monitored using a hunter checkstation, hunter contacts in the field, and registration hunt reports. We analyzed data on harvest success, hunt area, hunter residence and effort, and transportation type. To guard against overharvest, successful hunters were required to report their kill within 5–7 days. Harvest data were summarized by regulatory year.

MANAGEMENT PLANNING

No formal meetings to plan management were held during this report period. The advisory committees and subsistence council expect to begin a planning process during winter 2004–2005 concerning Fortymile caribou harvest management after RY06. This plan will be presented to the Alaska Board of Game and Federal Subsistence Board in spring 2006.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The herd doubled in size since 1995 (annual growth rates = 4–14%) when the Fortymile Management Plan was written (Table 1). Annual increases in herd size resulted from improved adult and calf survival rates and improved adult pregnancy rates (Table 1; Boertje and Gardner 1998*b*, 1999, 2000*a*). Of 4 nutritional indices, only pregnancy rates increased significantly (P = 0.02, chi-square test) during the period of population increase (1996–2002) compared to the period of population stability (1990–1995). Birthweights of calves, October weights of calves, and median calving dates did not change significantly between these 2 periods.

The primary cause of caribou mortality in the Fortymile Herd has consistently been wolf predation since studies began in 1984. Reduction in wolf numbers in recent years undoubtedly contributed to increased survival. Wolf numbers were reduced on a portion of the herd's winter range during 1995 and 1996 by elevated wolf harvest rates (28–57%) as part of a public wolf trapping program. Wolf numbers were reduced 75% within the herd's summer range excluding Yukon–Charley Rivers National Preserve during 2000–2002 by public wolf trapping and by

ADF&G's nonlethal wolf control program. This summer range was also used extensively by the herd during winters 1997–1998 and 1998–1999.

Population Composition

During 1996 through 1999, 2001, and 2002, the average percent calves (20.7%) in the fall was the highest since the late 1950s. In contrast, 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, an anomalous year (Table 1). Beginning in 1996, elevated pregnancy rates and favorable calf survival (Table 1) caused a substantial increase in the number of reproductive cows in the herd. In May 2002 an estimated 16,000–17,000 calves were born compared to about 8100 during 1994.

Due to low harvests during 1977 through 2000, the bull:100 cow ratio was similar to lightly harvested herds and remained in the high 30s and low-to-mid 40s, except for a few anomalous years. Harvest quotas were elevated in 2001 but still limited to a level that allowed the herd to increase. Up to 25% of the harvest quota could be cows. During 2001 and 2002, 493 and 667 bulls were harvested, the highest bull harvests since the 1970s. Harvest quotas will increase with herd size, but will remain conservative through 2006 to allow continued herd growth and a stable bull:cow ratio. This harvest strategy should also maintain the ratio of large bulls in the herd.

Estimated ratios in late June counts were more variable than fall counts and difficult to interpret (Table 2). During 1994 through 2002, we conducted calf mortality studies which gave us much better information on the timing and magnitude of early summer calf mortality. These data indicated that most mortality occurred during May through mid July. The fall composition counts were less variable than the calf mortality data, suggesting that fall surveys are the best indicator of herd trend. Only fall surveys allow for a large sampling of the herd when bulls are largely mixed with the groups. A summer composition count may be a good indicator of calf survival, if most of the herd is distributed in a few large groups. However, these distributions are often difficult to predict. I recommend summer composition surveys not be conducted on the Fortymile Herd unless an estimate of early calf survival becomes necessary for management decisions.

Distribution and Movements

In 2001 the herd primarily calved in Copper, Ruby, Slate, and Independence Creeks and drainages of the Seventymile River and spent the remainder of the summer between Mosquito Mountain, Mount Harper, and Glacier Mountain and the upper Salcha and Chena Rivers. During August, approximately 2000 were in the Birch Creek drainage and the remainder of the herd primarily ranged in the upper Salcha River, Charley River, and Slate Creek drainages. During late September through the rut the herd was in the Birch Creek drainage.

During winter 2001–2002 about 10,000 caribou extended FCH range use to the Preacher Creek drainage, west of the Steese Highway. The remainder of the herd was widely scattered in small groups in the Mosquito, Middle, and North Forks of the Fortymile River and in the Goodpaster and Salcha Rivers and Birch Creek.

In late April and early May 2002, the Fortymile Herd moved back to its calving grounds. Calving began in Independence and Granite Creeks (11 May). As the calving period progressed, most of the parturient cows moved down Independence Creek to the south side of Happy Mountain and Portage Creek. A secondary calving area was from Butte Creek to Mission Creek. During peak calving (21 May) most calves were born between Pittsburg Creek and Joseph Creek. The remaining parturient cows calved primarily in Ruby and Three-finger Charley Creeks. Calving ended about 27 May.

By early June most of the herd moved south onto Mosquito Mountain and Mount Harper. In mid June about half of the herd was on the Glacier Mountain and the remaining portions were in Copper Creek and upper Goodpaster River. During August and September, the herd ranged primarily between the Charley River to east of the Taylor Highway.

Beginning in mid September 2002, most of the herd traveled west and most of the rut occurred in the upper Middle Fork of the Chena River, Birch Creek, and the Salcha River. Immediately after the rut the herd moved east. By November over 30,000 were in Yukon, Canada and of these about 5000 were north of the Yukon River outside of Dawson. This is the first time since the early 1960s most of the Fortymile Herd wintered in Yukon, Canada. The herd starting coming back to Alaska during March and most of the herd was between Chicken and Glacier Mountain. Snow depth was below average and did not impede movements or range use throughout the herd's range.

During fall and winter 2001–2002, the herd increased its use of traditional range abandoned for about 40 years. The herd continues to calve in the central portion of its range. As the herd increases, we expect calving expansion towards the Steese Highway as occurred during the early 1900s through 1960 (Valkenburg and Davis 1986). Increased range use has meant the herd has been in contact with more wolf packs that were not reduced by control activities. We observed elevated wolf predation by nontreated packs during the past 4 years.

MORTALITY

Harvest

Season and Bag Limit. See Table 3 for unit-specific bag limits and seasons for state and federal hunts during RY01 and RY02 and for the regulatory history for the FCH. This table illustrates regulations that are complex or simple depending on whether state and federal management directions differ or are complementary.

Alaska Board of Game Actions and Emergency Orders. In spring 2000 the board reviewed and endorsed the Fortymile Caribou Herd Harvest Plan, 2001–2006 (Harvest Plan). 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 (≥10%). Harvest quotas will be set annually based on herd trend. Using the plan's recommendations, the board passed a regulation 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 ensured hunting opportunity across the herd's range during both the autumn and winter seasons while maintaining adequate protection against overharvest. The board also established a harvest quota for cows, limiting the number taken to 25% of the quota. These regulatory changes became effective autumn 2001.

Increasing opportunity to hunt Fortymile caribou caused an increase in the number of hunters in Unit 20E, and the board was concerned about possible excessive incidental take of moose by caribou hunters. In response, the board created a joint caribou–moose registration permit hunt in Unit 20E, excluding the Middle Fork Fortymile River. The regulation requires hunters to choose to hunt either caribou or moose and allows them to complete 1 hunt for 1 species, turn in that permit, and then hunt the other species. The intent is to stop incidental take of moose without limiting caribou hunting opportunity. This change did not affect most subsistence hunters because they traditionally hunt moose and caribou in different areas of Unit 20E and at different times.

The FSB endorsed the Harvest Plan during their May 2001 meeting. This decision benefited Fortymile caribou harvest management by ensuring that for the next 5 years, regulatory changes will have to meet the intent of the Harvest Plan, which protects the joint state–federal management program. Under this program the state and federal hunts are managed under one permit with one harvest quota, reducing paperwork and confusion for hunters and protecting against overharvest. To better meet the intent of ANILCA and to benefit federally eligible subsistence hunters, the FSB adopted a regulation that ensured that at least 50 caribou in the winter quota would be allocated to the federal season.

In 2002 the Alaska Board of Game established winter seasons for Fortymile caribou in portions of Units 20B and 20D. To guarantee hunting opportunity across the herd's range, ADF&G was authorized to set a maximum winter quota of 60% in the unit with the most caribou, ensuring that 40% of the quota could be taken by hunters in other areas of the herd's range. The board also further liberalized grizzly bear regulations by exempting the $25 resident tag fee in Unit 20E, excluding Yukon–Charley Rivers National Preserve. This has the potential to reduce predation on calves, e.g., if grizzly bear harvests above sustainable levels occur within the FCH calving ground. The effects of the regulatory change on grizzly bear hunting, harvest, and predation will be monitored.

Hunter Harvest. The harvest quotas during RY01 and RY02 were 850 and 950 caribou, respectively. These quotas were the first to be established using the 2001–2006 Harvest Plan and followed 5 years of minimal harvest (150 bulls/year). Annual quotas were subdivided between 3 fall hunts and 1 winter hunt. Yukon, Canada also had a quota of 300 in RY01 and 465 in RY02 but residents and First Nation members chose to forego hunting through regulation (for sport hunters) and by not exercising constitutional rights to hunt (Tr'ondëk Hwëch'in First Nation).

We issued 4539 permits in RY01 and 4161 permits in RY02 (Table 4). In comparison, we issued an average of 1141 permits during the 5 years of reduced quotas and 1909 permits during 1990–1995, when the harvest quotas ranged from 395–450 bulls. During RY01, 2931 hunters took 693 caribou and in and RY02, 2863 hunters took 864 caribou.

The Harvest Plan recommended that Fortymile caribou harvest should be administered using registration permits for at least 2 years or until harvest is no longer a concern or a reporting system is developed that allows a general hunt. Public interest in hunting Fortymile caribou is high and increasing. The Fortymile Herd is the only relatively large caribou herd along the road system that allows both residents and nonresidents to participate without substantial access restrictions. Hunter knowledge of the herd and expanding hunting opportunity is also increasing because the hunt is well advertised.

To ensure that the annual harvest quota is not exceeded, a registration hunt requiring quick reporting of success remains necessary (Table 5). However the combination of increasing number of hunters and multiple hunts has caused hunt administration to become very labor intensive. Also, because the number of hunters new to a registration hunt system is increasing, compliance to the conditions of the hunt is declining. In RY02 about 25% of the successful hunters reported late. The 3 following steps need to be taken to increase the efficiency of this hunt: 1) increased public education using *The Comeback Trail* and the Fairbanks and Anchorage newspapers, and seminars at least at the military bases in Fairbanks; 2) establish hunter checkstations along the Taylor and Steese Highways; and 3) convince Fish and Wildlife Protection to issue more citations for late reporting. The latter step is difficult due to the large number of infractions and the amount of paperwork and time required of FWP to write and serve the tickets.

During 1993–2000 we have had good success with registration hunts but the hunts were confined to a smaller area and fewer hunters participated. We were able to limit late reporting to less than 15 cases/year, using an educational program including newspaper articles, hunt clinics, a video, and more one-to-one contact with the hunters when the permit was issued. During RY01 and RY02, we operated a checkstation on the Taylor Highway to monitor hunting activity and compliance with the moose and caribou regulations. Not only were we able to better monitor the hunts, but by checking all hunters, we caused an improvement in hunter behavior. For example, we issued over 30 citations the first year compared to 5 the second year, yet the number of hunters and harvest were greater the second year. I believe if checkstations were periodically operated on the Taylor and Steese Highways, Fortymile caribou harvest management and hunter compliance would improve.

Illegal Harvest. Establishing a 1 caribou bag limit but with a cow quota minimized illegal harvest and allowed the herd to continue to increase at ≥10%/year. Only 2 hunters were cited during RY01 and RY02 for violating the requirement to hunt either caribou or moose in Unit 20E.

Harvest Plan. The Yukon territorial government, the Tr'ondëk Hwëch'in First Nation, and the Yukon public began working on a Yukon Fortymile caribou harvest plan in 2001 but little has been accomplished due to political reasons. It is still a goal in Yukon to complete a comprehensive FCH management plan that will complement Alaska's Harvest Plan. There has been agreement between the Yukon and the board that the initial harvest allocation would be 65% to Alaska and 35% to Yukon.

Hunter Residency and Success. During RY01–RY02, 2863–2931 people annually participated in FCH hunts (Table 6). The range of hunters who annually participated in each registration permit hunt were: RC863, 186–393 hunters; RC865, 757–908 hunters; RC866, 1006–1023 hunters; and

RC867, 514–758 hunters. Success rates by hunt were 18–32% for RC863, 15–57% for RC 865, 8–14% for RC866, and 39–48% for RC867. Residency and harvest success information for all hunts combined is included in Table 6.

Since caribou are both migratory and gregarious, hunt success is directly related to the hunter's ability to respond to herd movements. During RY01 and RY02, the herd was accessible during the winter season. In RY01 most of the herd was along the Steese Highway and in RY02 most of the caribou were accessible along the Taylor Highway. Hunters were very quick in responding to these areas resulting in season closures 1–7 days after the opening. In RY01 the herd spent most of the fall season in primarily inaccessible areas and harvest was low throughout its range. In RY02 most of the herd was in Unit 20E throughout August and September but hunters did not respond in large numbers until late August–early September.

Hunters appear to have a good memory of where caribou hunting was good in the past and many return to those areas without considering caribou behavior. This may be one reason why hunters did not respond quicker to the availability of caribou in Unit 20E in RY02. For example, during fall RY00 and winter 2001–2002, hunters had good success finding Fortymile caribou along the Steese Highway. These successes became common knowledge, resulting in over 1000 hunters traveling the Steese in fall 2001 and 2002 when few caribou were available. This scenario also occurred in Unit 20E during the early 1990s when it was common knowledge the best place to hunt caribou was Chicken Ridge. It took 3 years of low success before the number of hunters began to decline.

Some people believe herd location should be given to hunters. However, the ability of hunters to quickly exceed a hunt quota is well documented with the Fortymile Herd. Supplying success data from an on-going hunt will give hunters an accurate measure of what portion of the herd's range they may wish to explore, without causing hunters to flock to one area. As long as there are harvest quotas, which have the potential to be quickly exceeded, I recommend herd location information from ADF&G only include harvest success by unit.

During RY01 and RY02, after a 5-year closure, nonresidents could hunt Fortymile caribou during the fall season throughout the herd's range. Nonresidents composed 7–9% of the hunters and took 9–18% of the fall harvest. Hunting by nonresidents occurred throughout the herd's range but most nonresidents selected Units 20E (36–52%) or 25C (33–51%). Airplanes were used by most (56%) successful nonresident hunters.

Harvest Chronology. During RY01 no fall Fortymile caribou hunts were closed early by emergency order. The herd spent most of the season in the central portion of its range, mostly inaccessible to hunters except by airplane. There were a few scattered bull groups accessible from the Steese and Taylor Highways but most of the animals along the Taylor were within the Glacier Mountain Controlled Use Area where motorized access is prohibited. The greatest harvest occurred during the first week (Table 7) in Unit 25C (76%). In RY02 most of the herd was accessible from the Taylor Highway in the eastern portion of its range, resulting in an early closure (6 Sep) in Unit 20E. The herd moved back into the Birch Creek drainages during late September but few hunters were in the field.

Harvest quotas during the winter season in RY01 and RY02 were 305 and 240 caribou, and Fortymile caribou were available from both the Steese and Taylor Highways. The state winter seasons were closed 2–7 days after opening. Hunter participation and success ranged from 514 to 758 hunters and 39–48% success, illustrating the popularity of winter caribou hunts, the ability of hunters to take large numbers of caribou quickly, and the difficulty of managing relatively low quota hunts.

Transport Methods. Transportation types used by successful hunters in each of the 4 Fortymile caribou registration permit hunts differed depending primarily on the number of trails and whether air taxi companies worked the area. During RY01–RY02 all successful hunters in RC863 used boats and airplanes. This hunt area is remote with no trails and cannot be reached by ground transportation.

RC865 covers most of the herd's range in Unit 20E and is accessible by trails, rivers, and airplane landing areas. During RY01–RY02 the 2 most common transportation types used by hunters in RC865 were highway vehicles and 4-wheelers. Herd distribution dictates the most efficient transportation type. In RY01 the herd remained in the central or western portion of its range for most of the fall season and was difficult to access. Hunters using 4-wheelers to access the herd took the most caribou (46) but their success rate was 17%. In comparison, hunters using airplanes took 32 caribou but had a 65% success rate and hunters along the Taylor Highway had an 8% success rate. In RY02 most of the herd was accessible by ground transportation throughout the season. Hunters using 4-wheelers and highway vehicles took 88% of the harvest and had success rates of 71% and 44%, respectively.

Hunt RC866 takes place in southeastern Unit 25C and most hunters accessed the area using 4-wheelers on trails that intersect the Steese Highway or hunt along the highway using highway vehicles. During the first 2 weeks of the fall RY01 season, there were several bull groups in the vicinity of the highway and trails and 79% of the harvest was by hunters using 4-wheelers for transportation. In RY02 few caribou were available until the last few days of the season. Only 62 and 7 caribou were taken by hunters using 4-wheelers or highway vehicles and their success rates were 14% and 2%. Airplanes were not commonly used in this hunt even though there are vast areas suitable for airplane access.

RC867 is a winter hunt and hunters primarily access the herd using snowmachines and highway vehicles along the Taylor and Steese Highways. During RY01 and RY02, hunters using snowmachines for access took 57% and 65% of the harvest and had success rates of 66% and 65%.

Table 8 illustrates transportation use combined for all hunts and indicates that the Fortymile Herd is accessible to all hunters during some point of the season, regardless of what transportation type they have at their disposal. This accessibility magnifies the importance of Fortymile caribou recovery to Alaska. Accessibility will only improve as the herd increases. The most important factors to ensure access for all hunters are for the seasons to go to term and for hunters to have patience to wait for the herd to migrate to the areas they can hunt.

Other Mortality

Boertje and Gardner (1998*a*, 1998*b*, 1999, 2000*b*) and Gardner (2001) described in detail the factors limiting the FCH and management steps taken to benefit herd recovery during 1996–2000. Between November 1997 and May 2001, about 80% of the wolves in 15 pack territories were removed by either public trapping or ADF&G nonlethal wolf relocation. Low wolf numbers were maintained by sterilizing the 2 alpha wolves in each of those territories.

Preliminary analyses indicate that calf mortality declined significantly as indicated by increased calf:cow ratios during early winter (Table 1). Decreased wolf predation (the major factor controlling the herd) was likely the primary cause of the herd's recent increase. Depending on herd movements during the year, the number of wolf packs preying on the FCH was 26–40 (Boertje and Gardner 2000*a*), and only 15 packs were treated by ADF&G.

As of April 2003, 18 of the 15 pack territories were being maintained by 2 wolves, of which at least 1 was sterilized. Trapping and mortality of other wolves caused the other 7 territories to become open. Two of those territories were colonized by pairs of wolves in spring 2002. Both packs had pups last summer and each pack numbered 9 wolves during winter 2002–2003.

Grizzly bear numbers have not been reduced by either department-conducted control activities or by hunter harvest. As a result, annual grizzly bear predation rates on calf and on adult caribou remain similar to pretreatment years.

Apparently, the combination of wolf control and favorable weather during 1996–2001 allowed the Fortymile Herd to increase faster than any other Interior or Southcentral Alaska herd. Based on the herd's current young age composition, I expect this trend to continue even though wolf recovery is occurring.

HABITAT

Assessment

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%) in fecal samples. Fecal samples from overgrazed winter ranges contain a relatively high proportion of mosses or vegetation other than lichens (Boertje 1984). W. Collins (ADF&G, personal communication) has been evaluating Fortymile caribou winter range. He found excellent range conditions with high incidence of lichens. The Nelchina Herd has been wintering in portions of the Fortymile winter range since 1999. B. Dale (ADF&G, personal communication) captured and weighed a sample each spring and found that Nelchina Herd calves that winter in the Fortymile area are significantly heavier than calves that wintered in adjacent Units 11 and 13. Also, Nelchina calves on Fortymile range gain weight over winter, except in years when snow depth is above average.

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. Beginning in 2001, the herd expanded its range use, apparently as a result of increased herd size. It moved farther west near the Steese Highway in fall 2001 and utilized winter range in the Yukon during winters 2000–2001 through 2002–2003. In winter 2002–2003

the herd expanded its range use further by crossing the Yukon River in Canada. Still, more than 60% of the historic Fortymile range has not been used for over 40 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.

In 1993 nutritional stress was indicated by low pregnancy rates (66%, n = 47) probably due to many adult cows not gaining sufficient fat to ovulate in 1992 (Boertje and Gardner 1996). The growing season was short; the number of snow-free days during 1992 was the shortest on record. Also, high adult mortality during 1989–1992 may have been related in part to stress from adverse weather. Until 2001, 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, 2000*b*). However, during May 2000 and 2001 birth weights were the lowest since 1996. Also, weights of 5-month-old calves during October 2001 and 2002 were the first and fifth lightest during the past 13 years. We have not determined if these indicators of declining nutrition are due to declining range quality or were due to unfavorable weather on the summer range. Pregnancy rate data conflicts with the hypothesis that herd condition is declining. Pregnancy ranged from average to above average (88–95%) during 2000–2002. There are indications that drier than average conditions existed during the past 2 summers in the herd's range. These conditions may have contributed to reduced caribou nutritional status. These data will be analyzed and presented in future reports.

A draft EIS for the proposed Pogo mine project in the Goodpaster River was developed in spring 2003. As planned, this project is expected to have limited impact on the Fortymile Herd but concern remains focused on future plans in this area. If an all-weather road is built to Pogo Mine, it may lead to a complex of roads that reach to the upper Goodpaster River and Mount Harper area. If so, careful access management will be required to ensure that the herd is not negatively impacted. It does not appear that future access decisions have been adequately addressed.

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, 58,000 acres of spruce forest were burned in the eastern portion of the herd's range in Alaska. In 1999, 31,000 acres of spruce forest were burned 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 beginning in 10–20 years and optimal range and extensive caribou use in 50 years (B. Dale, ADF&G, personal communication).

One of the ongoing goals of the Fortymile Caribou Management Plan was to ensure adequate protection for the herd's range during and after recovery. Current habitat and development issues are mostly related to mining and military activities in the herd's calving and postcalving areas. The herd is most sensitive to disturbance during calving and postcalving. Working together with the mining community and the Air Force, we minimized the effects of mining exploration and low flying military aircraft during calving and postcalving by maintaining a website that displayed the areas the herd was using. The website was updated when the herd changed distribution. 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 1999 through 2002.

To evaluate the impacts of jet overflights on Fortymile caribou, we conducted a study during the 2002 calving season (Magoun et al. 2003). The hope was that these findings could be used in determining mitigation for jet-training exercises during calving and postcalving, realizing they are based on 1 year's data and that long-term effects on the herd are still unknown. Mitigation levels will be decided by the Resource Protection Committee composed of representatives of state and federal agencies and the Air Force.

Short-term responses by Fortymile caribou to overflights were generally mild compared to reactions to predators or perceived predators (Magoun et al. 2003). However, caribou did show strong-level reactions depending on the slant distance, jet speeds, and type of jet. Maintaining a floor of 2000' for all military jet aircraft would eliminate most stronger-level reactions by caribou but would be overly conservative. Based on Magoun et al. (2003), mitigation can be based on jet type, speed, and elevation and can be designed to adequately protect the herd and allow the Air Force to use most of the area to meet their training needs. The recommendation given to the Resource Protection Committee for calving and postcalving periods in 2003 follows: (1) within the four 3-nautical mile circles, which include most of the calving or postcalving caribou, A-10s could fly at any level, but if below 1000', speeds will be limited to <300 knots, and (2) all fighter jets (F-15 and F-16) would maintain the floor at 2000' except west of longitude 143° 45.00 where the floor would be 1500'.

Final language of the Department of Natural Resources Upper Yukon Area Plan gave adequate protection to the Fortymile Herd throughout its range and strong protection for the calving and postcalving ranges. The plan was completed in April 2003 and submitted to the commissioners/directors of the state and federal agencies for signature.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

The Fortymile Caribou Herd Management Plan formally ended in May 2001. Two of the plan's objectives are ongoing – habitat protection and a public awareness program. Protecting caribou habitat and informing the public about herd status and consumptive and nonconsumptive use opportunities were essential components of the Team's goal to restore the Fortymile Herd to its traditional range. It was also the Team's goal to promote healthy wildlife populations for their intrinsic value. As of April 2003, habitat protection in Alaska is being addressed through land use plans and agreements with the mining industry and the military.

Several public awareness projects are ongoing. Funding for highway informational signs along the Taylor and Steese Highways has been appropriated and construction is planned for summer 2003. The Fortymile caribou newsletter *The Comeback Trail* is produced 1–2 times/year and is distributed to about 4500 Alaska and Yukon residents, advisory committees, regional councils, state and federal management boards, and area schools. Additional public awareness programs would be beneficial to ensure continued public support for the Fortymile Herd in the future. Currently, the herd is increasing and often those management successes are covered by state and Canadian media. A cooperative state–federal program enhancing the viewing, education, and

hunting opportunities of the Fortymile Herd would benefit the herd and people interested in the herd.

CONCLUSIONS AND RECOMMENDATIONS

We met our objective to provide conditions for the Fortymile Herd to grow at a moderate annual rate of 5–10%. The FCH increased through the 1980s at an annual rate of 5–10%. Between 1990 and 1995, it was essentially stable. The average annual rate of increase was 11% between 1996 and 2002 due to improved pregnancy rates and, apparently, reduced predation. The FCH was the only Interior caribou herd in Alaska and Yukon, Canada to increase continuously during 1996–2001. The summer 2002 herd estimate was 44,750 caribou and I expect to meet the herd size objective of 50,000 by summer 2003. Based on the sex and age structure of the herd, the FCH has the potential to continue to increase. Current winter range conditions are excellent, and >60% of its traditional range remains unused by the herd. Range use is expanding and during winter 2002–2003, large numbers of Fortymile caribou crossed the Yukon River in Yukon, Canada for the first time in about 40 years. Based on radiotelemetry data, about 30,000 Fortymile caribou wintered in Yukon, Canada.

Nonlethal wolf control in combination with public trapping was conducted during November 1997–May 2001. The objective of reducing wolf numbers in 15 pack territories within the calving and summer ranges was achieved. We reduced the wolf population 78% by relocating 120 subordinate wolves, and we maintained low wolf numbers in these territories by sterilizing 41 alpha wolves. Preliminary results indicate that wolf predation has significantly declined during summer, as indicated by elevated calf:cow rates in early October.

During RY01 and RY02, harvest was managed using the Fortymile Caribou Herd Harvest Plan, 2001–2006. This Harvest Plan was developed by the 5 advisory committees within the herd's range. The goal of the plan was to increase harvest but at a rate that allowed herd growth at ≥10%/year.

We were close to meeting the objective to manage the herd with a sustained annual harvest of about 1000+ caribou. During RY01 and RY02, the harvest quotas were 850 and 950 caribou and 2863–2931 hunters took 693–864 caribou. The herd increased about 11–16% annually. Harvest was maintained at a level that did not affect the bull:cow ratio and it met the objective to maintain an October bull:cow ratio of at least 35:100. Currently, the Fortymile Herd offers one of the best opportunities in the state to observe large bulls. The harvest quota for RY03 will be 1150 caribou and is predicted to allow for 10% herd growth and little impact on bull numbers. This level of harvest will meet the harvest objective. We also met the objective to provide for increased caribou hunting, viewing, and other wildlife-related recreation in Alaska and Yukon. Herd recovery has made the Fortymile Herd one of the most accessible herds in the state, benefiting hunters and nonconsumptive users.

Joint state and federal harvest management of the Fortymile Herd continues to benefit the herd and all users and is a model of how dual management can work if hunters and the agencies are willing to work together.

One failure of Fortymile caribou harvest management was the high percentage of late reporting by successful hunters. To meet the harvest objectives, we need to find methods to convince hunters to meet the reporting requirements. I recommend better education, hunter checkstations, and additional enforcement.

The Fortymile Caribou Herd Management Plan was fully implemented during RY98–RY01. The reduced harvest quota and nonlethal wolf control ended in May 2001. The objectives for habitat protection and for public awareness programs are ongoing. We have continued to work with the mining community and the military to protect the herd's calving and postcalving habitats. We were also part of the Upper Yukon Area Plan and were successful in ensuring that adequate habitat protection was included in the plan. The draft EIS for the proposed Pogo Mine project went out for public comment in March 2003. If approved, expected effects of this project on the herd will be discussed in future management reports. Several public awareness programs are ongoing but more are needed to benefit the herd in the future.

We completed a study evaluating the effects of jet overflights on Fortymile caribou during calving and early postcalving periods. To minimize strong-level reactions by the herd, specific mitigations based on jet type, speed, and elevation are necessary. Our recommendations for summer 2003 were to limit jets within four 3-nautical mile circles (<2.5% of the Military Operating Area) inclusive of concentrated calving caribou. Specifically, we recommend allowing: (1) A-10s to fly at any level but if below 1000', speeds would be less than 300 knots, and (2) for all fighter jets (F-15 and F-16), maintain the floor at 2000' except west of longitude 143° 45.00 reduce the floor to 1500'.

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TABLE 1 Fortymile caribou fall composition counts and population size, 1986–2002

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
9/28/02	43	39	21	55	42	28	30	24	6088	44,750

[a] Herd estimates were the result of the summer censuses, except in 2001 and 2002 when caribou were too scattered and population models were used to derive total estimates.

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 1994–2002.

TABLE 3 Fortymile Caribou seasons and bag limits, regulatory years 1987–1988 through 2002–2003

Regulatory year	Unit 20B SE of Steese		Unit 20D N of Tanana River		Unit 20E		Unit 25C SE of Steese	
	State		State		State	Federal	State	Federal
	Season/Bag limit	Federal Season/Bag limit	Season/Bag limit	Federal 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]
1991–1992	8/10–9/20	No open	8/10–9/20	No open	EAST:	EAST:	8/10–9/20	8/10–9/20

Regulatory year	Unit 20B SE of Steese		Unit 20D N of Tanana River		Unit 20E		Unit 25C SE of Steese	
	State		State		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
	1 bull	Federal season	1 bull	Federal season	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	8/10–9/30[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	1 bull	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		State		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
2001–2002 Resident	8/10–9/30[d] 1 caribou 12/1–2/28[de] 1 caribou	No open season	8/10–9/20[d] 1 caribou	No open season	8/10–9/30[de] 1 caribou 12/1–2/28[de] 1 caribou	8/10–9/30[de] 1 caribou 11/1–2/28[de] 1 caribou	8/10–9/30[deh] 1 caribou 12/1–2/28[de] 1 caribou	8/10–9/30[fg] 1 caribou 11/1–2/28[f] 1 caribou
Nonresident	8/10–9/20 1 bull	No open season	8/10–9/20 1 bull	No open season	8/10–9/20 1 bull	No open season	8/10–9/20 1 bull	No open season
2002–2003 Resident	8/10–9/30[d] 1 caribou 12/1–2/28[de]	No open season	8/10–9/20[d] 1 caribou	No open season	8/10–9/30[de] 1 caribou 12/1–2/28[de]	No open season	8/10–9/30[de] 1 caribou 12/1–2/28[de]	No open season

Regulatory year	Unit 20B SE of Steese		Unit 20D N of Tanana River		Unit 20E		Unit 25C SE of Steese	
	State		State		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
Nonresident	1 caribou 8/10–9/20 1 bull	No open season	8/10–9/20 1 bull	No open season	1 caribou 8/10–9/20 1 bull	No open season	1 caribou 8/10–9/20 1 bull	No open season

[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 2002–2003

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] Registration permit	1989–1990	681	28			148	98	0	246[c]	
	1990–1991	1478	29	25	75	238	18	8	265	
	1991–1992	1864	21	23	77	335	1	1	337	
973	[d]		17	34	66	262	10	0	272	
		2809	22	15	85	325	10	0	335	
		2472	19	15	85	294	12	0	306	
1992–1993		1860	26	12	88	160	15	0	175	
1993–1994	[e]	1025	28	16	84	138	7	0	145	150 bull quota
1994–1995	[f]	1305	31	16	84	143	8		151	150 bull quota
1995–1996	[f]	886	38	27	73	151	4		155	150 bull quota
1996–1997	[g]	1317	35	17	83	142	10	3	155	150 bull quota
1997–1998	[g]	1173	28	17	83	142	7	1	150	150 bull quota
1998–1999	[g]	4537	35	24	76	493	196	4	693	850 total quota; 210 cows
1999–2000										
2000–2001	[gh]	4163	31	30	70	667	185	12	864	950 total quota; 235 cows
2001–2002										
2002–2003										
General hunt[i]	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
		308	44	9	91	15	0	0	15	
		306	37	23	77	40	0	0	40	
		99	35	36	64	23	0	0	23	
1994–1995										
1995–1996										
1996–1997										

Hunt	Regulatory year	Permits issued	% Did not hunt	% Successful hunters	% Unsuccessful hunters	Harvest			Total reported harvest[a]	Notes
						Bulls	Cows	Unk		
575	1991–1992	20				4	0	0	4	
Federal hunt	1992–1993	244	18	39	61	59	12	11	82	
		77	58	3	97	1	0	0	1	
	[j]	<30	100	0	0	0	0	0	0	
	[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	401	965 hunter reports
	1989–1990			37	63	326	98	0	424	1264 hunter reports
	1990–1991			21	79	285	20	8	313	1520 hunter reports
	1991–1992			23	77	434	5	2	441	1919 hunter reports
				34	66	382	24	11	417[d]	1086 hunter reports
		2886	23	15	85	326	10	0	337	
		2780	22	15	85	309	12	0	321	
		2166	28	14	86	200	20	0	220	
	[l] 1996–1997	1025	28	16	84	138	7	0	145	150 bull quota
	[b] 1997–1998	1305	31	16	84	143	8		151	150 bull quota
	[c] 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	1173	28	17	83	142	2	1	145	150 bull quota
	2001–2002	4537	35	24	76	493	196	4	693	850 total quota; 210 cows
	[h]	4163	31	30	70	667	185	12	864	950 total quota; 235 cows

1993–1994
1994–1995
1996–1997
1992–1993
1993–1994
1994–1995
1995–1996
2002–2003

[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 2002–2003

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	21	50	467
1993–1994	326	0	0	326	0	10	10	10	346
1994–1995	309	0	0	309	0	12	12	7	328
1995–1996	200	0	0	200	0	20	20	5	225
1996–1997	138	0	0	138	0	7	7	1	146
1997–1998	143	0	0	143	0	8	8	0	151
1998–1999	151	0	0	151	0	4	4	0	155
1999–2000	142	0	3	145	0	10	10	0	155
2000–2001	142	0	1	143	0	7	7	0	150
2001–2002	493	196	4	693	5	10	15	0	708
2002–2003[d]	667	185	12	864	5	5	10	1	875

[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 2002–2003

Regulatory year	Successful				Unsuccessful				Total hunters
	Local[a] resident	Nonlocal resident	Nonresident	Total[b] (%)	Local[a] resident	Nonlocal resident	Nonresident	Total[b] (%)	
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
2001–2002	88	557	48	693 (23)	255	1885	98	2238 (77)	2931
2002–2003[c]	182	617	59	864 (30)	224	1646	123	1999 (70)	2863

[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.

[c] Preliminary data.

TABLE 7 Fortymile caribou autumn harvest by month/day, regulatory years 1988–1989 through 2002–2003

Regulatory year	Harvest by month/day								*n*
	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	
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
2001–2002	91	45	60	53	49	14	9	7	328
2002–2003	147	75	133	258	11	15	9	5	653

[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 2002–2003

Regulatory year	Harvest percent by transport method									
	Airplane	Horse	Boat/ Airboat	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
2001–2002[c]	10	0	4	29	30	3	21	0	3	693
2002–2003[c]	8	0	3	39	15	4	26	1	3	864

[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 2000
To: 30 June 2002

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

Named for their distinct calving areas, the Galena Mountain, Wolf Mountain, and Ray Mountain caribou herds occur north of the Yukon River in the Kokrines Hills and Ray Mountains. The Galena Mountain Herd (100–150 animals) typically calves east of Galena Mountain and winters west of the mountain. The Wolf Mountain Herd (600–850 animals) calves and winters to the north and east of Wolf Mountain in the Melozitna and Little Melozitna River drainages. The Wolf Mountain Herd and the Galena Mountain Herd are sympatric on a portion of their ranges near Black Sand Creek of Unit 21C, and the identity of these two herds was never adequately determined. The Ray Mountains Herd (approximately 1800 animals) calves in the Ray Mountains around Kilo Hot Springs, and winters to the north in the Kanuti–Kilolitna or to a lesser degree in the Tozitna drainages to the south. 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.

Aerial surveys of the Galena and Wolf Mountain herds are difficult during fall and winter due to small group size and poor sightability in the dense black spruce forests where they occur. Similarly, fall aerial surveys of the Ray Mountains Herd are difficult due to fog, clouds, and high winds.

The origin of these herds is unknown. Some residents suggested they were reindeer from a commercial operation in the Kokrines Hills that ended around 1935. However, evidence suggests these animals are caribou because 1) reindeer physical characteristics are not apparent, 2) reindeer genes were not found when tested, and 3) reindeer calve earlier than these 3 caribou herds.

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 caribou hunting.

MANAGEMENT OBJECTIVES

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

METHODS

Caribou from these herds 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. Galena Mountain is a local name given the 3274-ft, unnamed mountain northeast 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. On 10 April 2002, 3 short yearling, 1 short 2-year-old and 6 adult females were radiocollared in the Galena Mountain Herd. On 11 April 2002, 1 short 2-year-old and 9 adult females were radiocollared in the Wolf Mountain Herd. We radiocollared 15 short yearling and 2 short 2-year-old females on 29 March 2002 in the Ray Mountains Herd.

We conducted aerial surveys with helicopters (Robinson R-22 or R-44) and fixed-wing aircraft (Super Cub or Scout) during October 1994 through 2002 following techniques outlined by Eagan (1993). Surveys conducted using helicopters allowed for composition data to be collected. Fixed-wing aircraft were used in RY98 and RY02 (RY = regulatory year, which begins 1 Jul and ends 30 Jun [e.g., RY02 = 1 Jul 2002 through 30 Jun 2003]) for the Galena Mountain and Wolf Mountain herds, therefore only numerical counts were completed.

We monitored hunting mortality from hunter harvest reports and hunter interviews. Harvest reports that were submitted by hunters were entered into the statewide harvest database. The

data from these caribou herds was summarized annually from the statewide harvest database and hunter interviews were conducted opportunistically. Data summarized includes total harvest, harvest location, hunter residency and success, harvest chronology, and the types of transportation used. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Galena Mountain Herd. The Galena Mountain Herd has never been censused, but the population was probably down to 100–150 caribou by RY02. The highest number of caribou seen during RY00–RY01 was 105 animals in June 2001 (Table 1). The population probably declined due to 2 factors, predation and shifting between the Galena Mountain Herd and the Wolf Mountain Herd. It is also possible that some caribou were missed during the winter counts. As reported in the previous management report, radiocollaring caribou did not increase the number of caribou found, but did demonstrate that caribou occupy dense black spruce habitat, where sightability is low, during the rut. Continuation of surveys or censuses during winter or spring postcalving aggregations will provide the best estimates of population size for this herd. Regardless, it appears the Galena Mountain Herd was declining to a point where recovery was unlikely without intensive management.

Wolf Mountain Herd. The first fall composition survey of the Wolf Mountain Herd was conducted in October 1995, and 364 caribou were counted (Table 2). The survey conducted in June 2002 counted 617 caribou and was the largest number of animals ever counted in that herd. Based on that count, I estimated the population of the Wolf Mountain Herd was 600–700 caribou. The 2002 count was the highest reported, but may be high because Galena Mountain Herd animals were mixed in with the Wolf Mountain Herd at the time of the survey. Population increase is unlikely because recruitment has been low; only 1 short yearling was found during radiocollaring activities conducted earlier that spring. Continuation of surveys or censuses during summer or postcalving aggregations will provide the best estimates of population size for this herd.

Ray Mountains Herd. The Ray Mountains Herd was first thoroughly surveyed by ADF&G and BLM in fall 1983 and periodically surveyed by BLM during 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 2001 survey yielded a count of 1695 caribou. 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. Continuation of surveys or censuses during summer or postcalving aggregations will provide the best estimates of population size for this herd.

Population Composition

Because some counts of the 3 herds were conducted with fixed-wing aircraft, not all surveys yielded composition data (Tables 1–4). During RY00–RY01, only the Ray Mountains Herd was classified.

The most recent calf:cow ratio data collected for the Ray Mountains, Wolf Mountain, and Galena Mountain herds were in the range of other Interior herds at 15:100, 22:100, and 13:100 for the 3 herds, respectively. 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). However, the percent of calves in the herd was down to 5% in 2002 for the Wolf Mountain Herd. During the collaring activities in April 2002 only 1 short yearling was found and it appeared that the 2001 cohort was almost nonexistent.

Distribution and Movements

Galena Mountain Herd. Galena Mountain caribou usually migrated toward alpine areas east of Galena Mountain in April. They were found on the alpine slopes of the southern Kokrines Hills during the 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 migrated from alpine areas across Galena Mountain toward the Holtnakatna Hills and Hozatka Lakes where they wintered. 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 WACH 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. With only 3 collars remaining from the 2002 efforts, no remarkable information relating to herd distribution was obtained. Seasonal movements appear to be generally consistent with earlier investigations.

Following the radiocollaring efforts in April 2002, 4 of the adults and 1 short 2-year-old died, apparently as a result of the capture operation. Mortalities in several other caribou capture operations also occurred in Alaska at the same time. Investigation into the mortalities was inconclusive but deaths were likely the result of either capture myopathy, narcotic recycling, or kidney failure from low blood oxygen levels, and not infection or trauma. However, there is no obvious reason why these caribou died at such a high rate in some herds and not in others, or why the mortality rate was so high in 2002 and so low in other years (P Valkenburg, ADF&G, personal communication). Between 17 July 2002 and 24 September 2002, 2 more yearlings died due to unknown causes. Active collars remain on only 2 adults and 1 yearling.

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 south facing slopes of the Kokrines Hills south of Wolf Mountain, spent most of the summer in the surrounding alpine habitat nearer Wolf Mountain, then in October moved northward toward Lost Lake on the Melozitna River. Radiocollared caribou confirmed these patterns and 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. With only 1 collar remaining from the 2002 efforts, no new information relating to herd distribution was obtained.

Following the radiocollaring efforts in April 2002, 7 of the adults died, apparently as a result of the capture operation. The previously described investigation of deaths in the Galena Mountain Herd included these animals as well. Two additional adults died apparently sometime prior to 18 May but it was not clear whether those mortalities were capture related. Only 1 active collar remains in the Wolf Mountain Herd on a 2-year-old caribou.

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 WACH.

Since radiocollaring began in October 1994, relocations during winter were primarily on the northern slopes of the Ray Mountains and during calving season on the southern slopes of the Ray Mountains in the upper Tozitna River drainages. Summer range is in the alpine areas of the Ray Mountains, frequently in the Spooky Valley area around Mount Henry Eakins and occasionally in the alpine areas south of the upper Tozitna River (Jandt 1998).

Following the radiocollaring operations of 29 March 2002, 4 short yearlings and 1 short 2-year-old apparently died from capture-related causes. The previously described investigation included these animals. Twelve collars from that operation remain active in the Ray Mountain Herd.

Body Weights and Genetics

In October 1995, female calves from the Galena Mountain Herd were among the heaviest in Alaska (Valkenburg et al. 1993). Wolf Mountain and Ray Mountains calves were also heavy.

In contrast, caribou calves caught in the Ray Mountains on 29 March 2002 were relatively light, indicating that body condition had declined considerably since 1994. Whether that

decline in condition is due to a short-term (summer weather) event or is a density-dependent decline in condition is unknown.

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.	(General hunt only)	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 southeast bank of the Kodosin Nolitna Creek, then downstream along the east bank of the Kanuti Kilolitna River to its confluence with the Kanuti River.		
1 caribou.	10 Aug–31 Mar	10 Aug–30 Sep
Unit 25D, that portion drained by the west fork of the Dall River,		

Units and Bag Limits	Resident/Subsistence Open Seasons	Nonresident Open Seasons
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.

Alaska Board of Game Actions and Emergency Orders. In March 1991 the Alaska Board of Game gave ADF&G emergency order authority to open a 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–RY02.

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 RY00 and RY01 hunting seasons, only 5 bulls and 2 cow caribou were reported taken. Two cows and 3 bulls were harvested in the Ray Mountains Herd and 2 bulls were harvested in the Galena Mountain Herd (Table 5).

Hunter access to the Ray Mountains Herd is limited to lengthy snowmachine trips during the open season in winter or to a few ridge-top landing areas. The Galena Mountain Herd is most accessible for hunting when it crosses the Galena–Huslia winter trail during winter. However, that area is closed during winter to prevent 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 continues to average <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 snowfields near the river in August, or wandering to the river during September. In addition, 5–7 caribou are probably taken each year 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. Predation was probably the main limiting factor, but no studies to determine mortality factors have been completed for these herds. Judging from adult abundance, total adult mortality was probably very low. Black bears were probably the primary calving ground predators on the Wolf and Galena Mountain herds. Grizzly bears are found throughout the calving ranges of all 3 herds and calf mortality studies in other areas indicate that they are important predators of caribou calves (Boertje et al. 1995). There is 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 2001.

CONCLUSIONS AND RECOMMENDATIONS

The mountains between Galena and the upper Hodzana River on the north side of the Yukon River contain 2300–2750 caribou in 3 herds centered around 3 distinct calving areas, although the calving areas of the Galena and Wolf Mountain herds may overlap. Although open hunting seasons for caribou exist, few animals were harvested due to limited access. Poor survival, due to predation, is the primary factor restricting herd growth. Survey and inventory information for wolves and bears indicated predator numbers were increasing during RY96–RY99 (Stout 1999, 2000). Prior to RY99, habitat apparently did not restrict growth because lichen ranges were lush. Large body size and weight of calves and adults for the Ray Mountains Herd and Galena Mountain Herd previously indicated good nutrition (Osborne 1995). The recent decline in calf weights may be related to less high-quality summer range available for Ray Mountain Herd caribou than previously thought.

Although there was a decline in the Galena Mountain Herd, harvest was not responsible for the decline; therefore, the first management goal – to ensure harvest does not result in a population decline – was met. However, the second goal, to provide increased opportunity for people to participate in caribou hunting, was not achieved, and more restrictive harvest regulations should be implemented to protect the Galena Mountain Herd. 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.

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TABLE 1 Galena Mountain caribou 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]						67
06/01[a]						105

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

TABLE 2 Wolf Mountain caribou composition counts, 1991–2002

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
7/02[c]		27 (5)		516

[a] No survey.

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

[c] Photocensus.

TABLE 3 Ray Mountains caribou fall composition counts and estimated population size, 1991–2001

Survey date	100 cows	Calves: 100 cows	Calves %	Cows %	Small bulls %	Medium bulls %	Large bulls %	Total bulls %	Composition sample size	Count or estimate of herd size
06/91		31						13[a]		446
06/91			19							303[b]
10/91[c]										140[d]
10/94[c]										652
10/94	37	19	12	64	4	8	11	24	629	629
01/95[c]										684
06/95[e]										1731
10/95	34	12	8	69	3	9	11	23	994	994
10/96	28	15	10	70	3	8	9	20	1387	1387
10/97	33	13	9	68	5	6	12	23	1114	1114
10/98	26	32	20	63	6	3	7	16	1756	1756
10/00[e]	38	19	12	64	10	6	9	24	1736	1800
09/01	30	15	11	68	10	5	5	21	1695	1800

Bulls:

[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, 1991–2002

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
1995–2002[a]					

[a] No counts completed.

TABLE 5 Ray, Galena, and Wolf Mountain caribou reported harvest, regulatory years 1990–1991 through 2001–2002

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
2001–2002	1	2	0	0	0	0

TABLE 6 Galena Mountain, Wolf Mountain and Ray Mountains caribou hunter residency and success, regulatory years 1990–1991 through 2001–2002

Regulatory year	Successful				Unsuccessful				Total hunters
	Local resident[a]	Nonlocal resident	Nonresident	Total	Local resident[a]	Nonlocal resident	Nonresident	Total	
1990–1991	0	4	0	4	3	23	3	29	33
1991–1992	0	3	0	3	2	28	0	30	33
1992–1993	0	5	2	7	1	7	2	10	17
1993–1994	1	6	1	8	0	15	2	17	25
1994–1995	0	3	2	5	2	18	0	20	25
1995–1996	0	0	0	0	2	10	0	12	12
1996–1997	0	1	0	1	1	11	1	13	14
1997–1998	0	0	0	0	1	5	2	8	8
1998–1999	0	0	0	0	4	0	2	6	6
1999–2000	0	1	1	2	0	4	2	6	8
2000–2001	3	1	0	4	3	13	2	18	22
2001–2002	1	2	0	3	0	20	8	28	31

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

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

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

HERD: Western Arctic

GEOGRAPHIC DESCRIPTION: Northwest Alaska

BACKGROUND

The Western Arctic Caribou Herd (WAH) ranges over approximately 140,000 mi^2 (363,000 km^2) of northwestern Alaska (Figs 1 and 2). 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 during the mid 1980s through 1995 most of the WAH wintered in the Nulato Hills as far south as the Unalakleet River drainage. Since 1996 the WAH has shifted the southern extremity of its winter range from the Nulato Hills to the Seward Peninsula. Additionally, since the mid 1990s this herd has generally dispersed more during winter than prior to this time.

In 1970, the WAH numbered approximately 242,000 caribou. By 1976 it had declined to an estimated 75,000 animals. From 1976 to 1990 the WAH grew about 13% annually, and from 1990–1996 it grew 1–3% annually. The herd may have peaked in 1996 at 463,000 caribou. Census results suggest the WAH 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. Since 1990, density of the WAH over its total annual range has been 3.0-3.3 caribou/mi^2 (1.1-1.3 caribou/km^2). This figure is misleading, though, because caribou exhibit a 'clumped' distribution in both space and time. Seasonal densities provide a more useful measure for evaluating effects of density on range and on individual caribou. However, seasonal densities only reduce rather than correct for the effects of clumping behavior on density.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Protect and maintain the WAH and its habitat.
- Provide for subsistence and recreational hunting on a sustained yield basis.

- Provide for viewing and other uses of caribou.

- Perpetuate associated wildlife populations, including carnivores.

MANAGEMENT OBJECTIVES

The following management objectives comprise the 7 basic elements of the WAH Cooperative Management Plan that was finalized in March 2003:

- Encourage cooperative management of the herd and its habitats among state, federal and local entities and all users of the herd.

- Recognizing that caribou herds naturally fluctuate in numbers, manage for a healthy population using strategies adapted to population levels and trends.

- Assess and protect important habitats of the WAH.

- Promote consistent, understandable and effective state and federal regulations for the conservation of the WAH.

- Seek to minimize conflict between reindeer herders and the WAH.

- Integrate scientific information, traditional ecological knowledge of Alaska Native users, and knowledge of all users into management of the herd.

- Increase understanding and appreciation of the WAH through use of scientific information, traditional ecological knowledge of Alaska Native users, and knowledge of all other users.

METHODS

Many of the terms used in this report are defined as follows:

> ‘Caribou’ in the generic sense refers to the WAH. Caribou from other herds are identified in text.
>
> ‘Local hunter’ is anyone that resides within the range of the WAH.
>
> ‘Nonlocal hunter’ includes residents of Alaska that live outside the range of the WAH and includes nonresident and alien hunters.
>
> ‘Winter’ is 1 November–31 March.
>
> ‘Adult caribou’ is any caribou >12 mos old.
>
> ‘Calf’ is any caribou <10–11 mos old.
>
> ‘Short yearling’ is any caribou 10–11 mos old.

‘Maternal cow’ refers to a female caribou accompanied by a calf or having ≥1 hard antler during June.

‘Recruitment survey’ is used interchangeably with ‘short yearling survey.’ These surveys are conducted during late March through May to estimate the ratio of short yearlings:100 adult caribou.

‘Conventional telemetry’ refers to radio collars with very high frequency (VHF) transmitters located using antennas mounted on airplanes.

‘Collar year’ is the period 1 October–30 September of the subsequent year.

‘Satellite collar’ is a radio collar that contains both a VHF transmitter and a PTT (platform terminal transmitter).

‘c.i.’ is the abbreviation for ‘confidence interval.’

‘Photocensus’ is the aerial direct count photo extrapolation technique (Davis et al. 1979).

Population Status and Trend. Radio collars were first deployed in the WAH in 1979 (Davis and Valkenburg 1985). Initially, few collars were deployed and the frequency of relocation flights was low. Although we have never collared more than 0.03% of the herd, since the late 1980s we have typically conducted 15–20 relocation flights annually.

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 WAH. Configuration of conventional and satellite collars, PTT duty cycles, VHF relocation techniques, types of data collected, allocation of collars between bulls and cows and sources of error in telemetry data have been previously described (Dau 1997, 1999).

As in the past, we attempted to complete each ‘collar year’ (1 Oct–30 Sep) with more than 100 functional transmitters on living caribou during this reporting period. To meet this goal we typically begin 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 attempt to maintain only 15 collared bulls in the total marked sample annually and we only deploy collars on large adult bulls. 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 cows in very poor physical condition are not collared.

We began the 2000–2001 collar year with 93 potentially active conventional collars on living caribou (84 cows and 9 bulls). Of these, 22 collars on cows were also equipped with a functional PTT. Sample sizes of potentially active radio collared living caribou in 2001–2002 were 103 (93 cows and 10 bulls) of which 33 cows were equipped with a functional PTT. In 2002–2003 we began the ‘collar year’ with 113 potentially active collars on living caribou (97 cows and 16 bulls) of which 32 cows and 4 bulls had 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). Many residents of northwest Alaska object to chemical immobilization and helicopter capture techniques. Therefore, as in the past to avoid using these techniques, we did not remove or replace radio collars on caribou during this reporting period.

Since 1999 we have used model ST-18 satellite collars with PTTs powered by 2 C-cell batteries. They were paired with model 600 VHF transmitters powered by 2 D-cell batteries. This configuration encloses both transmitters in a single canister and weighs about 3 lbs (1388 g). It is more streamlined than the 2-cannister ST-3 and ST-14 configurations that weighed almost 4 lbs (1789 g). The history and objectives of the WAH PTT program, configuration of satellite collars, PTT duty cycles, and use of data was summarized by Dau (1997). In 2000 and 2001 VHF transmitters were programmed with a 16-hr ON/8-hr OFF duty cycle to extend battery life. We did not use VHF duty cycles during 2002 following problems encountered in 2000 and 2001.

In 2000 we deployed radio collars on 20 caribou (3 bulls and 17 cows). Four of the collars deployed on cows were equipped with a PTT. Thirty six caribou (30 cows and 6 bulls) were radiocollared during 2001; of these, 15 were satellite collars that were deployed on cows. The Selawik National Wildlife Refuge (SNWR) contributed 10 of the satellite collars to the WAH collaring program in 2001. During 2002 we deployed 43 radio collars (30 conventional and 13 satellite collars) on caribou (28 cows and 15 bulls). Three of the satellite collars deployed in 2002 were provided by the SNWR: these were all deployed on cows. Four satellite collars purchased by ADF&G in 2002 were deployed on bulls. All satellite collars provided by the SNWR in 2001 and 2002 were equipped with a breakaway device (Telonics Cr-2a) programmed to release 3 years after the manufacture date.

Population Size and Composition. We determined population size using the aerial direct count photo extrapolation (photocensus) technique (Davis et al. 1979). The herd was last censused in July 1999. A photocensus was attempted, but not completed, in June/July 2002. Population composition for the WAH was estimated from calving surveys during June, composition counts during October and short yearling surveys during April–May.

In 2000 calving surveys were conducted on 7 and 12–14 June in a C-185 with 3 observers. In 2001 calving surveys were conducted in a C-185 and PA-18 on 4-6 and 16-17 June, and in 2002 they were conducted in a C-185 and PA-18 during June 1-3 and 5. We attempted to conduct calving surveys on or slightly before the date of peak calving (assumed to be roughly June 7-10); however, survey dates were ultimately dictated by weather. Calving survey techniques, criteria to determine maternal status, and geographic coverage were the same as previously described (Dau 1997).

Fall composition surveys were conducted 14 November 2001 using techniques previously described (Dau 1997). Fall composition surveys were not conducted in 2000 because of poor weather or in 2002 because of helicopter unavailability and conflicts with other work.

During 2001 spring composition (short yearling or recruitment) surveys were conducted on 13, 23, 28 and 29 May and 1 June. In 2002 these surveys were conducted on 29 March, 4 April and 15, 16 and 20 May. After the reporting period recruitment surveys were conducted in spring

2003 on 5, 6, 8 and 30 April, and on May 1 and 2. In all years we used survey techniques previously reported (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 (Dau 1997). Additionally, PTT data supplemented conventional telemetry locations.

I evaluated winter range use by subdividing the total WAH range (not just the winter range depicted in Figs 1 and 2) into 9 areas and counted the number of collared caribou that wintered in each area annually. The 9 subareas are:

1) the coastal plain of Unit 26A;
2) that portion of Unit 26A west of the Utukok River;
3) the northern foothills of the Brooks Range in Unit 26A east of the Utukok River;
4) the Kobuk drainage west of Selby drainage including the Squirrel drainage below the North Fork, Selawik drainage and Buckland drainage;
5) Kobuk drainage above Selby drainage, central Brooks Range north of the Koyukuk River and west of Bettles/Wiseman, and Noatak drainage above Douglas Creek;
6) a portion of the Koyukuk drainage south of the Koyukuk River;
7) most of the Seward Peninsula west of Buckland and Koyuk villages;
8) Nulato Hills; and
9) Noatak drainage below Douglas Creek, the Wulik and Kivalina drainages, and Squirrel drainage above the North Fork.

The first winter after a caribou was radiocollared was excluded from the sample because the collaring location predetermined range use the following winter. When a collared caribou used >1 area in a single winter, I assumed use of each area was equal and assigned the appropriate fraction of use to each area for that individual. I defined 'winter' as November–March. Caribou density on each winter range was estimated by multiplying the percentage of collared WAH animals in that area by the estimated population size. This approach did not consider reindeer or caribou from the Teshekpuk Lake Herd (TLH) and Central Arctic Herd (CAH) that were on WAH range. It also ignored collared WAH caribou not located during a winter and assumed those radiocollared caribou we did locate were randomly distributed throughout the herd. Given the small proportion of collared caribou in the WAH, this assumption was probably not always correct. I used population growth rates to estimate population size for years when we did not conduct a census.

Unlike my evaluation of winter range use where I subdivided the total WAH range, I evaluated summer range-use only for the area delineated as 'summer range' in Figures 1 and 2. Telemetry work conducted in conjunction with photocensuses since 1988 has indicated at least 95% of the herd has been within the area we've delineated as summer range by early July. Therefore, I calculated 95% of the estimated population size to estimate caribou density on summer range.

Mortality. Mortality rates for adult WAH caribou were estimated from cows with conventional radiocollars or ST-18 PTTs on a collar-year basis. Radiocollared bulls and cows collared with

ST-3 or ST-14 PTTs were not used to estimate mortality (Dau 1997). Two collar years (1999–2000 and 2001–2002) 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 usually increase 1–3% for 1 or 2 years after the end of each collar year. Estimated mortality rate includes all sources of mortality.

Harvest. We monitored harvest using 3 systems: 1) registration permits for local hunters; 2) statewide harvest tickets for nonlocal hunters; and 3) community-based harvest assessments for selected communities within the range of the WAH. Beginning in the 1998–1999 regulatory year the Division of Wildlife Conservation (DWC) resumed administering the statewide caribou harvest ticket system as they do for other big game species, e.g. moose.

During this reporting period I estimated total annual harvest by local hunters using community harvest assessment data. For communities not surveyed during this period, but which have been surveyed in the past, I calculated a mean per capita harvest rate from historical data and multiplied it by the appropriate community population size. When using historical data to estimate per capita harvest rates for individual communities, I included only years when availability of caribou was roughly comparable. For communities never surveyed I calculated a mean per capita harvest for communities nearby or with similar access to caribou. When combining several communities to calculate per capita harvest for an 'unsurveyed community,' I 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 in Unit 26A near areas where the CAH, TLH and WAH mingled, I initially estimated total community caribou harvest as described above. Geoff Carroll, Unit 26A Area Biologist, then estimated the percentage of total harvest comprised of WAH caribou based on the distribution of collared caribou in each herd. Although there is uncertainty associated with assigning harvest levels to individual caribou herds where they mix (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 (R. Sutherland, pers. commun.). This technique employed a Poisson distribution with 'WAH total harvest' as the distribution parameter. We calculated each 95% interval 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. Confidence limits for individual communities were summed to produce an interval around total harvest.

In addition to the 3 conventional systems for estimating harvests described above, we also developed statistical harvest models to estimate local harvests by communities in Units 22, 23 and 26A for the 1999–2000, 2000–2001 and 2001–2002 regulatory years (R. Sutherland, pers. commun.). It is much easier to estimate caribou harvests over the entire range of the WAH using statistical models than by calculating per capita harvest rates for individual communities. The models were based upon Analysis of Covariance. The dependent variable was 'community harvest' with independent variables of 'community population size' and 'caribou availability.' Herd availability was an indicator variable (far, close or average). For communities that have been surveyed in >1 yr it was evident harvest levels lacked independence through time.

Likewise, community harvest assessments for neighboring communities suggested a spatial dependence as well. Because community harvest levels were not independent through space or time, statistical harvest models were developed using a Generalized Least Squares technique. This technique accommodates dependent observations.

Disease. We collected blood samples from caribou when radiocollars were deployed at Onion Portage. Caribou were captured, restrained and released as previously reported (Dau 1997). In September 2000 we sampled 57 bulls and 59 cows; in 2001, 50 bulls and 40 cows, and in 2002 (after this reporting period) 55 bulls and 39 cows. Body condition (very skinny, skinny, average, fat, very fat) and presence/absence of a calf were recorded for caribou from which a blood sample was collected. Samples collected during 2000 were analyzed to monitor prevalence of 8 selected bacteria and viruses in the herd (Dau 1999) as well as haptoglobin levels (Dau 2001). Samples collected during 2001 and 2002 are initially being analyzed only for *Brucella* and haptoglobin levels.

On 15 April 2002 I necropsied 10 caribou collected in proximity to the Red Dog Mine and Port Site Road. Dr. Philip Meyer assisted with the necropsies. TekCominco hired 2 individuals from Noatak, Roland Ashby and Thurston Booth, to kill the caribou and paid for the heavy metals analyses. The meat from these caribou was salvaged and donated to the Kotzebue Senior Center. On 5 August, 2002 (after the reporting period) I killed and necropsied a mature bull caribou that had spent about 1 month near the Red Dog Mine tailings impoundment. Again, TekCominco paid to analyze its tissues for heavy metals. While processing the bull collected during August I trained 2 TekCominco staff in necropsy procedures.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The July 1999 photocensus produced a minimum estimate of 430,000 caribou (Table 1, Fig 3). Results of this census have been previously reported (Dau 2001). At its peak population size in 1999, the density of this herd over its total range was 3.3 caribou mi^2 (1.3 caribou/km^2). Overall density for the censuses conducted during 1990–1999 when the population was essentially stabile averaged 3.2 caribou/mi (SD=0.1, n=4). This is a slightly conservative measure of grazing pressure exerted annually on WAH range because it does not include reindeer or caribou from other herds with overlapping ranges. However, the functional density experienced by most individual caribou on seasonal ranges was undoubtedly much higher given their clumped distribution throughout the year.

At the end of the reporting period, late June 2002, we attempted to census the WAH. Avgas and all equipment for the camp were transported to Eagle Creek during the last week of June. However, high winds, snow, fog and cool temperatures prevailed during 30 June–12 July. We monitored the distribution of the herd from Kotzebue using conventional telemetry techniques as often as possible during this time. On 12 July the census was postponed until July 2003 because caribou were spread almost linearly through the De Long Mountains from Mount Kelly to Howard Pass, a straight-line distance of roughly 150 mi. All fuel and equipment were retrieved from Eagle Creek soon after the census was postponed.

During July 2003 (after the reporting period) we photographed the WAH as the 1st step in the photocensus process. Photographs were taken July 9, 11 and 12. Conditions were not ideal on any of the photography days. However, telemetry indicated >95% of the herd was aggregated in the groups we photographed. Also, continued marginal weather and movements of the herd suggested we would get no better opportunities to conduct photography during this attempt. As a result, we exposed 1157 photographs to completely photograph the herd. We intend to have the photographs counted by November, 2004. Even without a minimum count it was obvious during the photography the WAH is still very large.

Population Composition

Calving. We conduct calving surveys for several reasons: 1) to assess the distribution of WAH calving activity; 2) to monitor initial calf production; and 3) to contribute to our annual estimate of adult caribou mortality. Additionally, this parameter provides a 'backhanded' way to assess body condition of mature cows the previous fall (Cameron and Ver Hoef 1994). Calf production per se has probably had little affect on the population dynamics of this herd since at least the mid 1980s.

We observed 66 calves:100 radiocollared cows during June 2001, 78 calves:100 cows in 2002 and 68 calves:100 cows in 2003 (Table 2). The 2002 ratio is the highest observed since 1992. Calf production has generally increased since 1998 (Figure 4). We assume WAH calving peaks during the 1st week of June; however, we have no data to evaluate that assumption beyond qualitative observations of antler status and distention of cows' bellies associated with near term pregnancy. Since the mid 1990s we've attempted to conduct calving surveys during the week of peak calving. However, poor weather has often prolonged calving surveys beyond this time period. Our estimates of calf production are probably conservative because we do not record udder status for collared cows (Whitten 1995) and therefore misclassify some cows that lose their calf and antlers soon after birth as 'nonmaternal.' Even so, there has been no correlation between the median date that calving surveys were conducted and the calf:cow ratio.

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 (Spearman rank correlation = -0.89, n = 15 years). The median proportion of cows with velvet antlers during years when the calf:cow ratio was $\geq$70:100 (2.6%, n=7) was significantly lower (Kruskal-Wallis P=0.0003) than during years when this ratio was <70:100 (15.2%, n=8). 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 low calf:cow estimates are real and not artifacts of sampling error.

Between June 1992 and May 2002 there was no correlation between June and subsequent fall calf:cow ratios (r = 0.09, n = 10). 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 37:100 and bull:cow ratio was 38:100 in 2001. Poor weather and aircraft mechanical problems limited coverage during 2001 to the Mulgrave Hills. Although approximately half of the WAH was in this area during the time of the surveys, large numbers of caribou were also in areas (e.g. the Seward Peninsula) we did not cover. Additionally, the November 2001 Board of Game meeting delayed fall surveys until after rut was

completed and sexual segregation had begun to occur. Therefore, these results should be viewed with caution. No fall composition surveys were conducted in 2000 or 2002 because of poor weather or helicopter unavailability.

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 even calf:adult estimates because we do not sample the entire WAH and because sexual segregation varies among years. Between 1992 and 1999 there was a weak correlation (r = 0.54, n = 10) between the October calf:adult ratio and subsequent April/May calf:adult ratio.

Since 1992 the fall bull:cow ratio has ranged from 38-64:100 (Table 3). The median ratio has been 51 bulls:100 cows. Sexual segregation and our inability to sample the entire herd probably account for more annual variability in this parameter than actual changes in population composition.

Spring Composition. We observed 19 short yearlings:100 adults in spring 2001, 15:100 in spring 2002 and 19:100 in 2003 (Table 4, Fig. 5). There has been no trend in this parameter since 1999. Since the early 1980s, however, recruitment has generally declined.

Distribution and Movements

Historical Summary. Our historical understanding of the distribution of the WAH was previously reported (Dau 2001). During range-wide telemetry surveys we located: 88 of 134 potentially active collars during fall 2000 (66%); 90 of 127 (71%) during spring 2001; 84 of 125 (67%) during fall 2001; 91 of 126 (72%) during spring 2002; 110 of 135 (81%) during fall 2002; 97 of 126 (77%) in spring 2003; and 119 out of 133 (89%) in fall 2003.

Since spring 1995 when we began conducting range-wide surveys, we've located through conventional telemetry techniques an average 73% (SD = 10, n = 9) of all potentially active collars during spring and 74% during fall (SD=10, n = 9) surveys. Often, collars missed during a range-wide survey are located during the previous or subsequent survey period mixed with caribou that are found. This suggests long frequency scan times, steep topography, movements of caribou, errors made when programming receivers and infrequent relocation flights are responsible for 'missed' collars rather than incomplete coverage of the herds' range or unusual movements of caribou. The distribution of collars located during range wide surveys is probably a reasonably accurate though rough approximation of the distribution of the entire WAH (i.e., there have been no 'pockets' of caribou in areas we did not search).

General Movement Pattern: Pregnant cows and some nonmaternal caribou begin migrating from winter range toward the calving grounds in April. In typical years most pregnant cows have reached the calving grounds in the Utukok uplands by late May. Bulls, nonmaternal cows and immature caribou lag behind pregnant cows during the spring migration perhaps in part to exploit the northward progression of snow melt and green up. Most cows give birth in the Utukok uplands during late May through early June (Fig. 1; see section below). By mid June large post-calving aggregations begin forming as cows with neonates move west toward the Lisburne Hills. As mosquitoes begin to emerge in late June, bulls and nonmaternal caribou move into the western North Slope and De Long Mountains. Mosquito harassment intensifies and

oestrid flies emerge in early July. During the first half of July insect harassment causes WAH caribou to form aggregations sometimes numbering >100,000 individuals in this area. Even during the period of maximum insect harassment WAH caribou begin moving east-northeast through the Brooks Range and its northern foothills toward Howard and Anaktuvuk Passes. By early-to-mid August insect harassment begins to diminish and some caribou disperse north and west onto the North Slope, some going as far as Cape Lisburne and Barrow, while other caribou remain in the mountains between the Howard Pass and Anaktuvuk Pass. The fall migration begins in mid August as caribou in the vanguard move southwest toward Kotzebue and Norton Sounds. By late September, before some WAH caribou have even begun to migrate, caribou near the front of the migration have reached the southernmost portions of winter range. The fall migration extends through mid-to-late November. No matter where WAH caribou are, directed and lengthy migratory movements generally cease by this time and they become relatively sedentary until April when the spring migration begins.

Winter Range. Winter range is the most difficult of all WAH seasonal ranges to delineate. The area identified as 'winter range' in Figures 1 and 2 represents where most of the herd has wintered in most years since the mid 1980s. In reality, of course, caribou seasonal ranges are not mutually exclusive and, during winter, WAH caribou occur throughout most of their annual range albeit at very low densities in some areas (Table 5). Inupiaq of northwest Alaska have long understood that caribou winter range in this region has substantially shifted since the late 1800s (K. Mills, W. Woods, N. Sheldon, pers. commun.; see also Skoog 1968). Biologists that worked with this herd during the 1960s and 1970s recognized similar events (J. Hemming and J. Davis, pers. commun.).

Although radio collars have been deployed in the WAH only since 1979 and sample sizes of collared caribou have always been small in relation to the size of the herd, telemetry data provide rough estimates of winter range distribution through time (too few locations of caribou were recorded to evaluate winter range use before 1983-1984). The highest density observed in an area during any single winter was 26.4 caribou/mi^2 (10.2 caribou/km^2) in the Nulato Hills during 1990-1991 (Table 6). As shown in Figures 1 and 2, between 1983–1984 and 1996–1997 most WAH caribou wintered in the lower Kobuk-Selawik-Buckland area and in the Nulato Hills. Beginning in 1996–1997 caribou began to shift northwest from the Nulato Hills onto the Seward Peninsula (Tables 5 and 6).

The intensity and consistency of winter use of the Nulato Hills by WAH caribou between 1985–1986 and 1994–1995 is striking (Tables 5 and 6). In 7 of 10 years during this time >50% of the herd wintered in this area. In 2 winters (1990–1991 and 1993–1994) density in this area was >20 caribou/mi^2 (8 caribou/km^2) and in 4 other winters (1988–1989, 1989–1990, 1992–1993 and 1994–1995) density was 15-20 caribou/mi^2 (6-8 caribou/km^2). In only 1 other year since 1983–1984 did winter density in any other subarea (Seward Peninsula during 1996–1997) exceed 15 caribou/mi^2 (6 caribou/km^2).

In 1996–1997 the WAH began shifting its winter range northwest from the Nulato Hills to the Seward Peninsula. In no year prior to 1996–1997 did >9% of the herd winter on the Seward Peninsula. In only 1 year since that time (1999–2000) did <20% of the herd winter in this area and in 1996–1997 59% of the herd wintered there. For several years after this shift began 20-30% of the WAH still wintered in the Nulato Hills. Caribou have continued to abandon the

Nulato Hills since 1996 though. Only 5% of collared WAH caribou wintered in the Nulato Hills during 2001–2002 and none wintered there during 2002–2003. Telemetry information is consistent with reports from residents of Koyuk, Shaktoolik and Unalakleet, and with opportunistic observations by ADF&G staff, of very few widely scattered caribou in the Nulato Hills during this reporting period.

In addition to shifting its winter range during the mid to late 1990s, the WAH also became more dispersed during winter than in previous years. For example, in 10 of 13 years between 1983–1984 and 1996–1997 >50% of the herd wintered in a single geographic area (usually, the Nulato Hills). In each year since 1997–1998 the herd has been distributed in 3–4 geographic areas during winter and no area has contained >50% of the herd.

The estimates of winter range density reported here do not include caribou from the TLH, CAH or reindeer; therefore, the figures reported here represent minimum densities. This would primarily affect densities reported for the central Brooks Range, the foothills of the Brooks Range east of the Utukok River and the Seward Peninsula.

Calving Grounds. Two approaches have been used to delineate the WAH calving grounds, one qualitative and the other quantitative. In 1994, ADF&G qualitatively delineated seasonal ranges of the WAH, including the calving grounds, based on satellite and conventional telemetry data, opportunistic observations of caribou by ADF&G staff during wildlife surveys and many reports from the public. We attempted to show areas used seasonally by most of the herd in most years. Strengths of this approach are that it is informed by observations of literally tens of thousands of unmarked caribou (i.e., caribou not radiocollared) and considers contextual information that isn't always measured (e.g., snow characteristics, behavior, density of groups, general direction of travel, etc.) or measurable (e.g., traditional knowledge of Native residents). Weaknesses of this approach are that it is not quantifiable or repeatable. This approach emphasizes general patterns of 'typical' distribution.

In contrast, Kelleyhouse (2001) calculated concentrated calving and extent of calving for the WAH using kernel analyses and ADF&G data from 1987–2000. Quantifiable and repeatable, this approach is based on small sample sizes and considers only location information. In addition to showing patterns of distribution, this approach is well suited to showing variability in distribution among years.

Kellyhouse's depiction of concentrated calving generally agrees with ADF&G's qualitative delineation of the calving area except at their western extents. Kernel analyses extend concentrated calving farther west than ADF&G's delineation of calving. This difference is largely because ADF&G excluded calving data collected in 1990 while Kelleyhouse included it in her analyses. In 1990, in addition to the western distribution of 'calving,' the density of collared cows, westerly movement pattern and paucity of cows with hard antlers suggest we probably conducted calving surveys after the period of peak calving. Calendar dates of the 1990 surveys were within the range of dates for other years which suggests calving probably occurred early that year. In 1990 the westward post-calving movement was likely well underway when we conducted calving surveys. Kellyhouse's area of concentrated calving is smaller and more discontinuous than ADF&G's qualitative depiction of calving probably because sample sizes

used in the kernel analyses were small in relation to the number of caribou observed during ADF&G's qualitative delineation.

Kelleyhouse (2001) defined 'maternal' cows as those observed with a neonate at heel. In contrast, ADF&G has defined 'maternal' cows as those with a neonate at heel or having ≥1 hard antler. For determining parturition rate, ADF&G's definition is preferable (Whitten 1995). However, for delineating calving areas Kelleyhouse's definition is the more conservative approach because some pregnant cows may move 10–20 km/day up to the time of parturition (B. Griffith, pers. commun.). Caribou from this herd typically move almost due north onto the calving area. In all years when we classified at least some collared cows as 'maternal' based on antler status (n=11), median latitude was greater for cows with a neonate than for those without a neonate but ≥1 hard antler. In 7 of these years (1988, 1989, 1993, 1998, 2000, 2001 and 2002) this difference was statistically significant (Kruskal-Wallis tests, all $P<0.05$).

As previously reported (Dau 2001), the distribution of cows was unusually far south during the 2000 calving season. Breakup was exceptionally late during 2000 and it appeared many cows (up to 25%) calved en route to the calving grounds. For example, we observed 4 collared cows with neonates (of 39 collared cow/calf pairs) on the south side of the Brooks Range and 6 additional collared cow/calf pairs just northwest of Howard Pass. During the 2001 calving period the distribution of collared cows was even more dispersed and extended farther south than in 2000. As in 2000, breakup was exceptionally late during 2001. Unlike in 2000 we observed no collared cows with neonates off the traditional calving area in 2001; however, we did see 31 cows with hard antlers (i.e., maternal cows) as far south as Granite Mountain during calving surveys. If these hard-antlered cows managed to calve on the traditional calving area, they must have exhibited exceptionally high rates of travel just prior to parturition. The period of parturition may have extended later into June than in most years; if so, this would have given some cows more time to reach the traditional calving ground. Alternatively, some cows may have calved en route to the calving area after we conducted calving surveys.

To put the unusual distribution of calving during 2000 and 2001 in perspective, between 1987 and 1999 only 6 of 528 (1%) maternal cows (cows with either a neonate or ≥1 hard antler) and 16 of 279 (6%) nonmaternal cows were observed south of the Brooks Range crest. In 2000 we observed 11 maternal cows (28%) and 8 nonmaternal cows (36%) south of the crest. In 2001 we observed 31 maternal cows (91%, though none had a neonate) and 16 nonmaternal cows (73%) south of the Brooks Range crest. The distribution of cows was more typical in 2002 than in the previous 2 years. Although we observed no maternal cows south of the Brooks Range crest, 8 of 14 nonmaternal cows (57%) were south of the crest.

To summarize, data from 1990, 2000 and 2001 should probably not be used to delineate the typical or traditional WAH calving grounds because surveys were conducted late in relation to date of peak calving (1990) or the distribution of caribou was atypical (2000 and 2001). The anomalous years 2000 and 2001 illustrate the importance of maintaining free access onto the traditional calving grounds and an adequate buffer zone around the traditional calving area where calving may occasionally occur in years of unusual environmental conditions.

Summer Range. Conventional telemetry relocation flights associated with calving surveys and photocensuses as well as PTT data all indicate the vast majority of the WAH uses the western

North Slope and Brooks Range during summer. The size of the area shown as summer range in Figures 1 and 2 is about 43,000 mi^2 (111,400 km^2). In recent years up to several thousand WAH caribou, primarily bulls and immature cows, have reportedly summered on the Seward Peninsula as well (K. Persons, pers. commun.).

Although summer range is rarely, if ever, identified as critical for caribou, that portion of the De Long Mountains and its northern foothills west of and including the upper Utukok and Kugururuk drainages is probably critical for the WAH. Immediately following calving, maternal cows and calves begin moving into this area as they form large post-calving aggregations before the onset of insect harassment. Mosquitoes begin to emerge by mid-to-late June and oestrid flies (warbles, *Oedemagena tarandi*, and nose bots, *Cephenemyia trompe*) emerge by early July. Insect harassment causes bulls and nonmaternal cows to join post-calving aggregations (Dau 1986). During the first 2 weeks of July the WAH forms huge insect-induced aggregations near the Chukchi Sea coast and on barren ridge tops in the westernmost portion of its summer range. During this time virtually the entire herd rapidly moves from the Lisburne Hills/Cape Thompson area eastward toward Howard Pass and Chandler Lake (Fig 6). At no other time of year is the WAH more concentrated that during the first half of July. Any development that would affect WAH movements at this time would essentially impact the entire herd. For that reason this portion of summer range should probably be considered as critical to the WAH as calving grounds or important movement areas, e.g. Howard Pass and Onion Portage.

Telemetry data collected during the 1988–1999 photocensuses (n=5) suggest at least 95% of the WAH is consistently on its summer range by early July. Using this approach, caribou density on summer range has varied only in relation to population size and reached 10.1 caribou mi^2 (3.9 caribou/km^2) in 1999. Of course, density is much higher than this during early July when the herd is highly aggregated in the western portion of its summer range and lower when it is dispersed in August. Unlike for winter range, reindeer and caribou from the CAH and TLH have little effect on summer range densities because there is little mixing of animals during summer.

Satellite Collars. The annual distributions of satellite-collared WAH caribou were similar in 2001 and 2002 (Figs 1 and 2). Even so, this data reflects some of the annual variability in distribution that typically occurs.

Satellite collars enabled us to effectively search for conventional radiocollared caribou. They also allowed us to monitor the distribution and movements of the WAH during periods of inclement weather and short day length. The PTTs were especially useful for notifying reindeer herders of potential conflicts with caribou. During calendar year 2000 we had up to 25 satellite collars deployed in the WAH and collected 1564 locations. During 2001 up to 37 satellite collars provided 1622 locations and in 2002, 28 satellite collars provided 1391 locations. The number of locations reported here excludes locations collected during September-December in the first year of deployment. Because all collars are deployed at Onion Portage, including this data would erroneously suggest very high use of this and the nearby area. I also standardized all PTTs to a 1-day-on/5-days-off duty cycle for the entire year to avoid differences in duty cycles among seasons and individual PTTs.

Despite never having >10 functional PTTs on living WAH caribou at any time before 1998, satellite collars indicated the overall distribution of the WAH amazingly well. A scatter plot of

all WAH PTT locations collected since 1987 agrees with our representation of overall range (Fig 1) determined from thousands of conventional collar locations as well as countless opportunistic observations of caribou and public reports. Even so, the primary limitation of this data is the small number of PTT-collared caribou in relation to herd size (Dau 1999, 2001): during 1987–2002 we deployed a total of only 67 satellite collars on WAH caribou. Additionally, we have deployed very few PTTs on bull caribou. Despite this limitation, the aggregate of PTT data collected since 1987 provides an excellent depiction of general movements and seasonal distributions of the WAH. Until a much higher proportion of this herd is collared with PTTs, their use for time- and area-specific purposes should be approached with caution.

MORTALITY

Our estimates of adult mortality are conservative because they exclude bulls that tend to experience higher mortality rates than cows. Also, we do not collar emaciated, injured, or clinically diseased cows even though they comprise part of the population. Although these factors would shift the WAH mortality curve up, they should not affect its temporal trend (Dau 1997). We believe our estimates provide a reasonably accurate index of adult caribou mortality for the entire herd.

Since 1985 annual mortality has ranged from 7 (1997–1998) to 23 (1992–1993) deaths:100 collared adult cows (Table 7, Fig 7). Annual estimates of adult mortality have shown no statistically significant trend through time ($R^2 = 0.10$) and have exhibited more variability among years since 1992–1993 than prior to that time. Three-year moving averages reduce the effects of annual variability and suggest mortality has generally increased very slowly since the mid 1980s (Fig 8).

Adult caribou mortality is most meaningful in relation to recruitment. The significance of Fig. 8 is that these parameters have slowly converged since at least the mid 1980s. The census that will be attempted in July 2003 may 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

Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open 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 WAH 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 during this reporting period. 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) where no permanent caribou hunting regulations existed. When EOs opened hunting, bag limits were 5 caribou per day for resident hunters and 5 caribou per year for nonresident hunters. The following emergency orders, in chronological order, were issued to regulate harvest of WAH caribou:

1. EO 05-01-00 opened caribou hunting in the eastern portion of Unit 22E from July 22, 2000 to August 31, 2000. The area opened was that portion of Unit 22E northeast of Shishmaref, Cape Lowenstern, the northeast bank of Serpentine River and the northeast bank of Hot Springs Creek. The purpose of this action was to provide opportunity to harvest bull caribou that had moved into this area.

2. EO 05–04–00 opened caribou hunting in the southeastern portion of Unit 22E during 1 September 2000–30 June 2001 (see EO for description of area). This area was opened to caribou hunting after discussion with hunters and reindeer herders from Shishmaref. The area was identified to maximize hunting opportunity for caribou while minimizing the likelihood of inadvertent and illegal harvest of reindeer.

3. 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. The purpose of this order was to provide opportunity to hunt approximately 2000 caribou that had moved into the Pilgrim drainage in early October.

4. EO 05–04–01 opened caribou hunting in the northeast portion of Unit 22E during 4 July 2001–30 June 2002. The purpose of this action was to provide opportunity to hunt caribou that had been observed in this area during mid June 2001.

5. EO 05–08–01 opened caribou hunting in that portion of Unit 22D east of the Taylor Highway (Nome-Kougarok Road) and south of the Kuzitrin Bridge, the Kougarok River drainage, and a 1-mile-wide corridor along the west side of the Taylor Highway during 31 October 2001–30 June 2002. This order was issued to provide opportunity to hunt caribou that were migrating into the area.

6. EO 05–09–01 opened caribou hunting in that portion of Unit 22C east of the east bank of the Solomon River during 21 November 2001–30 June 2002. This order was issued to allow hunting of caribou that had moved into the eastern portion of Unit 22C.

Human-Induced Harvest. Hunters (recreational and subsistence hunters combined) reported harvesting roughly 15,700 WAH caribou during the 2000–2001 regulatory year, and 15,200 during 2001–2002. Assuming hunters took 15,000-17,000 caribou annually since 1999, this constituted roughly 3.5–4.0% of the 1999 population of 430,000 caribou.

These harvest estimates do not include caribou killed but not retrieved. Each year some harvested caribou are left in the field when discovered to be diseased or infested by parasites. Although often justifiable, carcasses are occasionally abandoned unnecessarily when common, harmless parasites are discovered in the meat or internal organs. ADF&G produced and distributed a field booklet of common wildlife diseases to try to reduce this source of caribou mortality through education (Elkin and Zarnke 2001). Additionally, some ADF&G staff prepared public service announcements and provided radio interviews regarding wildlife disease. More seriously, public reports and opportunistic observations of caribou carcasses suggest many WAH caribou are killed each winter and spring and abandoned merely because they are skinny. Additionally, wounding losses from inappropriate hunting techniques also result in caribou killed but not retrieved. The magnitude of these losses is unknown and virtually impossible to quantify.

Permit Hunts. All caribou hunting by residents that live north of the Yukon River and within the range of the WAH is by registration permit. Registration permits are available at license vendors and ADF&G offices in northwestern, western, and Interior Alaska. The permits are free and there is no limit to the number of permits issued each year. ADF&G sends a letter to each person that registered to hunt and asks how many caribou they shot the preceding year. Comparisons of registration permit harvest data and community harvest assessments indicate only about 10% of the actual harvest is reported through the registration permit system (Georgette 1994). The exception to this is the community of Nome where compliance with reporting requirements is believed to be much better (K. Persons, pers. commun.).

Nonresidents and residents that live outside the range of the WAH must carry a statewide caribou harvest ticket when hunting. Fish and Wildlife Protection officers indicate most nonlocal hunters possess a statewide caribou harvest ticket when hunting caribou (C. Bedingfield, J. Rodgers and D. Hildebrand, pers. commun.). We think this system is reasonably accurate for monitoring caribou harvested by nonlocal hunters.

Hunter Residency and Success. Beginning in the 1998–1999 regulatory year the statewide caribou harvest report system was resumed as for other big game, e.g. moose. During the 2000–2001 regulatory year, nonlocal hunters reported harvesting 523 caribou and in 2001–2002 they took 785 caribou (Table 8).

Statewide harvest ticket data confirm what we have suspected for many years: despite very long seasons in 5 game management units, nonlocal hunting of WAH caribou is concentrated in Unit 23 during late August through September. Since the 1998–1999 regulatory year an average 73% (n=4; SD=2) of all nonlocal WAH hunters pursued caribou in Unit 23. Similarly, an average 91% of nonlocal hunting effort occurred during late August-September (n=4; SD=2). This

space/time concentration of nonlocal caribou hunting has contributed to widespread and occasionally intense conflicts between local and nonlocal hunters throughout Unit 23. Similar conflicts have been reported in the vicinity of Anaktuvuk Pass.

Community-based harvest assessments have been conducted in selected villages within the range of the WAH since 1985 (Table 9). Generally, hunters residing within the range of the WAH harvested roughly 15,000 caribou annually since at least the mid 1990s. Annual estimates of local harvest (Tables 10 and 11; see also Dau 2001 for the 1999–2000 estimate of local harvest) probably underestimate annual variability in harvest levels. The artificial consistency of these annual harvest estimates occurs because few new community assessments are conducted each year. Therefore, per capita community harvest estimates based on historical data change little over short time spans (or not at all for communities with no new data). Until community harvest assessments are conducted more frequently and in a higher proportion of communities within the range of the WAH, or drastic changes occur in human population size or availability of this caribou herd, there is little benefit in using this approach to estimate local harvest levels more frequently than every 5-6 years. Factors that may make community based estimates of local caribou harvest conservative have been previously reported (Dau 2001).

The statistical model estimates of harvest for communities within Units 22, 23 and 26A were 14,468 (95% confidence interval 12,210-16,833) in 2000–2001, and 14,325 (95% c.i. 12,039-16,737) in 2001–2002. These estimates agree closely with per capita estimates (Tables 10 and 11). This modeling exercise suggested harvests were similar among communities within a GMU but differed among GMUs.

Harvest Chronology. Subsistence harvest patterns are tied to seasonal movements of caribou and ease of travel in the country. 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 and accessible.

During early fall, subsistence hunters select 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 WAH caribou using snow machines during late October–early 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 to

float rivers. Guides now rely heavily on 4-wheelers for hunting. This practice dramatically increased during the mid 1990s in Unit 23 and most guides now cache 4-wheelers at remote camps.

In Unit 23 some village residents transport nonlocal moose and caribou hunters via boats. This has proven divisive in some villages where transporters have exceeded numbers of clients acceptable to their community, where nonlocal clients have competed for choice hunting areas or inadvertently trespassed on private land (e.g. Native allotments or corporation lands) and when loud jet boats have been used for transport.

Other Mortality

Disease. Serology results show no temporal trends in exposure to 8 selected bacteria and viruses in the WAH for samples collected during 1992–2000 (Table 12). 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). Beginning with samples collected during 2001 WAH serum samples will initially be analyzed only for brucellosis and haptoglobin levels. Follow-up diagnostic serological tests may be conducted for individual caribou that exhibited an elevated haptoglobin level. Our primary objective for collecting caribou sera is to provide a 'red flag' indicator of disease in this herd annually. During this reporting period we analyzed our backlog of WAH caribou sera collected in 1992–1997 for haptoglobin levels. Haptoglobin results for samples collected during September 2001 and 2002 were not available when this report was prepared.

During 1992–2000, for caribou that had both a body condition score and a haptoglobin level, few individuals were scored 'very skinny' (6 cows and 2 bulls) or 'very fat' (16 cows and 15 bulls). No caribou scored 'very fat' has ever had an elevated haptoglobin level. In contrast, 83% of all cows and 100% of all bulls scored 'very skinny' had an elevated haptoglobin level. There were little differences in the percentages of bulls or cows among the condition categories 'skinny,' 'average' or 'fat.' This may be partly because our subjective assessment of body condition is insensitive for caribou that are only slightly above or below 'average.' Alternatively, there may be little actual difference in haptoglobin levels for caribou ranging from 'skinny' to 'fat.' Overall, about 10–11% of all caribou tested during 1992–2000 have had an elevated haptoglobin level (21 of 201 bulls and 28 of 263 cows). This does not indicate that 10–11% of the WAH is diseased. It indicates 10–11% of the herd has had some type of inflammation stemming from bacteria, viruses, parasites or physical trauma. During 1992–2000, 49% of all cows with a normal haptoglobin level were accompanied by a calf during September (n=270) while 45% of 31 cows with an elevated level had a calf. This difference is not biologically significant especially given the small number of cows observed with an elevated haptoglobin level. There has been no temporal trend in the percentage of caribou with an elevated haptoglobin level during this time (Table 12).

Levels of exposure to brucellosis have been low since 1996 (Table 12). The primary impact of this disease on caribou populations is reduced reproductive success (Dieterich 1981). During September 1992–2002 a higher percentage of cows with no evidence of exposure to brucellosis (49%, n=411 cows) were accompanied by a calf than those with antibodies against this disease (31%, n=26 cows). Although these percentages differ substantially, the low number of cows

exposed to this disease in recent years renders this difference biologically insignificant. Brucellosis is probably not affecting the population dynamics of the WAH at this time.

Environmental contaminants. Residents of Unit 23 have been concerned about contamination of subsistence foods since the Atomic Energy Commission conducted the Project Chariot/Plowshare Program in the 1950s and 1960s. Production of heavy metals at the Red Dog Mine beginning in the late 1980s renewed these concerns.

No WAH caribou collected since 1994 have revealed patterns or levels of heavy metals or radionuclides considered harmful to caribou or to people who eat them (Alaska Department of Public Health, unpub. rep.; O'Hara et al. 1999; O'Hara et al. unpub. ms.; Exponent, unpub. rep.; Woshner et al., unpub. ms.). Unfortunately, results of metal analyses for the bull collected near the tailings impoundment on 5 August 2002 are reported in terms of dry weight and are not comparable to results of all other collections reported in terms of wet weight.

Although metals levels in mosses and soil were clearly elevated along the Red Dog Road during summer 2000 (see 'Habitat' section below), caribou apparently did not assimilate adequate amounts of these elements to increase their tissue levels above those found in other Alaskan (O'Hara et al. unpub. ms.) and Canadian (Larter and Nagy 1999) caribou herds. This is probably because individual WAH caribou spend relatively little time near the Red Dog development complex. Any attempt to isolate the effects of the Mine on metals levels in caribou tissues would likely be confounded by naturally-occurring mineralization of the western De Long Mountains.

HABITAT

Assessment

ADF&G did not monitor range condition for the WAH during this reporting period.

During the summer of 2000 the National Park Service evaluated heavy metal levels in mosses and soils along the Red Dog Road (Ford and Hasselbach 2001). Although their results showed high concentrations of lead (Pb), zinc (Zn) and cadmium (Cd) near the road and indicated ore concentrate from the Mine was the source of these metals, subsequent discussions revealed the methods used near Red Dog were not comparable to other studies (L. Hartig, pers. commun.). Even so, Tek Cominco has since taken steps, e.g. complete coverage of transport truck payloads, to reduce or eliminate escapement of ore dust from transport vehicles.

Enhancement

There were no WAH habitat enhancement activities during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

WAH Cooperative Management

The Western Arctic Caribou Herd Working Group (Working Group) was organized in 1997. The purpose of the Working Group is to ensure the conservation of the Western Arctic Caribou herd, safeguard the interests of all users of the herd, and integrate indigenous knowledge with Western science. The Working Group consists of 20 voting chairs representing multiple stakeholders. It is

a non-regulatory body, emphasizes shared decision-making and is supported by four resource management agencies including the Alaska Department of Fish and Game.

During this reporting period the Working Group held 2 meetings a year and produced a newsletter, *Western Arctic Caribou Trails*, which was mailed biannually to almost 9,000 box holders within the range of the WAH.

In March 2003, the Working Group approved the *Western Arctic Caribou Herd Cooperative Management Plan*, a collaborative effort that supercedes the 1984 *Western Arctic Caribou Herd strategic management plan*. The new plan consists of seven plan elements: Cooperation; Population Management; Habitat; Regulations; Reindeer; Knowledge; and Education. Each of these plan elements consists of a goal, strategies and identified management actions. The Population Management element employs a population tracking strategy that intensifies biological surveillance and reduces allowable harvest as the herd declines. Implementation of the plan is facilitated through the four cooperating management agencies that meet annually and make subsequent recommendations to the Working Group.

A distinguishing characteristic of this new management plan is that it was written collaboratively by the Working Group. The plan thus represents agreement among those who use, manage and value the herd on how the herd should be managed. The approved plan also provides general guidelines for how the Western Arctic Herd should be managed in the future.

School programs

As in the past, ADF&G staff made presentations on WAH caribou in schools throughout the range of this herd. In 2000, 7th and 8th grade students from Anaktuvuk Pass participated in the Onion Portage (Kobuk River) collaring project. In 2001, high school students from Point Hope and Ambler participated in this project, and in 2002 high school students from Noorvik assisted. Students participating in the collaring project typically learn about the natural history of this herd, practical aspects of managing caribou, wildlife telemetry techniques and careers in natural resource management. Additionally, they learn camping skills from their teachers and chaperones and, when we necropsy a caribou, students are exposed to elementary anatomy, physiology and parasitology. Student involvement in the caribou collaring project has been a positive experience for the students, school district staff and agency staff since its inception in 1991.

Conflicts between the WAH and reindeer industry

Recent losses of reindeer to the WAH have been previously reported (Dau 2001). During this reporting period the Seward Peninsula reindeer industry continued to lose deer as they joined the WAH. During the winters of 2001–2002 and 2002–2003 substantial numbers of reindeer were lost from the Davis herd (Nome) when they joined the WAH. Only the Davis, Kakaruk (Teller) and Ongtowasruk (Wales) herds are still commercially viable as of spring 2003. ADF&G posted a web page showing real-time locations of satellite-collared WAH caribou on the Seward Peninsula in response to requests from reindeer herders for this information.

Satellite collar locations on the internet

ADF&G staff and the WAH Working Group discussed putting satellite collar locations for the entire WAH range on a web page. Residents of Units 23 and 26A fear this will concentrate highly mobile nonlocal hunters who access hunting areas using airplanes in areas where collars are located, and that such a web site will ultimately attract more nonlocal hunters into areas where conflicts and crowding already occur. Although the educational benefits of posting WAH satellite collar locations on the internet are appreciated by everyone involved in this discussion, the consensus is that we will only publish caribou location information for the Seward Peninsula to minimize the impact of caribou on the reindeer industry.

User issues

Conflicts between nonlocal hunters, commercial operators (guides and transporters) and local hunters continued in portions of WAH range during this reporting period. These conflicts were most pronounced in Unit 23 but also occurred near Anaktuvuk Pass. This complex issue involves all hunters, not just caribou hunters, and is affected by: 1) use 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 WAH caribou. Rather, the limiting factor is inadequate space to accommodate all users. The Unit 23 Users Issues process initiated by ADF&G during 1999 was discontinued in 2001 because of inadequate staffing. In 2003 the Kotzebue office of the NPS began their own process to regulate commercial activities in National Parks, Preserves and Monuments to address user issues.

CONCLUSIONS AND RECOMMENDATIONS

The WAH is still very large. However, converging trends in adult cow mortality and recruitment, a stable or possibly declining population, isolated starvation events and occasional years of generally poor pre-rut (September) body condition suggest this herd will probably decline in the foreseeable future. There is no evidence that any single factor, e.g. human harvests, predation, environmental contaminants or disease is currently limiting the size of this herd.

Our current level of investment in harvest assessment is probably adequate as long as the WAH is large and relatively stable. Once the herd begins to substantially decline, however, ADF&G, nonprofit Native organizations, boroughs and federal agencies should conduct community harvest assessments in a greater proportion of communities within the range of this herd each year, and repeat assessments in individual communities more frequently than current levels. ADF&G should continue to monitor harvest of WAH caribou by nonlocal hunters through the statewide caribou harvest ticket system. In contrast, ADF&G should consider eliminating the registration permit system except in areas where it appears to provide useful information, e.g. Nome. Until communities are assessed more frequently than current levels or caribou availability substantially changes through population size or distribution, range-wide estimates of local harvests need only be conducted once every 4–5 years. Modeling local caribou harvests appears comparable with the more laborious per capita estimation approach. In the future, it is probably unnecessary to estimate this component of harvest through the per capita technique.

Seward Peninsula reindeer continued to be lost to the WAH during this reporting period. ADF&G should continue to provide information regarding caribou movements and distribution to herders within the constraints of staff, weather, aircraft and budgets. In response to requests from reindeer herders, ADF&G will attempt to deploy 3 conventional collars and 2 satellite collars on WAH caribou on the Seward Peninsula during August 2003 to determine whether a stable subpopulation of caribou has become established in this area.

Conflicts between local subsistence hunters, nonlocal sport hunters, and commercial operators have intensified in portions of WAH range since 1992. The primary limiting factor driving these conflicts is inadequate space to accommodate all users. ADF&G should hire a planner position for Region V in part to address these issues.

ADF&G should also continue to support the WAH Working Group and help identify management issues to focus on now that the Cooperative Management Plan has been finalized.

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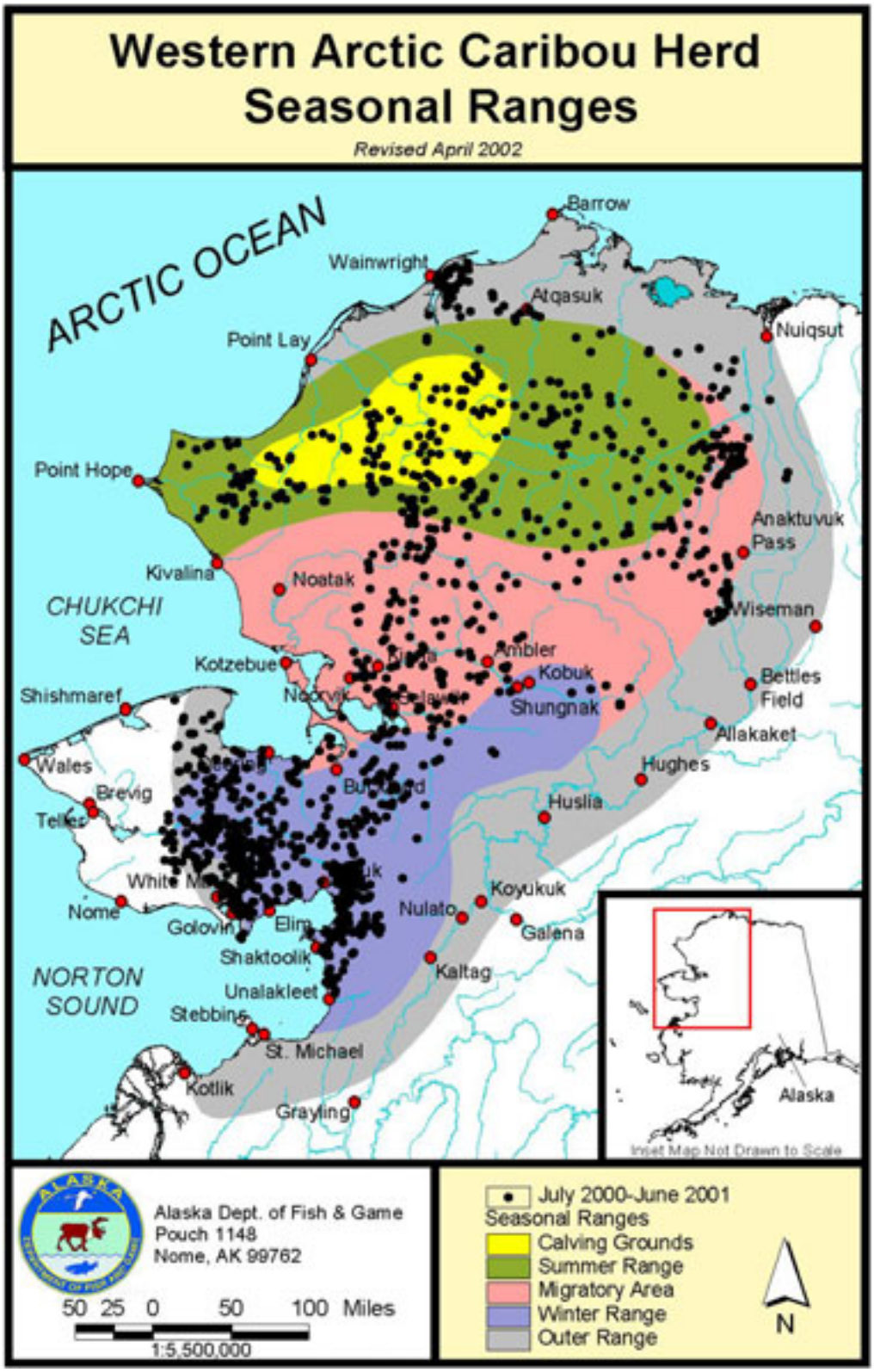


Figure 1 Seasonal ranges of the Western Arctic Caribou Herd with locations of satellite-collared caribou collected during regulatory year 2000–2001

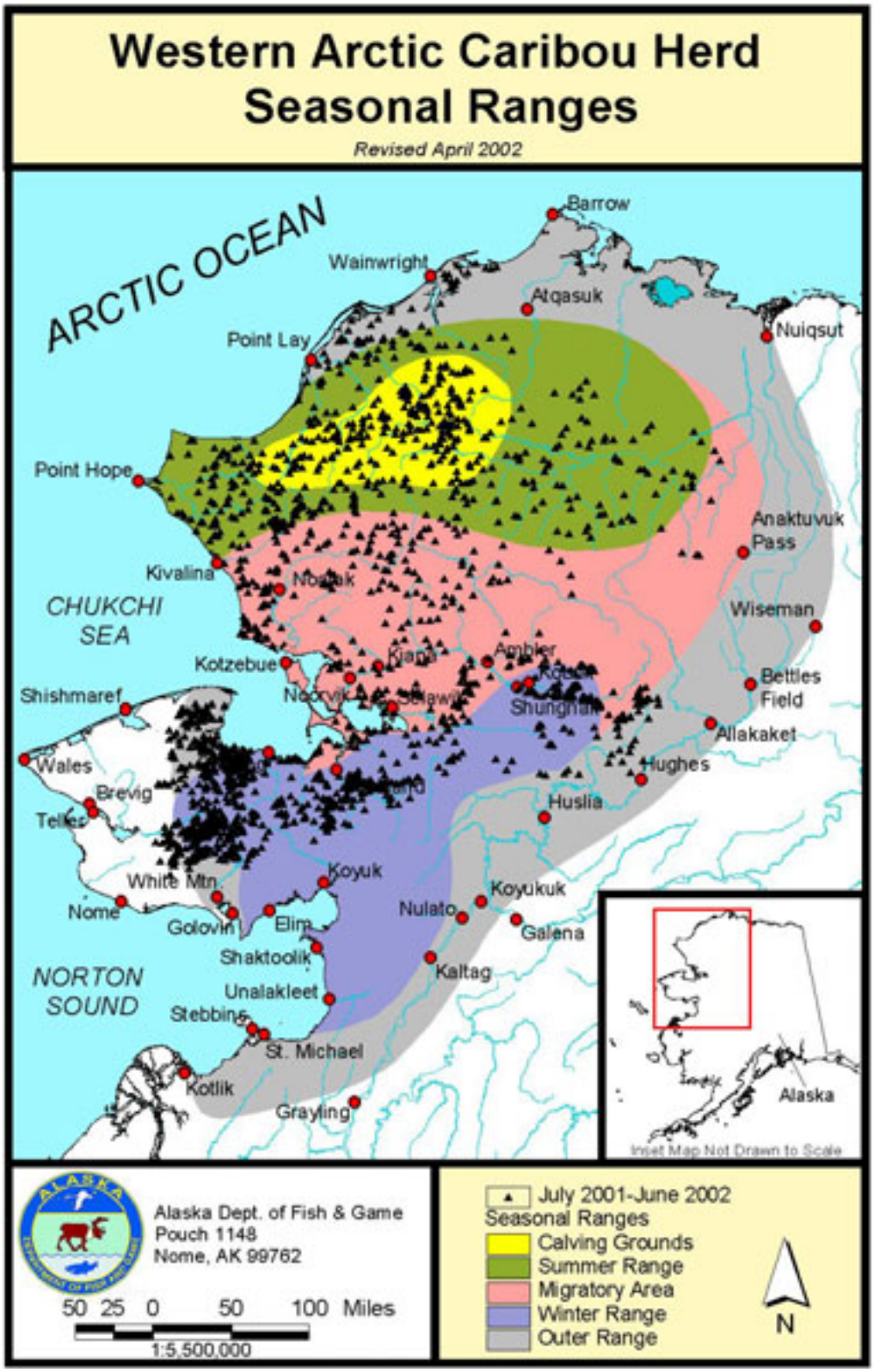


Figure 2 Seasonal ranges of the Western Arctic Caribou Herd with locations of satellite-collared caribou collected during regulatory year 2001–2002

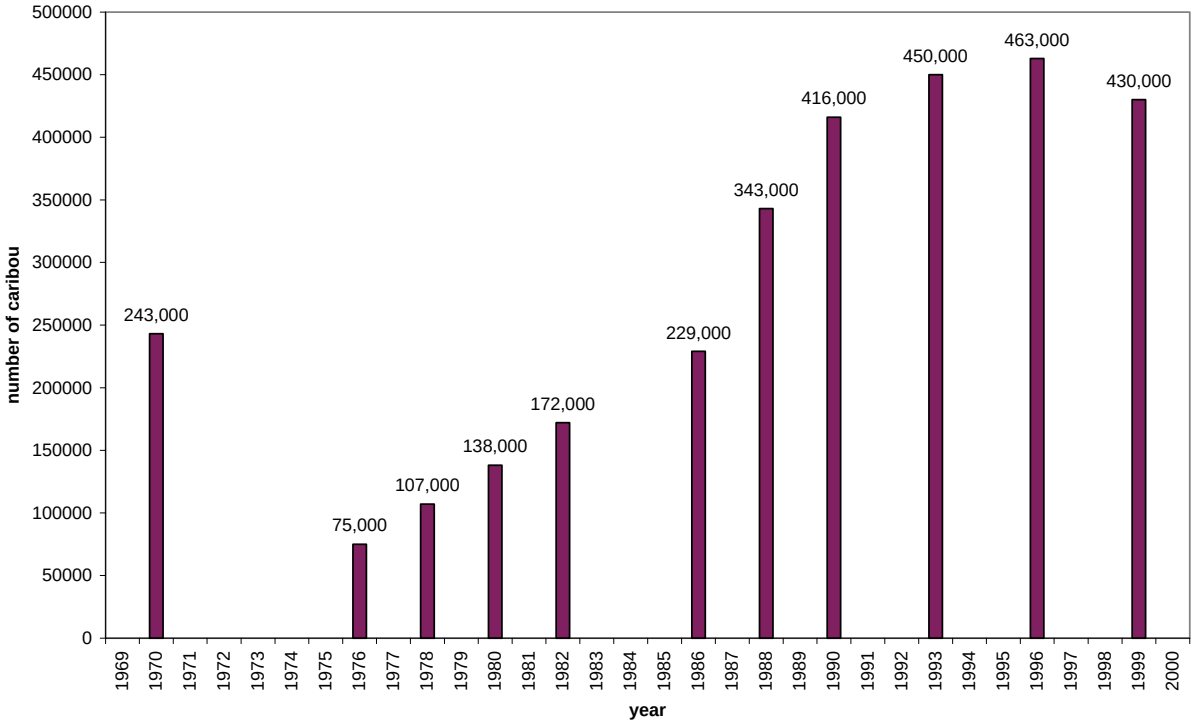


Figure 3 Photocensus estimates of the Western Arctic Caribou Herd, 1970-1999

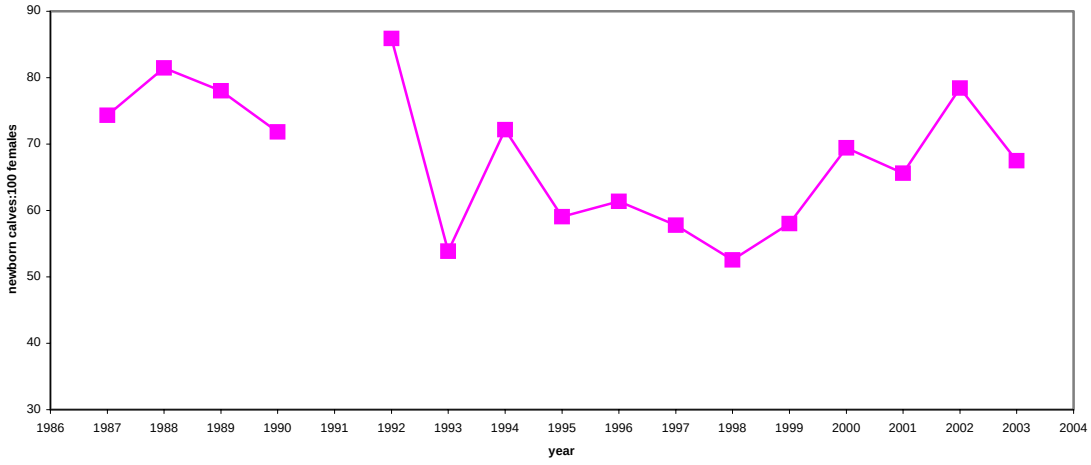


Figure 4 Western Arctic Caribou Herd calving survey results, 1987-2003

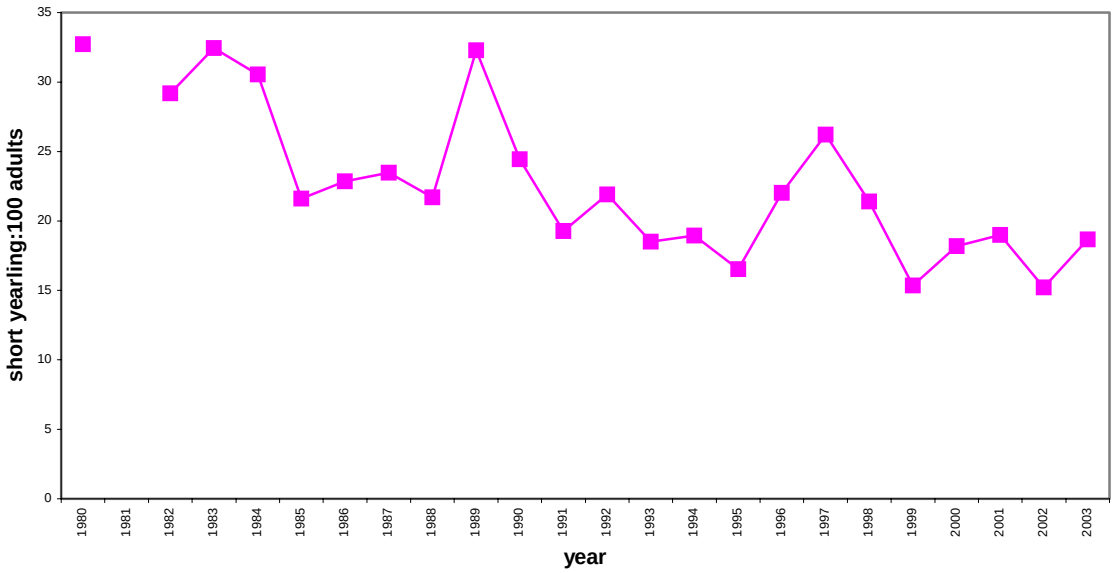
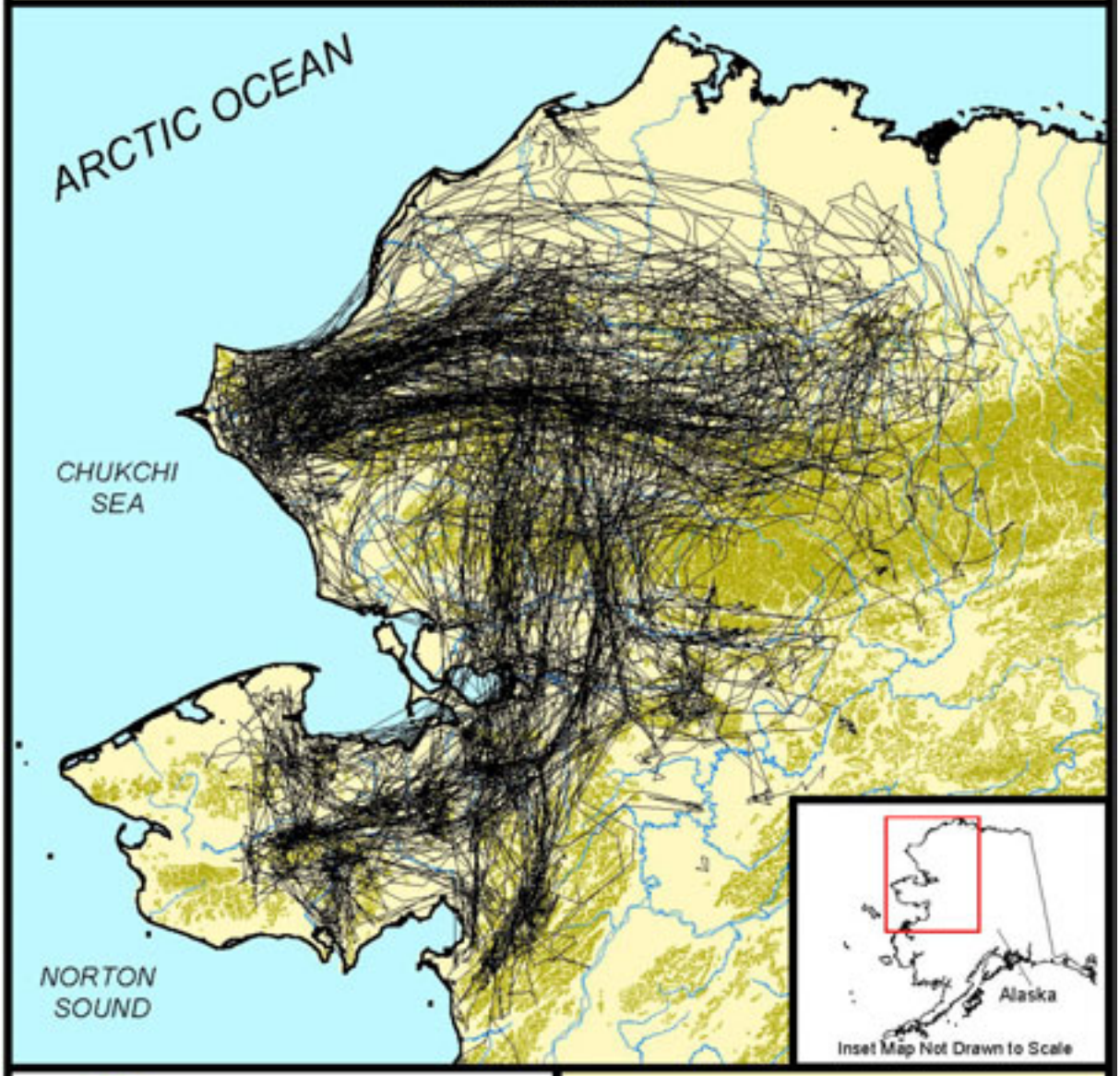


Figure 5 Annual estimates of calf recruitment for the Western Arctic Caribou Herd, 1980-2003

Western Arctic Caribou Herd
Satellite Collar History 1988-2002

Revised December 2002



Alaska Dept. of Fish & Game
Pouch 1148
Nome, AK 99762

40 20 0 40 80 Miles

Scale 1:8,000,000

Satellite Collar Deployments

Jan 1988 - Oct 2002
Total Collars = 67
Total Locations = 9637
Source file: 8702thn2.dbf

N

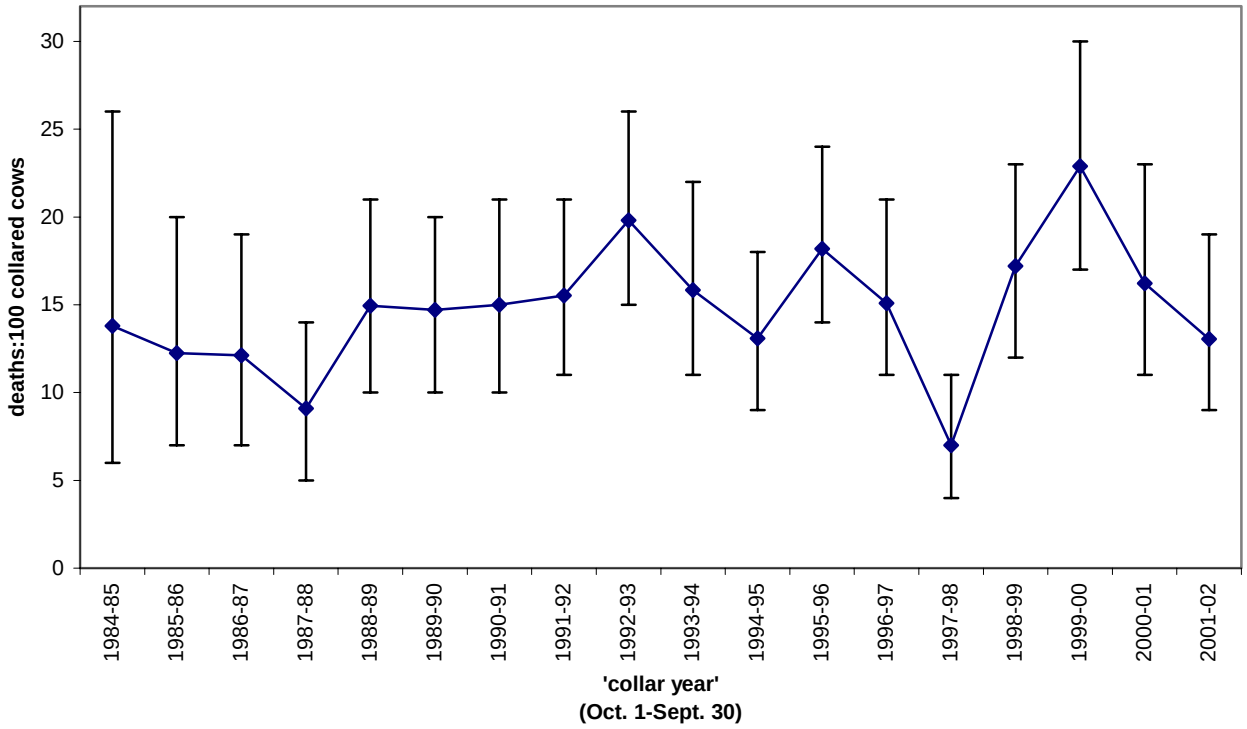


Figure 7 Annual estimates of adult cow mortality for the Western Arctic Caribou Herd, 1984-85 through 2001-2002 (brackets represent 80% binomial confidence intervals)

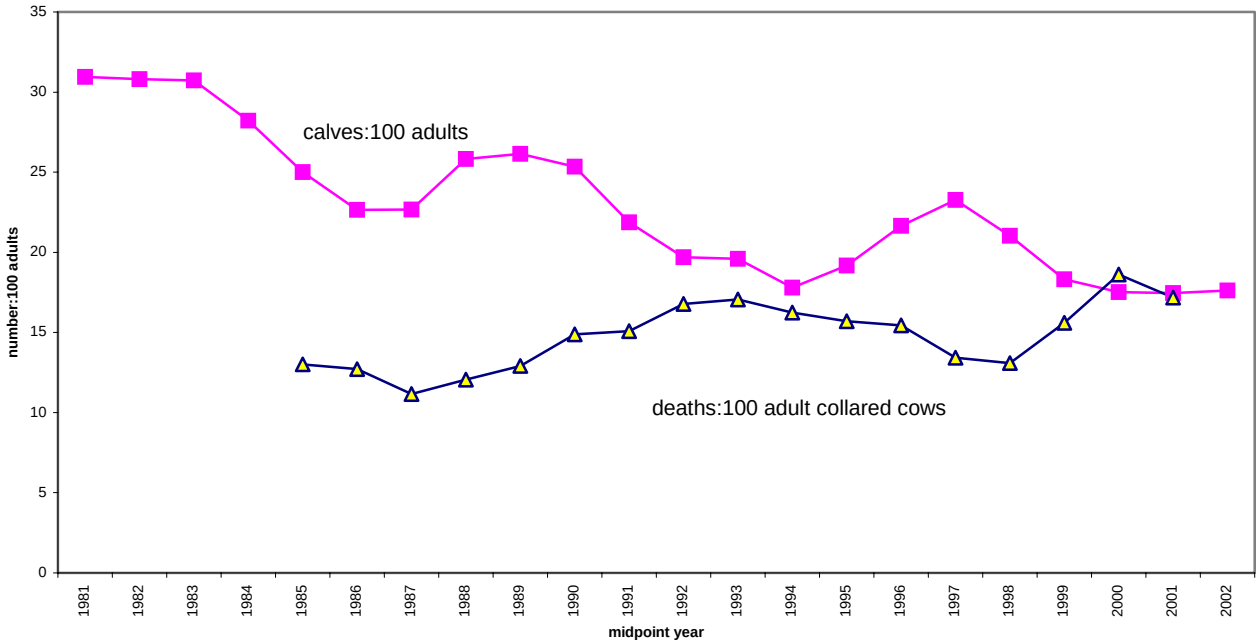


Figure 8 Three-year moving averages of Western Arctic Caribou Herd calf recruitment and adult cow mortality (Note: these indices of recruitment and adult mortality show trends but are not directly comparable)

Table 1 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	242,000		
1971		-18	200,000
1972		-18	164,000
1973		-18	135,000
1974		-18	111,000
1975		-18	91,000
1976	75,000		
1977		19	89,000
1978	107,000		
1979		14	121,000
1980	138,000		
1981		12	154,000
1982	172,000		
1983		7	185,000
1984		7	198,000
1985		7	213,000
1986	229,000		
1987		22	280,000
1988	343,000		
1989		10	378,000
1990	416,000		
1991		3	427,000
1992		3	438,000
1993	450,000		
1994		1	454,000
1995		1	459,000
1996	463,000		
1997		-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 2 Aerial calving surveys from observations of radiocollared cows in the Western Arctic Caribou Herd, 1987–2003

Year	median June survey date	With calf	No calf ≥1 hard antler	No calf soft antler	No calf no antler	Total	Maternal	Non-maternal	Calves: 100 cows
1987	16	29	0	1	9	39	29	10	74
1988	5	27	17	1	9	54	44	10	81
1989	12	34	5	2	9	50	39	11	78
1990	11	51	0	5	15	71	51	20	72
1991									
1992	12	55	6	0	10	71	61	10	86
1993	14	39	3	17	21	80	42	39	52
1994	11	42	15	2	21	80	57	23	71
1995	11	47	2	13	21	83	49	34	59
1996	6	38	16	13	21	88	54	34	61
1997	5	39	13	16	22	90	52	38	58
1998	13	36	5	16	21	78	41	37	53
1999	12	47	0	11	23	81	47	34	58
2000	13	39	11	5	17	72	50	22	69
2001	16	8	34	9	13	64	42	22	66
2002	2	13	38	8	6	65	51	14	78
2003	6	16	38	7	19	80	54	26	68

Table 3 Fall population composition of the Western Arctic Caribou Herd, 1961–2001

Year	Bulls	Cows	Calves	Total	Calves: 100 cows	Calves: 100 adults	Bulls: 100 cows
1961	276	501	187	964	37	24	55
1970	1748	2732	1198	5678	44	27	64
1975	720	2330	1116	4166	48	37	31
1976	273	431	222	926	52	32	63
1980	715	1354	711	2780	53	34	53
1982	1896	3285	1923	7104	59	37	58
1992	1600	2498	1299	5397	52	32	64
1993	859	2321	859	4039	37	25	37
1994	1354	3284	1118	5756	34	24	41
1995	1176	2029	1057	4262	52	33	58
1996	2621	5119	2525	10265	49	33	51
1997	2588	5229	2255	10072	43	29	49
1998	2298	4231	1909	8438	45	29	54
1999	2059	4191	1960	8210	47	31	49
2001	1117	2943	1095	5355	37	27	38

Table 4 Short yearling[a] survey results of the Western Arctic Caribou Herd, 1980–2003

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	18
2001	6814	1294	8108	32	33	19	17
2002	8268	1258	9526	38	42	15	18
2003	8748	1633	10381	43	50	19	

[a] Short yearlings are 10–11-month-old caribou.
[b] Calculates average using values from 1980-1982.

Table 5 Geographic distribution of radio collared Western Arctic Herd caribou during winter (November-March); numbers represent percentage of radio collared caribou located in each area (Note: 9 areas[a] comprise the total range of WAH, not just winter range shown in Figures 1 and 2)

Area[a]	1983 - 1984	1984 - 1985	1985 - 1986	1986 - 1987	1987 - 1988	1988 - 1989	1989 - 1990	1990 - 1991	1991 - 1992	1992 - 1993	1993 - 1994	1994 - 1995	1995 - 1996	1996 - 1997	1997 - 1998	1998 - 1999	1999 - 2000	2000 - 2001	2001 - 2002	2002 - 2003
1	14	13	6	12	0	0	0	5	5	9	0	1	10	4	6	9	0	5	0	5
2	0	16	6	0	0	0	0	0	0	0	0	1	0	0	0	0	9	0	0	0
3	7	13	0	0	0	0	11	0	0	2	4	0	5	0	5	1	1	4	0	4
4	24	32	12	38	49	28	20	2	53	6	1	26	33	12	6	11	42	12	22	21
5	14	11	18	0	8	1	9	0	9	6	8	3	26	4	25	31	5	5	9	13
6	0	0	0	0	0	1	1	0	6	19	4	1	2	1	0	2	12	0	2	8
7	2	0	0	0	1	5	2	3	4	4	7	6	9	59	29	24	17	43	30	42
8	17	5	53	38	39	64	56	89	21	54	75	55	16	20	30	20	5	29	5	0
9	21	11	6	12	3	1	2	0	2	0	0	8	1	0	0	1	9	2	26	7
n_i[b]	14	19	17	34	38	76	57	75	60	70	90	77	63	79	87	67	72	62	56	67

[a] Areas: 1 North Slope coastal plain west of Colville drainage; 16, 378 mi^2

2 Foothills of Brooks Range west of Utukok River; 8,817 mi^2

3 Foothills of Brooks Range east of Utukok River and west of Dalton Highway; 24,082 mi^2

4 Kobuk drainage below Selby River; Squirrel drainage below North Fork; Selawik drainage; Buckland drainage; 18,928 mi^2

5 Kobuk drainage above Selby R; central Brooks Range north of Koyukuk R & west of Dalton Hwy; Noatak drainage above Douglas Crk; 12,436 mi^2

6 Koyukuk drainage south of Brook Range mountains including Kanuti Flats, Galena Flats; 13,089 mi^2

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

8 Nulato Hills; 14,418 mi^2

9 Noatak drainage below Douglas Creek; Squirrel drainage above North Fork; Wulik and Kivalina drainages; Lisburne Hills; 16,541 mi^2

[b] Number of radio collared caribou; excludes the year in which a caribou was initially collared; when a collared caribou wintered in >1 winter range we assumed time was spent equally among ranges and included appropriate fractions of use

Table 6 Caribou density (number/mi^2) in 9 geographic areas of Western Arctic Caribou Range during winter (1 Nov.-31 March)

Area[a]	1983-1984	1984-1985	1985-1986	1986-1987	1987-1988	1988-1989	1989-1990	1990-1991	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999
1	1.73	1.71	0.82	2.01	0.00	0.00	0.00	1.39	1.34	2.55	0.00	0.18	2.69	1.05	1.55	2.35
2	0.00	3.81	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00
3	0.59	1.16	0.00	0.00	0.00	0.00	1.82	0.00	0.00	0.40	0.73	0.00	0.92	0.00	0.84	0.27
4	2.49	3.55	1.42	5.66	8.82	5.65	4.43	0.55	12.34	1.53	0.27	6.30	7.96	2.87	1.29	2.54
5	2.27	1.80	3.25	0.00	2.18	0.40	2.93	0.00	3.23	2.07	3.04	0.96	9.75	1.38	8.97	10.58
6	0.00	0.00	0.00	0.00	0.00	0.19	0.28	0.00	1.95	6.38	1.54	0.46	0.56	0.44	0.00	0.74
7	0.30	0.00	0.00	0.00	0.29	1.13	0.47	0.86	1.18	1.25	2.12	1.93	2.62	17.24	8.32	6.65
8	2.30	0.78	8.41	7.43	9.39	16.90	16.20	26.39	6.33	16.72	23.62	17.36	5.10	6.35	9.08	6.01
9	2.57	1.36	0.81	1.99	0.55	0.15	0.44	0.00	0.44	0.00	0.00	2.16	0.22	0.00	0.00	0.39
N[b]	*198*	*213*	229	*280*	343	*378*	416	*426*	*438*	450	*454*	*459*	463	*452*	*441*	430

[a] Areas: 1 North Slope coastal plain west of Colville drainage; 16, 378 mi^2

2 Foothills of Brooks Range west of Utukok River; 8,817 m

3 Foothills of Brooks Range east of Utukok River and west of Dalton Highway; 24,082 mi^2

4 Kobuk drainage below Selby River; Squirrel drainage below North Fork; Selawik drainage; Buckland drainage; 18,928 mi^2

5 Kobuk drainage above Selby R; central Brooks Range north of Koyukuk R & west of Dalton Hwy; Noatak drainage above Douglas Crk; 12,436 mi^2

6 Koyukuk drainage south of Brook Range mountains including Kanuti Flats, Galena Flats; 13,089 mi^2

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

8 Nulato Hills; 14,418 mi^2

9 Noatak drainage below Douglas Creek; Squirrel drainage above North Fork; Wulik and Kivalina drainages; Lisburne Hills; 16,541 mi^2

[b] Western Arctic Herd population size in thousands; numbers in italics represent estimates based on population growth rates, other numbers are census estimates

Table 7 Annual mortality rate and binomial confidence intervals for Western Arctic Caribou Herd cows collared with conventional or lightweight satellite radio collars[a], 1984–1985 through 2001-2002 'collar years' (1 Oct–30 Sep)

				Binomial confidence level		
Collar year	Sample size	No. died	Mortality rate[b] (%)	80%	90%	95%
1984–1985	29	4	14	6–26	5–29	4–32
1985–1986	49	6	12	7-20	5-23	5-25
1986–1987	66	8	12	7–19	6–21	5–22
1987–1988	88	8	9	5–14	5–16	4–17
1988–1989	87	13	15	10–21	9–23	8–24
1989–1990	102	15	15	10–20	9–22	8–23
1990–1991	100	15	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	110	20	18	13–24	12-25	11–27
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	84	19	23	17-30	15-31	14-33
2000-2001	75	12	16	11-23	10-25	9-26
2001-2002	87	13	15	10-21	9-23	8-24

[a] Sample size = total number of potentially active conventional or ST-10 satellite radiocollars active on adult cows at the beginning of the collar year

[b] Mortality rate = Number caribou died/Sample size

Table 8 Number of hunters residing outside the range of the Western Arctic Caribou herd and number of caribou they harvested by year and Game Management Unit

	1998-1999		1999-2000		2000-2001		2001-2002	
	Hunters	Caribou taken	Hunters	Caribou taken	Hunters	Caribou taken	Hunters	Caribou taken
Unit 21	8	2	3	2	5	0	2	0
Unit 22	28	23	36	32	43	51	82	70
Unit 23	446	565	440	415	445	406	431	630
Unit 24	70	25	59	12	59	11	44	17
Unit 26A	53	56	54	53	63	55	56	68
Total	605	665	592	514	615	523	615	785

Table 9 Summary of community-based harvest assessments (conducted by ADF&G unless otherwise noted) for communities within the range of the Western Arctic Caribou Herd, 1985–2002; human population numbers in parentheses estimated during household interviews rather than by Department of Commerce and Economic Development

Unit	Community	Survey year	Human population[a]	Number of caribou harvested	Reference
21					
	Galena	1996	548	40	ADF&G[b]
	Galena	1997	536	39	ADF&G[b]
	Galena	1998	481	7	ADF&G[b]
	Galena	1999	592	8	ADF&G[b]
	Galena	2001	675	0	ADF&G[b]
	Kaltag	1996	227	16	ADF&G[b]
	Kaltag	1997	247	8	ADF&G[b]
	Kaltag	1998	227	6	ADF&G[b]
	Kaltag	1999	251	0	ADF&G[b]
	Kaltag	2001	227	0	ADF&G[b]
	Nulato	1996	328	13	ADF&G[b]
	Nulato	1997	311	3	ADF&G[b]
	Nulato	1998	282	5	ADF&G[b]
	Nulato	1999	347	0	ADF&G[b]
	Nulato	2001	341	0	ADF&G[b]
	Ruby	1999	179	1	ADF&G[b]
	Ruby	2001	192	0	ADF&G[b]
22					
	Brevig Mission	2000	276	74	ADF&G[b]
	Golovin	1989	169	40	ADF&G[b]
	Golovin	2001	146	94	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]
	Shishmaref	2000	562	286	ADF&G[b]
	Wales	1993	152	4	ADF&G[b]
	Wales	2000	152	0	ADF&G[b]
	Elim	1999	306	227	ADF&G[b]

Unit	Community	Survey year	Human population[a]	Number of caribou harvested	Reference
	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]
	Shungnak	2002	249		ADF&G[b]
	Kiana	1999	398	488	ADF&G[b]
	Point Hope	1992	699	225	Fuller and George 1997
	Selawik	1999	767	1289	ADF&G[b]
	Noorvik	2002	677		ADF&G[b]
24					
	Alatna	1997	25	21	ADF&G[b]
	Alatna	1998	25	11	ADF&G[b]
	Alatna	1999	34	0	ADF&G[b]
	Alatna	2001	33	0	ADF&G[b]
	Allakaket	1997	176	11	ADF&G[b]
	Allakaket	1998	191	43	ADF&G[b]
	Allakaket	1999	197	13	ADF&G[b]
	Allakaket	2001	97	9	ADF&G[b]
	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]

Unit	Community	Survey year	Human population[a]	Number of caribou harvested	Reference
	Huslia	1999	283	78	ADF&G[b]
	Huslia	2001	285	0	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
	Nuiqsut	2000-01	468	600	Pedersen 2001
	Point Lay	1987	(121)	157	Pedersen 1989
	Wainwright	1988	506	505	Braund et al 1993
	Wainwright	1989	468	711	Braund et al 1993
	Wainwright	1992	584	748	Fuller and George 1997

[a] Human population figures from Alaska Department of Commerce and Economic Development, Alaska Community Database (www.dced.state.ak.us/mra/CF_CUSTM.htm)
[b] Alaska Department of Fish and Game Community Profile Database

Table 10 Estimated harvest of Western Arctic Herd Caribou during the 2000-2001 regulatory year by residents living within the range of this herd

Unit	Community	Human population	Per capita caribou harvest	Total community harvest	% WAH in harvest	Estimated Nr. of WAH caribou harvested	Assessments used to estimate per capita harvest[a]
21	Galena	675	0.01	6	100	6	Galena 98, 99, 01
	Kaltag	230	0.00	0		0	Kaltag 99,01
	Koyukuk	101	0.01	1	100	1	Gal. 98, 99, 01; Kal. 01; Nulato 99, 01
	Ruby	188	0.00	0	100	0	Ruby 99, 01
	Grayling	194	0.00	0	100	0	Kaltag 99, 01
	Nulato	336	0.00	0		0	Nulato 99, 01
	Total Unit 21					7	
22	Brevig Mission	276	0.27	74	100	74	Brevig 00
	Elim	313	0.74	232	100	232	Elim 99
	Golovin	144	0.74	107	100	107	Elim 99
	Koyuk	297	0.95	282	100	282	Koyuk 98
	Nome	3,505	0.16	574	100	574	Registration Permit System
	Saint Michael	368	0.27	99	100	99	Brevig 00
	Shaktoolik	230	0.71	163	100	163	Shaktoolik 98
	Shishmaref	562	0.51	286	100	286	Shishmaref 00
	Stebbins	547	0.27	147	100	147	Brevig 00
	Teller	268	0.08	21	100	21	Teller 00
	Unalakleet	747	0.71	531	100	531	Shaktoolik 98
	Wales	152	0.00	0	100	0	Wales 00

Unit	Community	Human population	Per capita caribou harvest	Total community harvest	% WAH in harvest	Estimated Nr. of WAH caribou harvested	Assessments used to estimate per capita harvest[a]
	White Mountain	203	0.47	96	100	96	White Mt. 99
	Total Unit 22					2,612	
23	Ambler	309	1.94	601	100	601	Shungnak 98, 02
	Buckland	406	1.67	679	100	679	Noa. 94, 99; Shg. 98; Kia. 99; Sel. 99
	Deering	136	1.67	227	100	227	Noa. 94, 99; Shg. 98; Kia. 99; Sel. 99
	Kiana	388	1.23	476	100	476	Kiana 99
	Kivalina	377	1.02	385	100	385	Kivalina 92
	Kobuk	109	1.94	212	100	212	Shungnak 98, 02
	Kotzebue	3,082	1.37	4237	100	4237	Kotzebue 91
	Noatak	428	1.62	693	100	693	Noatak 94, 99
	Noorvik	634	1.38	875	100	875	Noorvik 02
	Point Hope	757	0.32	244	100	244	Pt. Hope 92
	Selawik	772	1.68	1297	100	1297	Selawik 99
	Shungnak	256	1.94	498	100	498	Shungnak 98
	Total Unit 23					10,424	
24	Alatna	35	0.00	0	100	0	Alatna 99, 01
	Allakaket	97	0.08	8	100	8	Allakaket 99, 01
	Anaktuvuk Pass	282	1.76	496	80	348	Anaktuvuk Pass 90–95
	Bettles	43	0.46	20	100	20	Bettles 99

Unit	Community	Human population	Per capita caribou harvest	Total community harvest	% WAH in harvest	Estimated Nr. of WAH caribou harvested	Assessments used to estimate per capita harvest[a]
	Evansville	28	0.10	3	100	3	Evansville 97-99
	Hughes	78	0.28	22	100	22	Husl. 97–01; Alat. 97–01; Allak. 97–01
	Wiseman	21	0.28	6	100	6	Bettles 97-99; Evans. 97-99
	Huslia	293	0.14	40	100	40	Huslia 99, 01
	Total Unit 24					447	
26A	Atqasuk	228	1.11	252	40	101	Atqasuk 94–95
	Barrow	4,581	0.51	2338	30	701	Barrow 88, 89, 92
	Nuiqsut	433	1.28	555	10	56	Nuiqsuit 00
	Point Lay	247	1.27	315	80	252	Pt. Lay 87; Ww 88–89, 92
	Wainwright	546	1.27	691	40	276	Wainwright 88–89, 92
	Total Unit 26A					1,386	
Total: All Units						14,876[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] 13,700–16,000 caribou (95% bootstrap confidence interval)

Table 11 Estimated harvest of Western Arctic Herd Caribou during the 2001-2002 regulatory year by residents living within the range of this herd

Unit	Community	Human population	Per capita caribou harvest	Total community harvest	% WAH in harvest	Estimated Nr. of WAH caribou harvested	Assessments used to estimate per capita harvest[a]
21	Galena	694	0.00	0	100	0	Galena 01
	Kaltag	227	0.00	0	100	0	Kaltag 01
	Koyukuk	101	0.00	0	100	0	Gal. 01; Kal. 01; Nul. 01
	Ruby	188	0.00	0	100	0	Ruby 99, 01
	Grayling	194	0.00	0	100	0	Kaltag 00, 01
	Nulato	347	0.00	0	100	0	Nulato 99
	Total Unit 21					0	
22	Brevig Mission	292	0.27	78	100	78	Brevig 00
	Elim	326	0.74	242	100	242	Elim 99
	Golovin	146	0.64	94	100	94	Golovin 01
	Koyuk	313	0.95	297	100	297	Koyuk 98
	Nome	3,499	0.16	574	100	574	Registration Permit System
	Saint Michael	379	0.08	30	100	30	Teller 00
	Shaktoolik	224	0.58	130	100	130	Shaktoolik. 99
	Shishmaref	576	0.51	293	100	293	Shishmaref 00
	Stebbins	567	0.08	44	100	44	Teller 00
	Teller	258	0.08	20	100	20	Teller 00
	Unalakleet	736	0.58	426	100	426	Shaktoolik 98
	Wales	152	0.00	0	100	0	Wales 00

Unit	Community	Human population	Per capita caribou harvest	Total community harvest	% WAH in harvest	Estimated Nr. of WAH caribou harvested	Assessments used to estimate per capita harvest[a]
	White Mountain	203	0.47	96	100	98	White Mt. 99
	Total Unit 22					2,326	
23	Ambler	302	1.60	483	100	483	Shungnak 02
	Buckland	426	1.67	712	100	712	Noa. 94, 99; Shg. 98; Kia. 99; Sel. 99
	Deering	133	1.67	222	100	222	Noa. 94, 99; Shg. 98; Kia. 99; Sel. 99
	Kiana	394	1.23	483	100	483	Kiana 99
	Kivalina	380	1.02	388	100	388	Kivalina 92
	Kobuk	108	1.60	173	100	173	Shungnak 02
	Kotzebue	3,095	1.37	4255	100	4,255	Kotzebue 91
	Noatak	442	1.62	715	100	715	Noatak 94, 99
	Noorvik	656	1.38	905	100	905	Noorvik 02
	Point Hope	733	0.32	236	100	236	Pt. Hope 92
	Selawik	754	1.68	1302	100	1,302	Selawik 99
	Shungnak	253	1.60	405	100	405	Shungnak 02
	Total Unit 23					10,279	
24	Alatna	33	0.00	0	100	0	Alatna 01
	Allakaket	197	0.09	9	100	9	Allakaket 99, 01
	Anaktuvuk Pass	292	1.76	514	70	360	Anaktuvuk Pass 90–95
	Bettles	40	0.46	19	100	19	Bettles 97-99

Unit	Community	Human population	Per capita caribou harvest	Total community harvest	% WAH in harvest	Estimated Nr. of WAH caribou harvested	Assessments used to estimate per capita harvest[a]
	Evansville	25	0.10	2	100	2	Evansville 97-99
	Hughes	74	0.28	21	100	21	Husl. 97–01; Alat. 97–01; Allak. 97–01
	Wiseman	24	0.28	7	100	7	Bettles 97-99; Evans. 97-99
	Huslia	289	0.00	0	100	0	Huslia 01
	Total Unit 24					418	
26A	Atqasuk	230	1.11	254	40	102	Atqasuk 94–95
	Barrow	4,508	0.51	2301	30	690	Barrow 88–89, 92
	Nuiqsut	438	1.28	562	10	56	Nuiqsuit 00
	Point Lay	252	1.27	321	80	257	Pt. Lay 87; Ww 88–89, 92
	Wainwright	545	1.27	690	40	276	Wainwright 88–89, 92
	Total Unit 26A					1,381	
Total: All Units						14,404[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] 13,300–15,500 caribou (95% bootstrap confidence interval)

Table 12 Percent positive results and sample sizes (in parentheses) for 8 selected pathogens and haptoglobin levels from serology analyses of the Western Arctic Caribou Herd, 1962–2002 (Note: these percentages reflect gross levels of exposure to pathogens rather than levels of actual infection)

	IBR[a]		BVD[b]		PI3[c]		RSV[d]		EHD[e]		BT[f]		Lepto.[g]		Bruc.[h]		Hapto.[i]	
Year	%	(*n*)	%	(*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)		(40)					0	(9)	14	(14)		
1981	0	(20)	0	(19)	0	(20)		(55)	0	(20)	0	(20)	0	(19)	39	(23)		
1986	5	(40)	3	(40)	24	(41)	0	(63)	2	(41)	0	(41)	0	(41)	19	(37)		
1992	5	(59)	3	(59)	22	(58)	0	(60)	0	(59)	0	(59)	3	(59)	4	(52)	0	(14)
1993	2	(63)	8		8	(63)	0	(44)	5	(63)	0	(63)	5	(63)	12	(51)	4	(25)
1994	0	(61)	5	(61)	8	(61)	0	(71)	11	(61)	0	(61)	2	(61)	11	(47)	19	(27)
1995	2	(44)	18	(44)	2	(44)	0	(75)	0	(44)	0	(44)	0	(44)	12	(34)	5	(19)
1996	6	(71)	18	(71)	11	(66)	7	(112)	0	(71)			1	(70)	3	(76)	1	(73)
1997	0	(75)	15	(75)	16	(73)	1	(52)	0	(71)			0	(75)	0	(76)	11	(62)
1998	4	(112)	21	(11)	7	(111)	8	(72)	0	(104)			15	(112)	7	(113)	16	(112)
1999	6	(70)	14	(64)	4	(52)	0	(72)	0	(74)	6	(72)	12	(77)	5	(77)	10	(77)
2000	0	(116)	10	(11)	4	(70)	0				0	(116)			6	(115)	10	(116)
2001															2	(50)		
2002															1	(92)		

[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
[h]Brucellosis = *Brucella suis* type 4
[i]Haptoglobin level
[f]BT = Bluetongue
[g]Leptospirosis = *Leptospira* spp.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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 to carry out 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. A variety of factors affect PCH management including board recommendations, biological studies, and Congressional actions regarding the potential 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 2001, 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 OBJECTIVE

- Maintain a minimum population of 135,000 caribou.
    - Conduct censuses every 2–3 years.
    - Estimate parturition rates and late June calf:cow ratios of radiocollared females.
    - Monitor herd movements by periodically relocating radiocollared caribou.
    - Monitor the harvest through field observations, hunter reports, and contact with residents.

METHODS

Personnel from ADF&G, ANWR, and Yukon Department of Environment (YDOE) 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*). The most recent census was conducted on 3 July 2001. At that 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 YDOE conducted composition counts on the PCH winter range during March of each year.

Harvest tickets submitted by nonlocal hunters (nonresidents and Alaskans residing outside Units 25, 26B and 26C) provided most harvest data for this region of Alaska. The ADFG Division of Subsistence gathered additional data on harvest by local hunters through field interviews. Canadian harvest and composition data were obtained from YDOE. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Personnel from ADF&G, US Fish and Wildlife Service (FWS), YDOE, and Canadian Wildlife Service counted 123,052 caribou in aerial photographs taken on 3 July 2001 (Table 1). During the most recent previous survey in July 1998, we estimated the herd at 129,000 caribou. The highest population ever recorded was 178,000 in 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). Surveys of radiocollared cows during late June 2001 and 2002 found 51 and 56 calves:100 cows, respectively (Table 3). March composition surveys by the YDOE found 28 and 31 calves:100 cows, respectively, for the 2000 and 2001 cohorts (Table 3; D Cooley, Yukon Department of Environment, Yukon Territory, 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 portion of the herd was classified.

Reproduction and Calf Survival

Calf survival was relatively high in 1999 but declined in 2000 and 2001, probably because of unusually late snowmelt that delayed migration during those 2 years. As a result of the delay, most calves were born before the cows reached the calving grounds. Parturition rate and early calf survival were both very low during these years (Table 3). In spring 2002, weather was milder and most caribou reached the arctic coastal plain by the time calving occurred, and parturition and calf survival both were higher than during the 2 previous years.

On 1 June 2001, when calving probably began, most collared caribou cows were located in northern Yukon between the mouth of the Babbage River and Old Crow. Most caribou that initially were located south of the Babbage River continued to move northward during 1–5 June,

despite the presence of newborn calves. This required calves to cross the Porcupine River and several other major rivers soon after the ice broke up and the water was high. As of 11 June, 58 (83%) of 70 radiocollared cows were judged to be parturient (pregnant or had given birth). Forty-three cows were observed with calves, 15 were judged to be either pregnant or had produced and lost a calf (based on presence of hard antlers and enlarged udders), and 12 were determined to be not parturient (no hard antlers and udders not distended). The peak of calving appeared to occur between 5–8 June, several days later than usual but similar to 2000. During 26–28 June, 71 radiocollared cows were observed. Most cows were moving westward along the coastal plain of Canada and Alaska, and many had already entered Alaska. Additional tracking flights were conducted on 2–3 July in conjunction with a complete photocensus of the PCH. All radiocollared caribou were located on the Alaskan coastal plain or the foothills immediately south of the plain. Thirty-four calves (79%) observed in early June survived until late June, a lower survival rate than for 1993–2000. This estimate did not include calves that died before they could be observed, so it overestimates actual calf survival. Although data from previous years also include a similar bias, the bias probably was greater during 2000 and 2001 because of the adverse conditions during which calves were born (cows continuing to migrate through deep snow), which likely increased perinatal mortality of calves. Thirty-six adult cows (51%) were accompanied by calves during late June, including 2 with calves born between 11–26 June. This proportion was higher than during 2000 but still among the lowest recorded for the PCH (Table 3).

On 1 June 2002, most radiocollared caribou cows were located along the arctic coastal plain, extending from the Hulahula River in Alaska eastward across the Canadian border to the Babbage River. The largest concentration of caribou was between the Jago and Kongakut Rivers in Alaska. Most of the caribou that initially were located east of the Kongakut River continued to move westward during 1–7 June. Sixty-eight radiocollared cows were observed during early June. Of these, 59 (87%) were parturient (pregnant or had given birth). Forty-one of these were observed with calves, 11 were pregnant (based on presence of hard antlers and enlarged udders), 7 appeared to have produced and lost a calf between successive observations (2 were observed with placentas present but no calf; 5 had lost one or both antlers but had distended udders), and 9 were not parturient (no hard antlers and udders not distended). The peak of calving appeared to be around 5 June, several days later than normal but earlier than during 2000 or 2001. Forty-eight (81%) of 59 parturient cows had given birth by 7 June.

During 25–26 June, 77 radiocollared cows were observed, including 7 that had been located but not observed (due to adverse weather) during 1–7 June and 3 that had not been detected during previous flights. One barren caribou with a nonfunctional VHF collar was observed during 1–7 June but was not seen during 25–26 June. Thirty-five calves (85%) observed in early June survived until late June. Forty-three adult cows (56%) were accompanied by calves during late June, including 7 with calves born between 7–25 June and 1 that was not located during early June. The parturition rate and late June calf:cow ratio were greater than during 2000 and 2001 (Table 3). However, the proportion of cows accompanied by calves at the end of June was lower than during 1994–1999, suggesting that current levels of reproduction may not be sufficient to halt the decline in population that has occurred since 1989.

Distribution and Movements

Information on movements and distribution of the PCH has been summarized by Garner and Reynolds (1986), Whitten (1987, 1993*b*, 1995*b*), Whitten and Regelin (1988), Fancy et al. (1989), Golden (1989, 1990), Whitten and Fancy (1991), and Griffith et al. (2002). During 1997, 1998, and 2002 snowmelt and new plant growth occurred earlier than in some other years. 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 1999, 2000, and 2001, deep snow and cold weather delayed the spring migration, and prolonged the calving period. This was especially pronounced in 2000 and 2001, when calving occurred over a much wider area than usual, including parts of northwestern Yukon and northeastern Alaska, and most calves were born south and east of the traditional calving area. 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. During fall and winter 1999–2000 and 2001–2002, a substantial proportion of the PCH returned to Alaska during late August and September and wintered in the vicinity of Arctic Village. Few caribou wintered in Alaska during 2000–2001 or 2002–2003. Satellite collar data and anecdotal observations suggest 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 the winter, 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 RY00 and RY01.

Hunter Harvest. We do not have an estimated total harvest for the PCH because harvest data from northern Yukon were not available for RY99–RY02. Harvest by local and nonlocal residents in Alaska was reported differently. Nonlocal hunters used statewide caribou harvest ticket report cards. This harvest was 72 in RY00 and 114 in RY01. The harvest in RY01 was slightly higher than previous years (Table 4). Most harvest by nonlocal hunters occurred in Unit 25A (Table 5). Most nonlocal hunters were Alaska residents, and harvested primarily bull caribou.

Reporting of harvest by hunters living north of the Yukon River was not required after 1989. 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. 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. Estimated harvests by local residents in Alaska were 300 and 400 caribou during RY00 and RY01, respectively.

Harvest in Canada probably continued to be relatively high because caribou often move through the Old Crow area several times each year. During fall and winter 2000 and 2001, 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; however, in general success rates were high (≥ 49%; 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 2000 and 2001 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 approximately half the herd wintered in this area during RY01. Hunters from other Gwichin communities took small numbers of caribou along the Porcupine River near the Alaska–Yukon border in fall.

Harvest Chronology. Nearly all nonlocal harvest of the PCH in Alaska occurs during August and early September. Caribou were available during winter 2001–2002 near Arctic Village in 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. Studies on the calving ground indicate calving caribou select areas with rapid plant growth, rather than specific sites or habitats. Areas with the most rapid plant growth vary each year, but rapid growth 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 Yukon, Canada

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 actual population was likely higher than estimated, the 1998 and 2001 population estimates probably did not meet our management objective of 135,000 animals. However, the herd is still above levels observed in the 1970s when it numbered 102,000–110,000.

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. 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 population decline indicates that adult survival may also have declined during the 1990s, perhaps due to increased predation or 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 in Alaska, 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.

ADF&G 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. ADF&G 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). ADF&G 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 Oct.
[c] Only these surveys sampled all portions of the herd, including bull groups.
[d] No counts completed.

TABLE 3 Porcupine caribou herd demographic data, 1987–2002

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
2002	68	0.87	56		

[a] Number of radiocollared cows observed during May and Jun.

[b] Includes only radiocollared adult cows ≥3 years old.

[c] As of Mar 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 2001–2002

Regulatory	Reported				Estimated unreported			
year	M	F	Unk	Total	Alaska	Canada	Total	Total
1984–1985	49	4	0	53	500–700	4000	4500–4700	4553–4753
1985–1986	52	12	1	65	500–700	4000	4500–4700	4565–4765
1986–1987	70	14	0	84	1000–2000	500–1000	1500–3000	1584–3084
1987–1988	106	22	1	129	<500	2000–4000	2500–4500	2629–4629
1988–1989	82	7	0	89	<500	2000–4000	2500–4500	2589–4589
1989–1990	104	8	0	112	500–700	2000	2500–2700	2612–2812
1990–1991	19	1	0	20	100–150	1680	1780–1830	1800–1850
1991–1992	101	3	0	104	100–150	2774	2874–2904	2978–3028
1992–1993	78	1	0	79	658	1657	2315	2394
1993–1994	77	5	0	82	250	2934	3184	3266
1994–1995	72	3	0	75	200	2040	2240	2315
1995–1996	61	7	0	68	200	2069	2269	2337
1996–1997	76	2	0	78	200	2159	2359	2437
1997–1998	58	4	1	63	300	1308	1608	1671
1998–1999	83	11	1	95	300	--[a]	--	--
1999–2000	84	4	0	88	400	--	--	--
2000–2001	62	10	0	72	300	--	--	--
2001–2002	105	9	0	114	400	--	--	--

[a] Pending Canadian data.

TABLE 5 Porcupine caribou herd nonlocal[a] and nonresident hunter success, regulatory years 1991–1992 through 2001–2002

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	22	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	3	100	17	117
Successful	63	3	2	68	9	77
% Successful	74	25	67	68	53	66
1999–2000						
Total hunters	80	23	146	6	6	125
Successful	55	14	5	2	3	74
% Successful	69	61	3	33	50	59
2000–2001						

Regulatory year/ Hunters	Unit					Total Units 25 and 26C
	25A	25B	25D	25	26C	
Total hunters	91	13	12	116	6	122
Successful	56	0	2	58	2	60
% Successful	61	0	17	50	33	49
2001–2002						
Total hunters	121	27	14	162	14	176
Successful	85	5	2	92	9	101
% Successful	70	18	14	57	64	57

[a] Nonlocal includes Alaskans residing outside Units 25, 26B, and 26C.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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 (FCH) crossed the Steese Highway to calve and summer in the White Mountains (Jones 1961). As the FCH declined throughout the 1960s, these caribou abandoned the traditional White Mountains calving area and remained southeast of the Steese Highway. However, in the late 1970s, public reports and incidental observations by biologists confirmed the year-round presence of caribou in the White Mountains, implying a small resident herd had existed for many years (Valkenburg 1988).

When the White Mountains caribou herd was first 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), the Bureau of Land Management (BLM) estimated the herd's size at around 1000, although 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 radiocollared animals 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 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 herd movements and distribution. 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, trails, and cabins. Despite this increased access, annual

reported harvests have been low. In 1990, 2 drawing permit hunts (DC877 and DC878) were established to provide opportunity to hunt caribou in winter. DC877 allowed motorized access hunting, while DC878 was nonmotorized access only. Although 100 permits were issued for the first 3 seasons (50 per hunt), success was low (6 caribou). The number of permits available was increased to 250 (125 per hunt) during regulatory years (RY) 1993 and 1994 (RY = 1 Jul through 30 Jun; e.g., RY00 = 1 Jul 2000 through 30 Jun 2001). 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 from 1 bull to 1 caribou, RC877 and RC878 were combined to create RC879 which had season dates of 1 November through 31 March and no motorized restrictions, but the area open to hunting White Mountain caribou was reduced.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

1 Ensure that increased recreational use and mining development do not adversely affect the White Mountains Herd.

2 Provide the greatest sustained opportunity for hunting caribou.

3 Provide an opportunity to view and photograph caribou.

MANAGEMENT OBJECTIVES

1 Maintain a fall bull:cow ratio of 30 bulls:100 cows.

2 Develop a creative strategy to increase winter hunting opportunities, while minimizing potential for overharvest.

3 Maintain a reported harvest of up to 75 caribou, including up to 30 cows during the winter registration hunts.

4 Maintain at least 20 radiocollared caribou in the herd to adequately measure herd dynamics.

METHODS

POPULATION STATUS AND TREND

Population Size

ADF&G and BLM estimated population size using the radio-search technique (Valkenburg et al. 1985). We photographed large groups from aircraft with 35-mm cameras loaded with slide film. The herd was counted on 7 July 2000 using 2 radiotelemetry-equipped aircraft, a Piper Cub and a Bellanca Scout. The total count was 687 caribou.

In our attempt to maintain at least 20 radiocollared caribou in the herd to aid in the estimation of herd dynamics, we deployed radio collars on 3 female caribou calves on 6 April 2001, and 9 female caribou calves on 26 September 2001, bringing the total number of active radio collars to approximately 17 at the beginning of winter 2001–2002.

Population Composition

We conducted composition surveys in September 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 animals and also classified any caribou found in a search of the surrounding area. We broadly searched areas containing numerous radiocollared caribou for additional groups. We also classified any caribou encountered while in transit between search areas. Classification categories consisted of cows; calves; and large, medium, and small bulls. Observers identified bulls by the absence of vulva and classified bulls by antler characteristics (Eagan 1993). We tallied the composition of each group on a 5-position counter and recorded the tallies on a data sheet. We classified 399 caribou on 29 September 2000 and 441 caribou on 25 September 2001.

MORTALITY

Harvest

We estimated harvest by using data from returned harvest tickets and registration permit report cards. For RY00 and RY01, caribou harvested west of Preacher and American Creeks and north of the Steese Highway were considered White Mountains animals; caribou harvested east of these drainages and/or south of the Steese Highway were considered FCH animals. To separate the White Mountains Herd from the Ray Mountains Herd's harvest in Unit 20F, caribou killed south of the Yukon River were considered White Mountains animals. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The July 2000 minimum population of 687 caribou was below the 1992 minimum population of 832 caribou. However, the difference is only 145 caribou, and herd distributions during either survey could have contributed to the difference between these counts.

Population Composition

Fall calf:cow and bull:cow ratios in the White Mountains Herd have been variable (Table 1). However, productivity and early calf survival appeared sufficient (>25 calves:100 cows) to suggest herd growth in most years. Bull:cow ratios remained relatively high and met objectives. Variation in bull:cow ratios (23–62:100) for the White Mountains Herd probably reflected biased sampling because bulls are often segregated after the rut (i.e., in 1991 and 1995). Surveys conducted early in the fall (i.e., 29 Sep–6 Oct) yielded higher bull:cow ratios

than surveys conducted later. Differences in composition among years may also be attributed to the behavior of the White Mountains caribou herd. Because these caribou are usually in small, scattered groups and in timbered areas, it is easy to miss groups that could affect the overall composition estimates.

Distribution and Movements

Radiocollared White Mountains caribou are located infrequently, therefore data concerning their movements are minimal. Limited data suggest the herd calves primarily in the higher elevations 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 east of Beaver Creek to Mount Prindle. In August or September White Mountains caribou often move north of Beaver Creek and winter in upper Hess and Victoria Creeks and the upper Tolovana River drainages, although some winter in the Preacher Creek drainage west of Circle.

MORTALITY

Harvest

Season and Bag Limit.

	RY90–RY97	RY98–RY00	RY00–RY01	RY01–RY02
Fall season bag limit	1 bull		1 caribou	1 bull after 3/02
Winter season hunt	Drawing	Registration		
Winter season motor vehicle restrictions	Yes		No	
Winter season dates	Feb–Mar		Nov–Mar	Dec–Mar
Winter season hunt area	Units 20B, 20F, and 25C, north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway.		Units 20B and 20F north and east of the Elliott and Dalton Highways, and north and west of the Steese Highway, and Unit 25C west of Preacher and American Creeks.	

Alaska Board of Game Actions and Emergency Orders. At the March 2000 Board of Game meeting the board approved ADF&G's 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.

At the March 2002 meeting, the board approved ADF&G's proposal to change the fall general season bag limit back to 1 bull, and change the registration hunt (RC879) dates to 1 December–31 March. These changes provided consistent caribou hunting regulations along the Steese Highway.

That portion of hunts RC877 and RC878 east of Preacher and American Creeks in Unit 25C was 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. Harvest during fall hunts was low from RY87 to RY99 (6–26). However, the fall harvest almost doubled in RY00 to 51 (Table 2). In RY00 FCH animals came north of the Steese Highway and may have been the source for many of the 51 caribou taken. Additionally, RY00 was the first year that cow caribou were legal in the fall hunt and harvest of cows contributed 20 of the 51 caribou in the reported harvest. The fall harvest then dropped to normal levels in RY01.

Permit Hunts. Participation was high and harvests were low for registration hunt RC879 (Table 3) in RY00 with 333 permits issued and a reported harvest of 10 caribou (6 cows and 4 bulls). In RY01, 405 permits were issued with a reported harvest of 17 caribou (1 cow, 16 bulls, and 1 of unknown sex).

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 maximum total fall and winter harvest of 40 bulls and 25 cows. The higher-than-average harvest of RY00 approached sustainable limits with 34 bulls and 26 cows taken, but harvest was well below sustainable limits in RY01 with 30 bulls, 9 cows, and 1 caribou of unknown sex taken.

A high ratio of large bulls:100 cows is an indication of bull harvest below sustainable limits. The proportion of large bulls per hundred cows averaged 13 over the 10 years RY92–RY01 (Table 1), and 11 during RY00–RY01. These data suggest the bull segment of the White Mountains herd is in no danger of being overharvested and may even provide limited trophy-hunting opportunity.

Hunter Residency and Success. The majority of White Mountains caribou are harvested by resident hunters, and most live locally (Table 4). Success rates are usually quite low in both fall and winter hunts. The low success rates are presumably due to the inaccessibility of caribou during both seasons.

Harvest Chronology. From RY90 (when the winter seasons were opened) to RY00, 84–100% of the harvest occurred during the fall season (10 Aug–20 Sep). However, in RY01 the higher winter harvest decreased the fall season proportion to 58%.

Transport Methods. The most common method of transportation used by successful hunters during the fall seasons of RY00 and RY01 were 3- or 4-wheelers, which accounted for 73%

(37 of 51) and 74% (17 of 23) of the respective transportation use (Table 5). Because of limited participation and low harvests, transportation methods for the winter hunts have little meaning, but in hunts where motorized access was allowed, the vast majority of the harvest was by snowmachine.

Winter travel in the White Mountains can be difficult for hunters, but extension of developed trails and cabins provided by BLM is making winter access easier. However, access trails have not been well developed in caribou wintering areas, and most caribou winter in dense spruce forest, making hunting difficult.

CONCLUSIONS AND RECOMMENDATIONS

We met most of the objectives for this reporting period. Objective 1, to maintain a fall bull:cow ratio of 30 bulls:100 cows, was met. Objective 2, to develop a creative strategy to increase winter hunting opportunities, while minimizing potential for overharvest, was met with unlimited registration permits for winter hunts, and harvest within sustainable limits. Objective 3, to maintain a reported harvest of up to 75 caribou, including up to 30 cows during the winter registration hunts, was met, but the herd could provide additional hunting opportunity and harvest. In the future, 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, as the FCH harvest is liberalized, hunting pressure on the White Mountains Herd may decrease. We failed to meet Objective 4 – maintain at least 20 radiocollared caribou in the herd to adequately measure herd dynamics – maintaining only 17 functioning radio collars in the herd.

The objectives for the next reporting period are being revised here. Objective 2 will be omitted because it was an activity rather than an objective, and has largely been completed by liberalizing the winter hunting season. We will replace Objective 3 with a population objective that includes Objective 1. Specifically, this objective will be to maintain a stable or increasing population with a fall bull:cow ratio of at least 30 bulls:100 cows. Objective 4 was also omitted because it is an activity rather than an objective. We will also continue the population modeling activity as a guide for estimating sustainable harvest limits.

Management objective for the next reporting period is:

1 Maintain a stable or increasing population with a fall bull:cow ratio of at least 30 bulls:100 cows.

Population data for the White Mountains Herd are generally 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 to data collection in the form of more intensive census efforts. Relatively low herd size and hunter success have made funding allocations for this herd a low priority compared to other Interior caribou herds.

By working closely with BLM, we monitored increases in recreational uses and development. We should continue to contribute to meetings on development of BLM lands. This

cooperation will help effect better management strategies for the White Mountains caribou herd.

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.

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TABLE 1 White Mountains caribou herd fall composition counts and estimated population size, 1983–2002

Date	Bulls:100 Cows	Large bulls: 100 Cows	Calves:100 Cows	% Calves	% Cows	% Small bulls	% Medium bulls	% Large bulls	% Total bulls	Composition sample size	Estimate of herd size
9/29/83	44	19	31	18	57	26	29	44	25	135	
10/85	36	0	31	18	60	0	0	0	22	65	
9/29/88	43	14	33	19	57	51	16	33	24	211	
10/06/89	50	11	36	19	54	46	33	22	27	744	750–1000
10/11/91	23	5	24	16	68	44	35	21	15	312	
10/29/91[a]				15						324	761[b]–1000
10/13/92	39	12	23	14	62	52	18	30	24	247	832[b]–1000
9/27/93	48	21	22	13	59	34	23	43	28	497	
10/04/94	39	16	25	15	61	34	24	42	24	418	
10/16–17/95	36	10	31	19	60	44	27	29	22	418	
10/2/96	44	9	54	27	50	60	20	20	22	513	
10/2/97	34	11	38	22	58	50	19	31	20	341	
10/2/98	50	11	18	11	60	42	37	21	30	759	
9/30/99	62	16	39	20	47	33	40	26	31	644	
9/29/00	54	11	13	8	60	40	40	20	32	399	687[b]–800
9/25/01	57	11	26	14	55	46	36	19	31	441	700–800
9/24/02	34	7	29	18	61	44	35	21	21	405	

[a] Fixed-wing aircraft.
[b] Actual count of herd size.

TABLE 2 White Mountains caribou harvest[a], regulatory years 1987–1988 through 2001–2002

Regulatory year	General season harvest			
	M	F	Unk	Total
1987–1988	6	0	0	6
1988–1989	12	0	0	12
1989–1990	14	0	0	14
1990–1991	17	0	1	18
1991–1992	19	0	0	19
1992–1993	15	0	0	15
1993–1994	21	0	0	21
1994–1995	18	0	0	18
1995–1996	10	0	0	10
1996–1997	17	0	0	17
1997–1998	25	0	0	25
1998–1999	13	0	0	13
1999–2000	26	0	0	26
2000–2001	30	20	1	51
2001–2002	15	8	0	23

[a] Excludes winter permit hunt harvest.

TABLE 3 White Mountains caribou herd harvest by permit hunt, regulatory years 1990–1991 through 2001–2002

Hunt	Regulatory year	Permits issued	Did not hunt (%)	Unsuccessful hunters (%)	Successful hunters (%)	Bulls	Cows	Unk	Harvest
DC877 & DC878	1990–1991	89	66 (74)	18 (86)	3 (14)	2	1	0	3
		100	88[b] (88)	12 (100)	0 (0)	0	0	0	0
		100	76 (76)	19 (86)	3 (14)	1	2	0	3
		150	120 (80)	26 (100)	0 (0)	0	0	0	0
		149	116 (78)	26 (90)	3 (10)	1	2	0	3
		137	98 (72)	37 (100)	0 (0)	0	0	0	0
		106	86 (81)	17 (100)	0 (0)	0	0	0	0
		67	46 (69)	20 (95)	1 (5)	1	0	0	1
RC877 & RC878	1998–1999[a]	74	25 (34)	49 (98)	1 (2)	0	1	0	1
		119	28 (24)	91 (88)	13 (13)	3	10	0	13
RC879	2000–2001	333	137 (41)	178 (95)	10 (5)	4	6	0	10
		405	252 (62)	128 (88)	17 (12)	15	1	1	17

[a] Registration hunt with an unlimited number of permits available.

[b] Includes those that did not report.

1991–1992

1992–1993

1993–1994

1994–1995

1995–1996

1996–1997

1997–1998

1999–2000

2001–2002

TABLE 4 White Mountains caribou herd hunter residency and success during fall general seasons, regulatory years 2000–2001 and 2001–2002

	Successful				Unsuccessful				
Regulatory year	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Total (%)	Total hunters
2000–2001	45	38	6	89 (38)	106	29	9	144 (62)	233
2001–2002	22	13	1	36 (18)	127	31	6	164 (82)	200

[a] Residents of Units 20 and 25C.

TABLE 5 White Mountains caribou herd harvest[a] by transport method during fall general seasons, regulatory years 1988–1989 through 2001–2002

Regulatory year	Harvest by transport method								*n*
	Airplane	Horse	Boat	3- or 4-Wheeler	Snowmachine	ORV	Highway vehicle	Other/Unk	
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
2000–2001	1	1	2	37	2	6	2	0	51
2001–2002	0	0	0	17	0	1	5	0	23

[a] Excludes winter permit hunts.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

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 (WAH) 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 ADF&G and BLM. During July 1984, the first photocensus of the herd was completed using a modified aerial photo-direct count extrapolation (APDCE) technique; ADF&G and BLM staff counted 11,822 animals from photographs. Trent and Toovak made a visual count in 1985 and counted 13,406 caribou (ADF&G files). We completed photocensuses and counted 16,649 caribou in 1989 (Carroll 1992), 27,686 in 1993 (Carroll 1995), 25,076 caribou in 1995 (Carroll, 1997), and 28,627 in 1999 (Carroll, 2001).

The TCH is an important subsistence resource to hunters from several North Slope villages. Approximately 2503 caribou were harvested from the TCH during 1999–2000 (Carroll, 2001).

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 2–3 years;
- Monitor recruitment and calf production through late winter recruitment and summer calving ground surveys each year;
- Define critical habitat areas such as calving, insect relief, and wintering areas;
- Identify and map the movements and distribution of the herd throughout the year using aerial survey, radiotelemetry, and satellite telemetry data;
- Encourage local participation in research and management decisions;
- Work with the North Slope Borough and the ADF&G Subsistence Division to collect harvest information;
- Determine the 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 1–2 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

A modified APDCE photocensus (Davis et al. 1979) of the TCH was successfully completed in 2002. Photographs were taken from a DeHavilland Beaver (DHC-3) aircraft with a floor-mounted camera on 16 July while TCH caribou were in insect relief aggregations. Cessna 185 and Piper PA 18 aircraft with telemetry equipment were used to detect how many radiocollared TCH animals were in the photographed groups and if there were any instrumented WAH or CAH caribou in the area. Images of caribou on the photographs were counted during the following winter.

Spring short yearling and fall composition surveys were flown using a Cessna 207 on 17 and 25 April 2001, a Piper PA 18 on 4 April 2002, and a Bianca Scout on 27 October 2001. We used telemetry equipment to locate radiocollared cows and counted approximately 100 adults and calves in the area surrounding the collared animals. Locating the radiocollared animals helped us distribute our sampling effort throughout the range of the TCH.

Calving surveys were flown using a Cessna 207 on 5–18 June 2001 and a Bianca Scout on 2–12 June 2002. Weather permitting, we flew surveys every 2 to 3 days over most of the TCH range and used telemetry equipment to locate as many collared cows as possible. The cows were observed at close range to determine the success, timing, and location of calving. For each observation we recorded the location using a Garmin Global Positioning System (GPS) receiver, whether the cow had a calf, and whether the cow 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 and that was recorded as the approximate successful calving location. For cows that were never seen with a calf, we recorded their location midway through the observation period as their location during calving. ArcView GIS was used to map locations of cows that calved successfully (were seen with a live calf) and those that did not calve successfully (were not seen with a live calf). In 2001 we distinguished between cows that had calves, cows that did not have calves, and cows that had calves but the calf died. We also used GIS to look at calving locations for all years and calculate the number of caribou calving within the traditional calving area. We also looked at the calving success of caribou found within the calving area and the calving success of caribou that were found outside the calving area during the calving period. We defined the calving area as the area surrounding Teshekpuk Lake that BLM gave protective status to because of its importance as caribou and goose habitat in its 1998 Integrated Activity Plan for the northeast section of the National Petroleum Reserve–Alaska (BLM, 1998).

We used a Hughes 500 helicopter on 10 July 2000 to conduct post calving 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 20 female caribou north of Teshekpuk Lake from July 8–10, 2000 using a Hughes 500 helicopter with a skid-mounted net gun, and attached 5 Platform Transmitter Terminal collars (PTT = satellite radiocollar transmitters) and 12 VHF radiocollars. We also captured 13 caribou (9 males and 4 females) north and west of Teshekpuk Lake on 26–27 June, 2001 using a Robinson 220 helicopter with a hand-held net gun, and attached 10 PTT and 3 VHF radiocollars. In both capture operations caribou were restrained using blindfolds, hobbles, and 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 PTTs 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 2000-2001. Because villages harvest caribou from more than one herd we had to estimate the percentage of the caribou harvested in each village 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 2000–2001. We multiplied the total number of caribou harvested times the percentage of caribou that were most likely from the TCH to determine the total number of TCH caribou harvested by each village, and totaled these to calculate the total TCH harvest for 2000–2001. 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 radiocollared caribou by examining radiotracking survey data. From 1990-1998 we did not include data collected from caribou instrumented with PTTs because they had a higher mortality rate than those collared with VHF collars. Beginning in 2000, improvements in the design of the PTTs eliminated the difference in mortality rates, so since then we used data from both types of collars. The VHF transmitters attached to all the collars were configured with MS6 mortality sensors that doubled their rate of transmission 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. We began collaring males as well as females in 2001, so mortality information for both males and females is included beginning in 2001–2002.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

From census photographs taken on 16 July 2002, we counted 45,166 caribou. Previous censuses in 1989 (16,649 caribou), 1993 (27,686 caribou), 1995 (25,076 caribou), and 1999 (28,627) indicated that the TCH increased at a rate of 14% per year during the period 1989–1993, and then the counts appeared to stabilize from 1993 until 1999 (Table 1). Because the 2002 figure increased so dramatically over 1999, we reexamined the counting process to look for possible sources of error and found the following:

- It is unlikely that we counted a substantial number of CAH or WAH caribou in the TCH photocensus. The CAH was photocensused the same day and was found to the east of the Colville River and well out of the area where the TCH was photographed. All 24 of the WAH satellite radio collars were located along the crest of the Brooks Range, approximately 200 miles away from where the TCH was photographed. (Figure 1) On radiotracking surveys we found no WAH or CAH VHF radiocollared caribou in the area of the TCH photocensus.

- The photograph layout was reexamined and it was determined that no groups of caribou were counted twice.

- Photograph counters counted consistently. We had all 5 counters count calibration photos and no individual counter seemed to be over-counting The 2 counters that counted 92% of the photos varied by less than 1% on 22 photographs they both counted in a blind test. One counted 8407 and the other 8330 caribou in the test.

- A higher percentage of calves were probably counted in the 2002 photocensus than previous counts. The photographs were very good quality and calves showed up more clearly than in past years. We recounted a sample of 40 photographs and found that 14% of the caribou counted were calves. By comparison, in the 2002 CAH caribou photocensus count, 7% of the animals were listed as calves (Lenart, Pers. Com., 2003)

From the above information, it appears that the minimum population estimate of 45,166 is legitimate. The reason for the relatively large number of caribou counted is a combination of excellent counting conditions, the behavior and distribution of the caribou, good coverage by the photocensus crew, good photograph quality, a substantial increase in the herd, and the fact that the count was conducted on a year when there was very good recruitment (74 calves per 100 cows) (Table 2). The count may be slightly elevated by a larger than normal percentage of calves being counted but, since this is a minimum population estimate of the post-calving population, this estimate is closer to the real population than in some past estimates.

However, it seems unlikely that the herd could have achieved the growth rate of 16.2% per year that would have been required to increase from 29,000 in 1999 to 45,000 caribou in 2002, particularly when there was poor recruitment (9%) in 2001-2002 and mediocre recruitment (15%) in 2000–2001 (Table 3). It is more probable that the census in 1999, and possibly the census in 1995, undercounted the population and that the herd has been steadily increasing through the 1990s. There were several years of good recruitment between 1995 and 1999 (24%, 21%, 14%, 21%), and it seems quite possible for the herd to have achieved the growth rate that would have been required.

Population Composition

Calving. Teshekpuk caribou show great fidelity for the traditional calving area surrounding Teshekpuk Lake and caribou that are found within the area during calving season have much higher calving success than caribou that are found outside the area (Figure 2). In recognition of its importance as wildlife habitat, BLM gave much of the area surrounding Teshekpuk Lake special protection in its 1998 Integrated Activity Plan for the northeast section of the National

Petroleum Reserve–Alaska (BLM 1998). The protected area encompasses the traditional calving area of the TCH. In surveys we have conducted since 1990, 147 out of 163 (90%) of caribou that calved successfully have calved within these protected areas. Of the 178 caribou that were found within the protected areas, 83% calved successfully. Of the 59 cows that were found outside the protected areas during calving season, 25% calved successfully.

In 2001 heavy snow and a late snow melt-off prevented many cows from getting back to the traditional calving area in time to calve, and this resulted in very poor calf survival. We flew surveys to determine calving location and success on 5, 9, 12, 16, and 18 June. Only 16 of 36 collared cows were seen with live calves, for 44% calving success, which is the lowest we have recorded for any year (Table 2). The second lowest year of calf survival was 1997 (53%) when natural conditions also prevented many cows from making it back to the traditional calving area by early June (Carroll 1999). In 2001 the calving success for collared cows that were found in the traditional calving area was much better (76%) than ones that were found outside the area (10%) (Figure 3). It appears to be very important for caribou from the TCH to be able to get to and use their traditional calving area.

In 2002, calving surveys were flown on 2, 5, 7, 10, 11, and 12, June. We located 31 collared cows and 23 of these had calves at heel, for 74% calving success (Table 2). Snowmelt was very early and approximately 50% of the calves were born by 2 June, which was earlier than normal. In conjunction with the early snow-melt, most of the caribou calved north of the lake (Figure 4).

Fall composition counts. Fall composition surveys were flown on October 27, 2001. We located 17 collared caribou including 3 bulls, 10 cows without calves, and 3 cows with calves. We classified 1458 caribou in the vicinity of the collared animals and counted 163 calves, which computed to 11% calves, or 13 calves:100 adults.

Short yearling counts. Short Yearling counts were flown 17 and 25 April 2001. We located 15 collared cows, 6 of which had short yearlings at heel. We also classified 1369 caribou in the areas surrounding the collared animals and counted 1168 adults and 201 short yearlings. This computes to 15% short yearlings or 17 short yearlings:100 adults. This survey was cut short because the plane crashed.

Short yearling counts were also flown on 4 April 2002. We located 22 collared caribou – 2 were males, 2 were cows with calves, and 20 were cows without calves (9 short yearlings:100 collared cows). We also classified 2270 caribou in the areas surrounding the collared animals and counted 2070 adults and 200 short yearlings. This computes to 9% short yearlings or 10 short yearlings:100 adults. (Table 3). The spring 2002 count is the worst recruitment we have recorded for the TCH and coincides with the poor calving success in 2001.

Summer composition counts. We flew summer composition surveys 10 July 2000 and classified 3921 caribou - 1858 as cows, 886 bulls, and 1177 calves. We calculated 47% cows, 23% bulls, 30% calves, 48 bulls per 100 cows, and 63 calves: 100 cows.

Distribution and Movements

Most TCH caribou move toward Teshekpuk Lake during May, and most of the pregnant females move into the area northeast, east, and southeast of Teshekpuk Lake to calve in early June (Figure 2). 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. Most TCH caribou winter on the coastal plain on most years, but the wintering location is quite variable and ranges from near Teshekpuk Lake to south of the Brooks Range. The most common area for wintering is the area around Atqasuk.

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. In 1998–1999 most of the herd wintered on the coastal plane between Atqasuk and Teshekpuk Lake. During 1999–2000, most of the herd wintered between Wainwright and Atqasuk, with another segment wintering south of Umiat.

During 2000–2001 most of the herd moved north of Teshekpuk Lake during the July insect season and gradually moved south during late summer and fall. During July 75% of the radiocollared caribou were found north of Teshekpuk Lake. Most of the herd wintered in the Atqasuk/Wainwright/Barrow area, with others spread across the coastal plain and south of Anaktuvuk Pass. Snow melt-off was very late and the spring migration was delayed by 2 to 3 weeks.

During 2001–2002 we were able to track the movements of 7 bull caribou. Four of the bulls moved away from the TCH cows in early October and wintered in the CAH wintering area SE of Anaktuvuk Pass. Two of these bulls returned to the TCH area in the spring, one stayed with the CAH and one was shot on the Colville River, half way between the 2 herds. Most of the cows wintered in the Atqasuk/Wainwright area, with some wintering near Teshekpuk Lake. Snow melt-off was very early during the spring of 2002 and 15 out of 23 of the cows that calved successfully calved north of Teshekpuk Lake (Figure 4)

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 most recent 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 2000–2001 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 2766 TCH caribou harvested in 2000–2001 (Table 5). This represents a 6.1% 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 for collared cows. During most years the mortality rate ranged from 11% to 17% with the average rate for all years being 14%. The highest mortality rate (24%) 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 (Carroll 1999). The lowest mortality rate was in 1998–1999 when 8% of the collared cows died (Table 8). The year 2001–2001 was the first year we had collared bulls and there were no bull mortalities and there was 17% collared cow mortality.

We have recorded sizable caribou die-offs in past years within the range of the TCH. During the winter of 1989–1990, many dead and lethargic caribou were found in an area between Teshekpuk Lake, the Ikpikpuk River, and the Colville River. We estimate approximately 2000–3000 caribou died in this area, but it is impossible to determine how many were from the TCH since caribou from the WAH and the CAH were also present in the area (Carroll 1992). During the winter of 1992–1993 at least several hundred, and probably over 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, Prichard et al. 2001), VHF radiotracking flights, and composition surveys have indicated that the areas to the south, east, and north of Teshekpuk Lake are critical for calving; the area to the north of the lake is critical for insect relief and grazing; and the narrow corridors of land to the east and northwest of the lake are very important for migrating to and from the insect relief area.

In 1997 BLM began a 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, which

includes the 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. In recognition of the importance of the land around Teshekpuk Lake to as crucial habitat for caribou and geese much of it was protected. No leasing was allowed in the area north and east of the lake and no surface structures were allowed in a strip of land to the west and south of the Teshekpuk Lake and around the Kogru River (BLM, 1998).

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 counted 45,166 caribou in a 2002 photocensus, which represents a substantial increase over the 1999 count of 28,627. It seems unlikely that the herd could have grown that quickly, particularly when there was poor recruitment (9%) in 2001–2002 and mediocre recruitment (15%) in 2000–2001. It is more probable that the census in 1999, and possibly the census in 1995 undercounted the population and that the herd has steadily increased since the early 1990s. Previous censuses indicate an increase in the count of 14% per year from 1989 (16,649 caribou) to 1993 (27,686 caribou).

A fairly high recruitment rate and relatively low mortality rate for most years since 1995 appears to have contributed to the recent population growth. Our recruitment results indicated the percentage of short yearlings ranged from 9% to 26% of the population and averaged about 19%. The lowest recruitment rate occurred in 2001–2002 (9%) and was a result of very poor early calf survival when late snow melt-off prevented many of the parturient cows from getting back to the traditional calving area by calving time. The mortality rate was 11% in 2000–2001 and 14% in 2001–2002. It has ranged from 8% in 1998–1999 to 24% in 1996–1997 with an average of about 14%.

TCH caribou have shown great fidelity for the traditional calving area surrounding Teshekpuk Lake and have much higher calving success within the calving area than caribou that are found outside the area. In surveys we have conducted since 1990, 147 out of 163 (90%) of caribou that calved successfully have calved within BLM protected areas that encompass the calving area. Of the 178 caribou that were found within the protected areas, 83% calved successfully. Of the 59 cows that were found outside the protected areas during calving season, 25% calved successfully.

It appears to be very important for the TCH to be able to get to and use their traditional calving area. In 2001 a late snow melt-off prevented many cows from getting back to the traditional calving area in time to calve. This late arrival to the calving area resulted in only 44% of the collared cows being seen with calves, which is the lowest early calf survival for any year we

have recorded. The second lowest year of calf survival was 1997 (53%) when natural conditions also prevented many cows from making it back to the traditional calving area by early June (Carroll 1999). In 2001 the calving success for collared cows that were found in the traditional calving area was much better (76%) than ones that were found outside the area (10%).

The results of several harvest monitoring projects, human population numbers, and caribou distribution data were used to estimate that approximately 2766 TCH caribou were harvested in 2000–2001. This represents a 6.1% harvest of the herd, so the herd will need to maintain a fairly high recruitment rate to sustain this level of harvest in addition to other natural mortality. It is important that development activities do not reduce the productivity of this important subsistence resource.

Due to federal regulations and local opposition to drug use in wildlife capture, helicopters with net guns have been used to capture TCH caribou since 1990. After the caribou were netted, we used blindfolds, hobbles, and ropes to control the caribou. Caribou were measured and weighed and samples were collected while the animals were restrained. In 2001 and 2002 we used a hand held net gun (as opposed to a skid-mounted net gun), which allowed the helicopter pilot to cut in front of caribou, causing the animals to hesitate, and making it possible to shoot the net when the caribou were not running full speed. There were no capture mortalities among the 33 TCH caribou we captured in 2001 and 2002.

Radiotelemetry has been very useful in all aspects of monitoring the TCH and satellite collars have revealed movements within the herd that were previously unknown. The radiocollars have shown that during most years most of the collared caribou winter on the North Slope coastal plain, but that during other years some or most of the herd may winter in a variety of places such as the Anaktuvuk Pass area, or near Cape Lisburne, or as far south as the Seward Peninsula. TCH bulls were collared for the first time in 2001, and 4 out of 7 of the satellite collared bulls wintered in the CAH wintering area southeast of Anaktuvuk Pass. During the spring of 2002, 2 of these bulls returned to the TCH area, one stayed with the CAH and one was harvested midway between the 2 herds. VHF collars have also been very useful, primarily in conducting censuses, composition surveys, and productivity studies.

Using satellite and VHF collars, we have learned that the areas 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; and that there are narrow migration corridors to the east and northwest of the lake that need to be protected. The BLM began the process of opening a planning area in the northeast corner of NPRA to petroleum leasing and development, which includes these crucial 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. However, the critical TCH habitat area also has high potential for petroleum reserves, so the issue may be revisited. It is important to continue surveys in this area so resource managers make informed decisions regarding the habitat of the TCH.

We have provided a variety of educational opportunities for North Slope students. Students have assisted in caribou capture operations, collected samples from captured caribou, and helped with necropsy work. Several school classes have tracked the movements of satellite-collared caribou.

In addition we have given lectures to middle school, high school, and college classes on the biology and population dynamics of caribou.

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, 1978–2002

Year	Population estimate	Average annual rate of change
1978–1982	3000–4000[a]	N/A
1984	11,822[b]	
1985	13,406[a]	N/A
1989	16,649[b]	
1993	27,686[b]	
1995	25,076[b]	
1999	28,627[b]	
2002	45,166[b]	[c]

[a]Derived from visual estimate.
[b]Derived using aerial photocensus.
[c]It is unlikely that the herd increased at this rate. The 1999 count was probably an underestimation and the herd has increased since 1995

Table 2 Teshekpuk caribou herd calving and post-calving composition counts, June–July, 1991–2002

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	3921
2001	44					
2002	74					

[a] Surveys conducted early to mid June
[b] Surveys conducted in July

Table 3 Spring and fall composition data for the Teshekpuk caribou herd, 1990–2002

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
2001(spring)	1168	201	1369	17	15
2001(fall)	1295	163	1458	13	11
2002(spring)	2070	200	2270	10	9

Table 4 Summary of community-based harvest assessments for communities within the range of the Teshekpuk Caribou Herd, 1985–2002.

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
Nuiqsut	2000–2001	468	600	Pedersen (Pers. Com.)
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 2000–2001 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	30	165	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			600	60	360	2000–2001 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					2766	

[a]The Estimated Total Community Harvest was derived from an ADFG Subsistence Division harvest survey that was conducted in Nuiqsut in 2000–2001 (Pedersen, Pers. Com., 2003)

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 radiocollared Teshekpuk Caribou, 1990–2002

Collar Year[a]	Sample Size[b]	Mortalities[c]	Mortality rate[d]
1990–1991	13	2	15%
1991–1992	21	3	14%
1992–1993	21	3	13%
1993–1994	30	4	13%
1994–1995	29	5	17%
1995–1996	31	4	13%
1996–1997	25	6	24%
1997–1998	28	4	14%
1998–1999	39	3	8%
1999–2000	37	5	14%
2000-2001*	45	5	11%
2001-2002**	49	7	14%
Males	9	0	0%
Females	40	7	17%
Totals	374	50	14%

[a] Collar year defined as July 1–June 30.
[b] Sample Size - the total number of active radiocollars used in the analysis at the beginning of the collar year.
[c] Number of radiocollared caribou that died during the collar year.
[d] Mortality rate - Mortalities/Sample Size.
*Beginning in 2000-2001, caribou that were collared with PTT's or VHF radio collars were used in the analysis. Previous to 2000-2001 only VHF collared caribou were used.
**Beginning in 2001-2002, males as well as females were collared

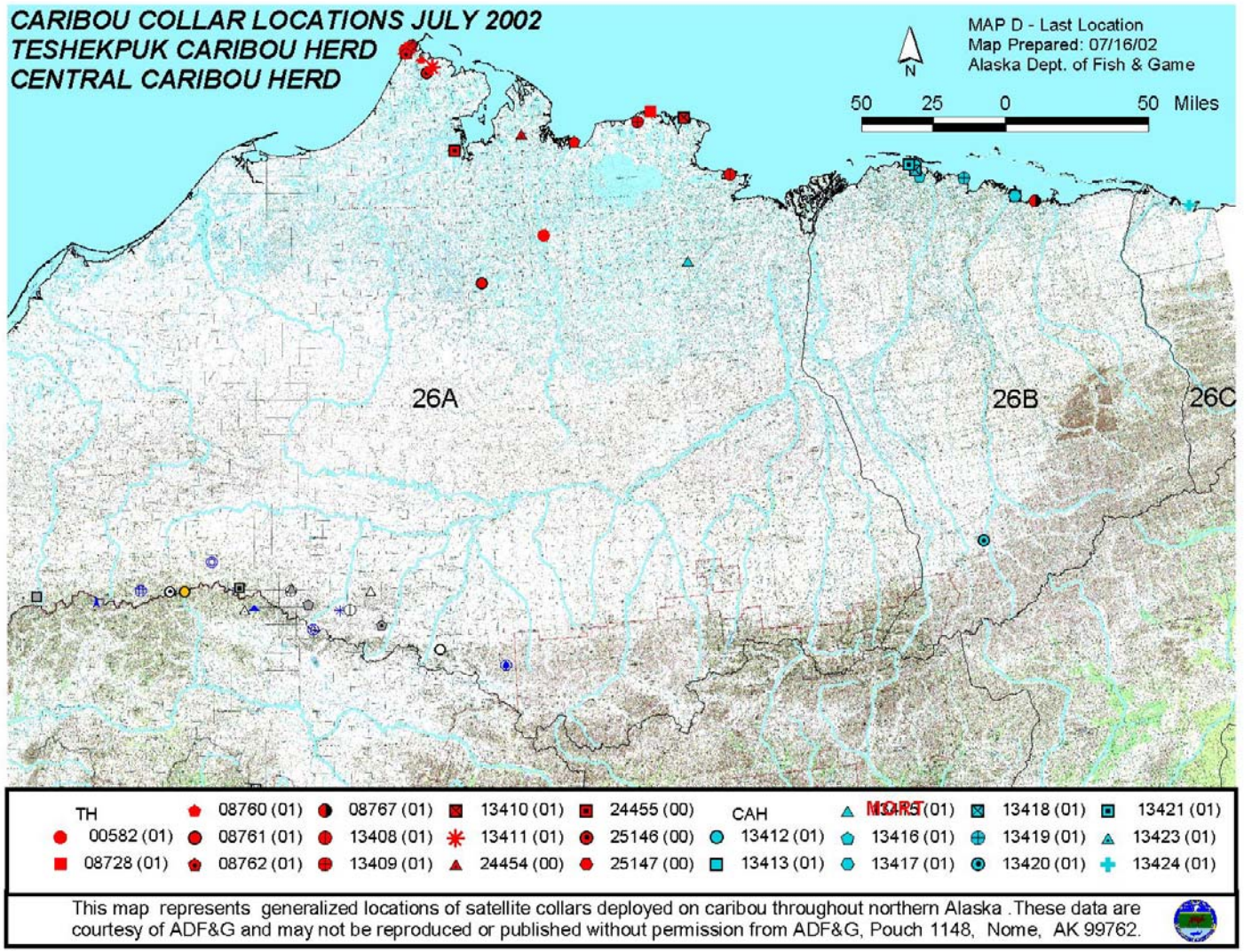

Figure 1 Locations of satellite collared caribou from the TCH (red), the CAH (light blue), and the WAH(purple, yellow, white) on 7/16/2002, the day of the TCH and CAH photocensus. Note: all of the WAH satellite collars were located along the Brooks Range. The CAH caribou shown in the TCH range was a mortality.

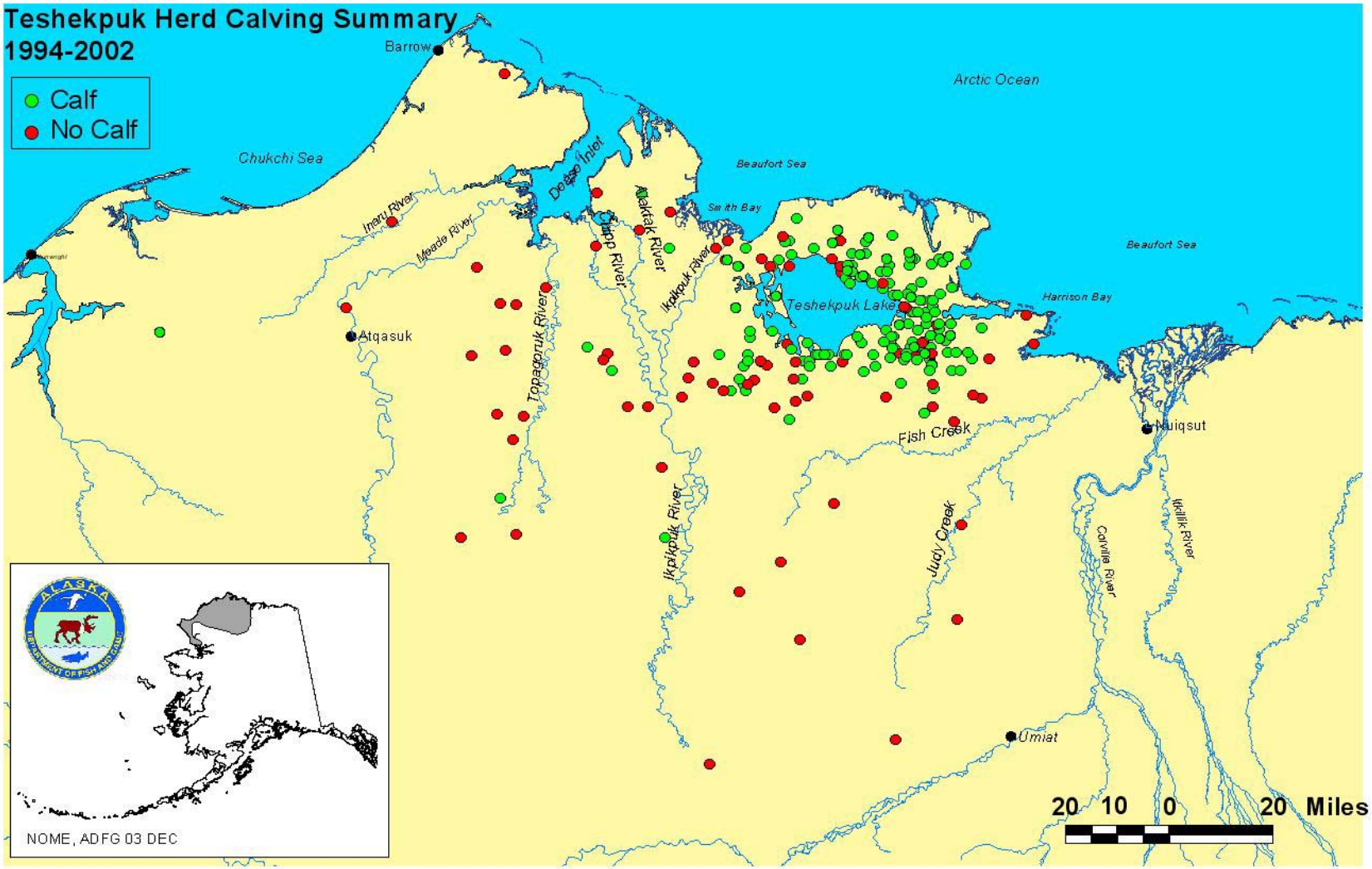

Figure 2 Calving locations of collared TCH cows that calved successfully (produced calves that survived through the end of calving survey observations) and locations of collared cows that did not have calves or had calves that died prior to the end of the calving survey observations from 1994–2002.

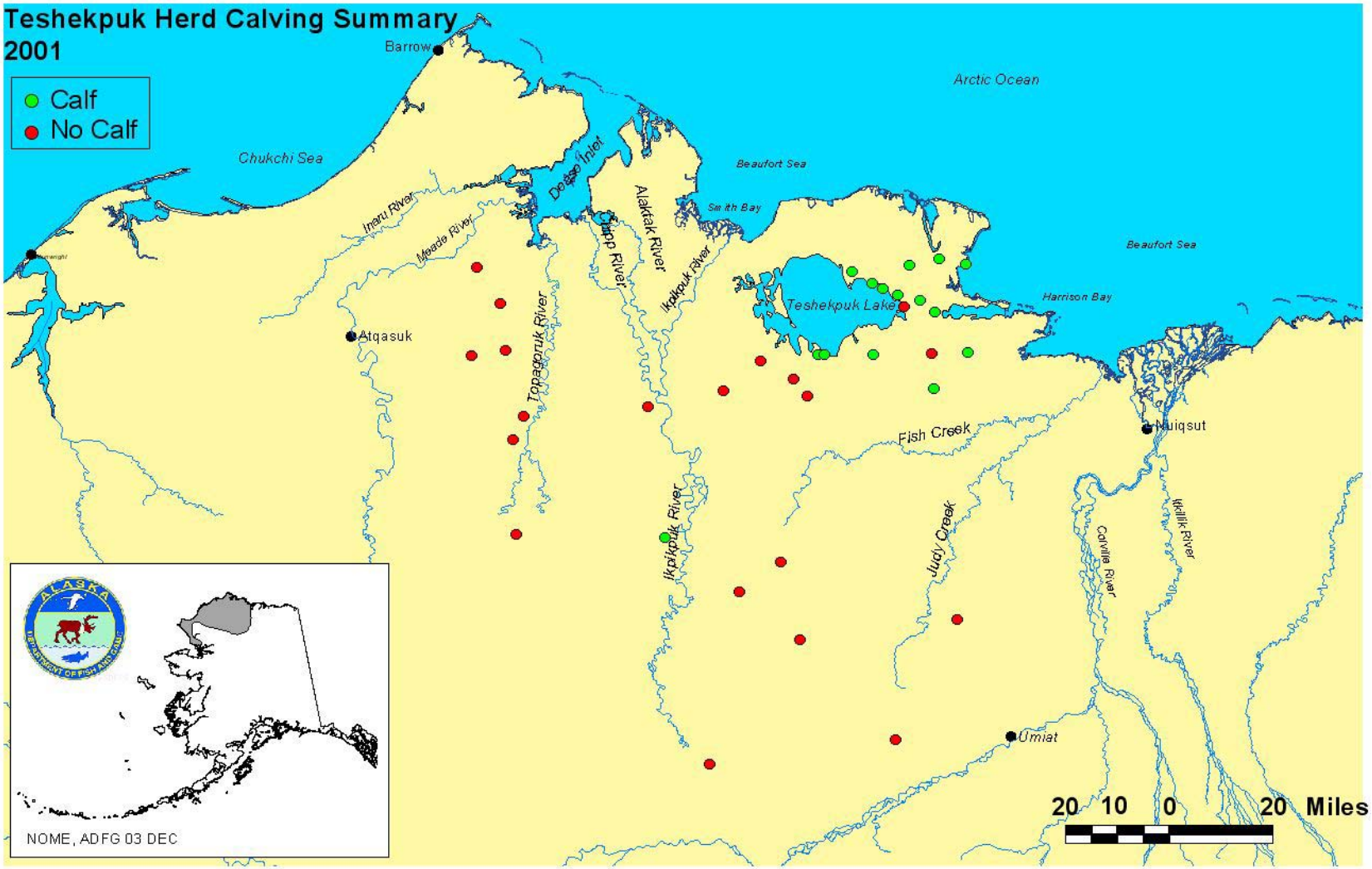

Figure 3 Calving locations of collared TCH cows that calved successfully (produced calves that survived through the end of calving survey observations) and locations of collared cows that did not have calves or had calves that died prior to the end of the calving survey observations in 2001.

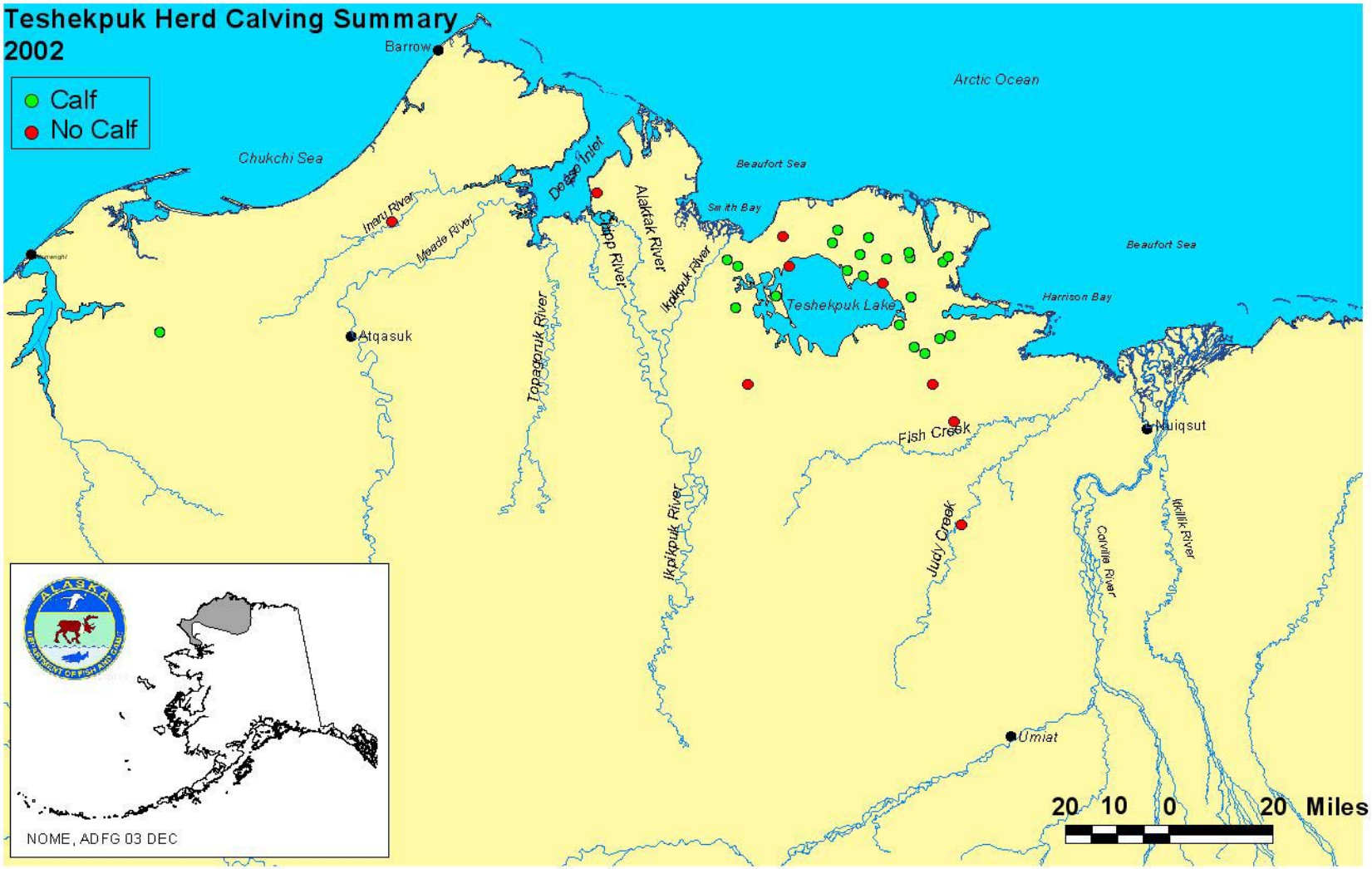

Figure 4 Calving locations of collared TCH cows that calved successfully (produced calves that survived through the end of calving survey observations) and locations of collared cows that did not have calves or had calves that died prior to the end of the calving survey observations in 2002.

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CARIBOU MANAGEMENT REPORT

From: 1 July 2000
To: 30 June 2002

LOCATION

GAME MANAGEMENT UNITS: 26B and 26C (25,787 mi^2)

HERD: Central Arctic

GEOGRAPHIC DESCRIPTION: Central Arctic Slope and Brooks Range

BACKGROUND

In the mid 1970s, the Central Arctic caribou herd (CAH) was recognized as a discrete herd and in 1975 it was estimated at 5000 caribou (Cameron and Whitten 1979). By 1983 the CAH increased to approximately 13,000 and by 1992 to over 23,000 caribou (Valkenburg 1993). In 1995 the herd declined to 18,100 and then stabilized for a few years. By 2000, herd size increased substantially to over 27,000 animals. The recent increase was due to low adult mortality (<10%), high parturition rates (≥90%), and high calf survival to October (≥50: calves:100 cows) during 1998–2000.

Reported harvest on the CAH has changed over time, probably as a result of regulatory modifications and changes in hunting pressure. In regulatory year (RY) 1986 (RY = 1 Jul through 30 Jun, e.g., RY86 = 1 Jul 1986 through 30 Jun 1987), more restrictive regulations were adopted and harvest decreased substantially through RY90. Beginning in RY91, harvest and hunting pressure increased on the CAH probably because (1) hunting was severely restricted on several Interior Alaska caribou herds (e.g., Delta, Macomb, Fortymile) which displaced hunters to hunt the CAH and (2) the CAH was accessible by road because the Dalton Highway was officially open to traffic in 1991. Reported harvest increased moderately in RY00. Some of this increase was by bowhunters using the Dalton Highway.

The CAH'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. 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.

Within the range of the CAH, oil exploration and development began in the late 1960s and continues to the present. Beginning in the late 1970s, the Alaska Department of Fish and Game (ADF&G) implemented long-term studies on population dynamics, distribution, movements, and

effects of development on the CAH. During the 1980s calving activity was rare in the Prudhoe Bay oilfield where it was known to occur before development (Whitten and Cameron 1985). In addition, 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*a, b*; 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. Beginning in 2001, research efforts were renewed to look at the effects of oilfield development on calf production and survival (Arthur 2002).

MANAGEMENT DIRECTION

Some of the CAH management goals and objectives were developed in response to concerns arising from research conducted during 1978–1993. Based on the hypothesis that displacement of sufficient magnitude would be harmful to the CAH (Cameron 1983), we worked with the oil industry to minimize disturbance to caribou movement due to physical barriers created by oil development. In addition, given that stress is cumulative, ADF&G reduced hunting activity in areas adjacent to the oilfield and the Dalton Highway and also restricted the cow harvest. The current management objectives reflect these concerns. In addition, 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 (5 AAC 92.108).

MANAGEMENT GOALS

Goal 1 Minimize the adverse effects of development on CAH caribou.

Goal 2 Maintain a CAH population level that will support a harvest of at least 600 caribou without precluding population growth.

Goal 3 Provide the opportunity for a subsistence harvest of CAH caribou.

Goal 4 Maintain opportunities to view and photograph CAH caribou.

MANAGEMENT OBJECTIVES

Objective 1 Maintain a population of at least 18,000–20,000 caribou. (Goals 1, 2, 3)

Objective 2 Maintain accessibility of seasonal ranges for CAH caribou. (Goal 1)

Objective 3 Maintain a harvest of at least 600 caribou if the population is ≥18,000 caribou. (Goal 2)

Objective 4 Limit the annual harvest of cows to a maximum of 3% of the cows in the population. (Goals 1, 2, 3)

Objective 5 Maintain a ratio of at least 40 bulls:100 cows. (Goals 1, 2, 3)

Objective 6 Reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway. (Goal 3)

MANAGEMENT ACTIVITIES

- Conduct a photocensus every 2–3 years. (Objective 1)
- Conduct annual fall composition counts. (Objectives 3, 4, 5)
- Radiocollar 10–20 yearling females every 1–2 years. (Objectives 1 and 2)
- Radiotrack during early summer, fall, and winter to determine seasonal distribution. (Objectives 1 and 2)
- Radiotrack and estimate parturition rate and late June calf:cow ratios for radiocollared females. (Objective 1)
- Monitor harvest through harvest ticket reports and Division of Subsistence harvest surveys. (Objectives 3 and 4)
- Work with the oil industry and other agencies to minimize disturbance to caribou from resource development. (Objectives 1 and 2)
- Regulate hunting to maintain a maximum annual harvest rate of 3% of cows in the population. (Objective 4)
- Regulate caribou hunting along the Dalton Highway to reduce conflicts between consumptive and nonconsumptive uses. (Objective 6)

METHODS

POPULATION STATUS AND TREND

Population size

Population size was estimated in July 1997, 2000 and 2002 using the modified aerial photo-direct count technique (Davis et al. 1979). Postcalving aggregations of caribou were located by radiotracking collared animals. These aggregations usually occurred when temperatures were >55°F and wind was <8 mph. Groups of caribou were photographed with a Ziess RMK-A 9×9-inch aerial camera mounted in a DeHavilland Beaver aircraft. Caribou were counted directly from photographs.

Parturition and early calf survival (survival to 2 weeks) data were stratified as Unit 26B West (west of the west bank of the Sagavanirktok River) or Unit 26B East (east of the Sagavanirktok River) because Cameron (ADF&G [retired], unpublished data) estimated that 80% of CAH cows maintain fidelity to these calving areas from year to year. These 2 calving areas may not be

totally separate, but are nonetheless somewhat distinct. Because some overlap does occur, we arbitrarily chose the Sagavanirktok River as 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.

Parturition rate was determined by observing radiocollared females ≥2 years old from a fixed-wing aircraft during the first half of June. Caribou observed with calves, hard antlers, or distended udders were classified as parturient (Whitten 1991). During 1988–1993, caribou were relocated 2–3 times during 30 May–15 June. Beginning in 1995, caribou were located once and the target date was pre-peak calving between 3–9 June. Since 1994, parturient caribou may have been missed because the cow did not have hard antlers and the udder was not distended and (1) calves were born early and died or (2) calves were born late and not observed. Data were stratified based on the location of caribou east and west of the Sagavanirktok River (as described above) using locations from the current summer.

The proportion of calves:100 cows were determined by observing radiocollared females ≥2 years old from a fixed-wing aircraft after most calving should have occurred. If a cow was observed with a calf, she was classified as “with calf.” If distended udders were detected but no calf was seen, we assumed the cow had recently lost a calf and she was classified as "without calf.” During 1988–1994, calves:100 cows were determined from the last half of June through mid August and since 1994, calves:100 cows were determined during 15–30 June. This technique provides an indication of early calf survival and is referred to as late June calf:cow ratios. In addition, data were stratified based on the location of caribou east and west of the Sagavanirktok River (as described above) using locations from the current summer.

Parturition rates and the proportion of calves:100 cows were calculated for 3 categories: known–age females, females ≥4 years old, and “sexually mature” females. “Sexually mature” females were those 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). Data for “sexually mature” females were stratified based on the location of caribou east and west of the Sagavanirktok River and included only those animals located on the same side during the previous and current summer. Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River during the current summer.

We used logistic regression to compare parturition rates and the proportion of calves:100 cows 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 at $\propto = 0.05$. We allowed the Akaike Information Criterion to choose the best model (Akaike 1973).

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 through 2000 using methods described in Lenart 2001.

Fall composition was estimated from a helicopter in mid October 2000, 2001, and 2002. Caribou were classified as cows; calves; and small, medium, or large bulls. Fall composition surveys were not conducted during 1997–1999 because of poor weather.

Distribution and Movements

Distribution of the CAH was monitored during calving, postcalving, summer, rut, and winter by relocating radiocollared females during June, July, mid October, and late March or early April.

HARVEST

Harvest and hunting pressure by Alaska residents 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 harvested by residents of Kaktovik and Nuiqsut. Caribou harvested by hunters from Nuiqsut included animals from the Teshekpuk and Western Arctic caribou herds, as well as some CAH caribou.

A hunter checkstation was operated on the Dalton Highway near the Yukon River Bridge during August and September 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

In July 2002 we estimated 31,857 caribou based on a photocensus conducted during the postcalving aggregation. This represented a 17% increase (8.5% annually) from the July 2000 estimate of 27,128 (Table 1). The CAH has been increasing substantially since 1997 when the herd was estimated at 19,730 caribou. Population modeling indicates this increase can be accounted for by the high parturition rates, high early summer calf survival, and low adult mortality observed during this period (Tables 2, 3, and 4).

Parturition rates of radiocollared females ≥4 years old for all of Unit 26B increased significantly during 1994 through 2002 (P = <0.0025). Parturition rates were low in 1995 and 1997 (<65%) when the herd was declining or stable, but by 1998 they exceeded 85%. These high parturition rates contributed to the increase in population size observed in the 2000 and 2002 censuses (Tables 1 and 2). Parturition rates of "sexually mature" females were similar to females ≥4 years old (Table 2). Parturition rates for 3-year-olds also were high during 1998–2002 (≥75%), although sample sizes were small (n = 4–13; Table 4). A high parturition rate, particularly in 3-year-olds, is indicative of good nutritional condition; although variability in parturition rates can be relatively high among 3-year-old cows (Valkenburg et al. 2000). In 1995, when the

population appeared to decline somewhat, no 3-year-old females were pregnant (n = 4) and parturition rates for females ≥4 years old was also low (56%, Tables 1 and 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.

In Unit 26B West, the parturition rate was considerably higher than in Unit 26B East in 1995 and 1997 (Table 2). However, over time (1994–2002) using the Common-Slope-Intercept Model, these parturition rates did not differ between west and east (P = 0.73), and there was no significant area/year interaction (P = 0.10). Yet, for years 1988–1994 Cameron (1995) and Cameron et al. (2002) detected a significantly lower mean parturition rate in Unit 26B West than in Unit 26B East (P = 0.003; Table 2). This occurred during part of the period when the herd was declining (1992–1995).

Late June calf:cow ratios of radiocollared females ≥4 years old in all of Unit 26B also increased during 1994–2002; although the change was not statistically significant (P = 0.17). Similar to parturition rates, late June calf:cow ratios were lower (<65%) during years when the herd was declining or stable than in years when the herd was increasing (1998–2002, ≥75%). This indicated a consistently high early calf survival during the past 6 years, which also contributed to the increase in population size observed in 2000 and 2002 (Table 3). 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. Late June calf:cow ratios for "sexually mature" females were similar to those observed for females ≥4 years old (Table 3). During 1998–2002, variability in calf:cow ratios was higher for 3-year-olds than for the overall sample in the herd (33–60%, Table 5). This suggests that calves born to 3-year-olds tend to have lower survival rates, although our sample sizes were small (n = 4–12).

Late June calf:cow ratios for radiocollared females ≥4 years old were considerably higher in Unit 26B West than in Unit 26B East in 1995 and 1997, similar to differences observed with parturition rates. However, logistic regression using a Null Model indicated that there were no significant differences due to area (east or west) or area/year interaction for females ≥4 years old during 1994–2002 (Table 3).

Although our analyses used the Sagavanirktok River to separate Unit 26B West and Unit 26B East, 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 a 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.

Population Composition

We estimated 72 calves:100 cows during calving ground transect surveys in both 1997 and 2000 in all of Unit 26B (Table 1). Estimated calf:cow ratios in Unit 26B West were 69:100 during 1997 and 72:100 during 2000. 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.

The fall composition survey in October 2002 indicated a bull:cow ratio of 67:100 and a calf:cow ratio of 72:100 (Table 6). Bull:cow ratios have been high since 1976 (>50:100). These high bull:cow ratios indicate that harvest has had little effect on sex ratios. Calf:cow ratios have been high since 2000 (>50:100), indicating that summer calf survival rates were relatively high in 2000, 2001, and 2002. The calf:cow ratio was extremely high in 2000 (72:100), but this number may be inaccurate, because the sample size was considerably smaller than sample sizes in 2000 and 2001 (Table 6). Nonetheless, calf survival during summer 2002 was very good. During the fall 2002 survey the calves appeared healthy and fat. Summer 2002 was cool and cloudy and had less abundant insects than other years. Cloudy summers can increase quality of forage for caribou (e.g., nitrogen content; Lenart et al. 2002) and cool summers can decrease insect harassment, which allows more time for foraging (Mörschel and Klein 1997). The composition surveys occurred in the Brooks Range in the Chandalar Shelf, Atigun Pass, Galbraith Lake, and upper Sagavanirktok River areas.

Distribution and Movements

The proportion of the CAH that calved southwest of the Kuparuk oilfield appeared 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 springs 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 (Dau 1986). 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. Observations indicate that postcalving distribution and movements during July did not vary significantly during 1994–2002, with caribou distribution depending on weather conditions. Radiotracking data in conjunction with an ongoing research project corroborate these observations for 2001 and 2002 (ADF&G files). 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. In 2002, caribou persisted on the coastal plain through August and the first week of September because of warm weather. By mid September, most of the caribou were headed for the foothills of the Brooks Range.

During the October rutting season in 2000 and 2001, large concentrations of caribou were on the Chandalar Shelf in Your and Thru Creeks and the North Fork and Middle Fork Chandalar River on the south side of the Brooks Range. On the north side of the Brooks Range, caribou were located around Galbraith Lake, Accomplishment Creek, and in the upper Sagavanirktok River. These areas represent a portion of the rutting area, as we do not radiotrack the entire herd during rut.

Many Central Arctic caribou wintered in the Chandalar Shelf area and east into the Wind River drainage, and in the Tinyaguk and upper North Fork Koyukuk Rivers during the mid 1990s (ADF&G files). In RY00, RY01, and RY02, most of the herd wintered east of the Dalton Highway with 1/3–1/2 on the north side of the Brooks Range in the upper Sagavanirktok, Accomplishnent, and Lupine Rivers with some caribou distributed throughout as far east as the Canning River. Caribou were also found near Galbraith Lake and Slope Mountain and sparsely distributed west along the foothills to Anaktuvuk Pass. On the south side of the Brooks Range, 1/2–2/3 wintered from the North Fork Chandalar to Wind River with some groups as far south as Ackerman Lake. Large concentrations (≈5,000+) were found in Your and Thru Creeks and some CAH animals also wintered in the Tinyaguk River and Glacier and Hammond Creeks, west of the Dalton Highway. In RY02, many caribou were distributed across the coastal plain, west of the Dalton Highway; approximately 2500–3500 caribou wintered along the Kuparuk River. We suspect that the caribou west of the Dalton Highway were a mixture of Teshekpuk, Western Arctic, and Central Arctic caribou, as some radio collars from each herd were found there. However, for all 3 years ≥90% of the CAH radio collars were heard or located east of the Dalton Highway. March 2003 experienced heavy snows on the south side of the Brooks Range and it appeared that the spring migration north was delayed.

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. However, harvest in units other than Unit 26B (e.g., Unit 25A) was recorded as harvest for a different herd (e.g., PCH). In addition, 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–RY02).

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 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 Jul–30 Apr; 2 bulls

Unit/Location	Resident Open Season/Bag Limit	Nonresident Open Season/Bag Limit
	1 Oct–30 Apr.	
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 which encompasses most of the Prudhoe Bay oilfield. 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.

Alaska Board of Game Actions and Emergency Orders. During the 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 have remained the same since 1996.

Hunter Harvest and Success and Residency. During RY01, 918 hunters reported hunting caribou in the CAH range and 507 hunters reported harvesting 515 caribou. Reported harvest was considerably higher in RY00 and RY01 than in the previous 7 years (Table 7). Since 1984, harvest in the CAH has fluctuated. The change in harvest over time 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 through RY90. In RY90 hunting restrictions were implemented on several Interior Alaska caribou herds (e.g., Delta, Macomb, Fortymile), and hunters were displaced. Many of these hunters began hunting the CAH because they are accessible by road. 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 and number of hunters increased in RY97 and continued to increase thereafter.

Hunter success has always been good for the Central Arctic Herd (≥40% and frequently ≥50%; Table 7). Lower success rates (<49%) began in RY98 when reminder letters were sent out to hunters to remind them to send in their report cards. This likely prompted unsuccessful hunters to turn in their report cards; thus the reported success rate after RY97 probably more closely reflects the actual success rates compared to years before RY97.

A small proportion of hunters were nonresidents (12–19%) during RY92–RY01, and they took 16–24% of the harvest (except in RY95 when they took 37%). Nonresident hunters were highly successful (57–88% success). Nonlocal resident hunters during the same period also had good success (37–54%). Harvest by local residents (residents of Units 24, 25, 26; particularly Nuiqsut and Kaktovik residents) was estimated at 200–250 caribou annually. However, it is difficult to accurately assess 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.

Reported harvest of cows was low during RY92–RY01 (16–32 cow caribou). The harvest of cows by local residents was estimated at 22% of the estimated total harvest of 200–250 caribou. This was based on several years data (1985, 1992, 1993, 1994, 1999) from the Nuiqsut Subsistence Caribou Harvest Surveys which is a cooperative effort of the City of Nuiqsut, Kuukpik Corporation, Native Village of Nuiqsut, North Slope Borough, and Division of Subsistence, Alaska Department of Fish and Game (ADF&G files).

Bowhunters accounted for 37% of the harvest in RY01. The number of caribou harvested by archers was higher during RY97–RY01 ($\bar{x}$ = 36%) than during the previous 5 years (RY92–RY96; $\bar{x}$ = 27%; 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 bowhunters using the DHCMA.

Harvest Chronology. During RY92–RY01, most reported harvest occurred in August (41–61%; Table 8). The remaining harvest occurred primarily in September and October. During RY97–RY00 the proportion of harvest in August was higher ($\bar{x}$ = 55%) than in the 4 previous years ($\bar{x}$ = 45%; RY92–RY96), probably because of the increase in hunters 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 ($\bar{x}$ = 23%, RY92–RY96) than in subsequent years ($\bar{x}$ = 19%, RY97–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. In RY01, a substantial increase in the proportion of harvest occurred in October (25%). This was probably related to warmer weather persisting into October during fall 2001. A small number of caribou were taken in late winter and spring, primarily in March and April (1–5%).

Harvest by Nuiqsut residents occurs in July, August, and September and in March and April. A little over 50% of the harvest occurs in summer and fall. 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 RY92–RY01, the proportion of hunters using highway vehicles was stable, ranging from 57 to 70%. 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 2 years. Residents of Unit 26 used boats during summer and fall and snowmachines during the spring months. Nuiqsut residents primarily hunted from the Colville River and Fish Creek in Unit 26A during summer and Kaktovik residents hunted along the coast to Camden Bay (ADF&G files; 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 and snowfall is heavier. However, there have been no studies of predation rates on the CAH. During the 5 years from RY97–RY01 we confirmed 3 (3%), 1 (2%), 8 (9%), 15 (14%) and 4 (5%) mortalities among cow caribou with functioning radio collars.

CONCLUSIONS AND RECOMMENDATIONS

High parturition rates, high late June calf:cow ratios, and low adult mortality during 1998–2002 contributed to an increase of approximately 61.5% in the Central Arctic caribou herd in 5 years (Tables 1, 2, and 3). Harvest increased in RY00 and RY01, 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 bowhunters also increased in recent years. Hunters residing in Unit 26 used boats, with approximately half of the harvest occurring in July, August, and September and the other half of the harvest occurring in March and April by use of snowmachine. Although herd size has increased and harvest has remained somewhat stable with a slight increase in RY00 and RY01, the CAH has provided substantial hunting opportunity and we recommend no regulatory changes.

We met our first goal to minimize adverse effects of development on caribou by working with CONOCO–Phillips Alaska, Inc. in developing mitigation measures for a new road that was built on the western edge of the calving grounds in Unit 26B West. We met our second goal to maintain a population level that will support a harvest of at least 600 caribou without precluding population growth because the herd is growing and harvest exceeds 600. We met our third goal of maintaining an opportunity for a subsistence harvest by providing liberal hunting seasons. We met our fourth goal to maintain viewing and photographing opportunities because these opportunities were adequate when taking into account the unpredictability of caribou movements.

Our first and third objectives to maintain a population of at least 18,000–20,000 caribou and a harvest of at least 600 caribou if the population is ≥18,000 caribou was met because in 2002 population size was 31,857 caribou and for RY01, reported and estimated harvest combined was 765 caribou. We also met our fourth objective of limiting the annual harvest of cows to a maximum of 3% of the cows in the population because cow harvest has been <1% since RY92. This was partially accomplished by maintaining a bulls-only season during the time of year when hunting pressure is highest. We met our fifth objective to maintain a ratio of at least 40 bulls:100 cows because the ratio has been high since RY92 (>60 bulls:100 cows). We met our second objective to maintain accessibility of seasonal ranges for CAH caribou because based on radiotelemetry and anecdotal observations, CAH animals were able to access their calving, postcalving, summer, fall, and winter ranges. We met our sixth objective to reduce conflicts between consumptive and nonconsumptive uses of caribou along the Dalton Highway because in 2002 the board established the North Slope Closed Area, which is closed to big game hunting for ¼ mile on either side of the highway in Unit 26B.

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TABLE 1 Central Arctic Herd caribou calving composition on the calving grounds[a] and estimated population size, 1978–2002

	Calving composition survey						Population survey	
Year	Day/ Month	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
2002							16 Jul; APDC	31,857

[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, 1988–2002

		Percent parturition by subunit									
		≥4 years old[a]						Sexually mature[b, c]					
Year	Date	26B West (*n*)		26B East (*n*)		All 26B (*n*)		26B West (*n*)		26B East (*n*)		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)
2002	4–7 Jun	83	(29)	92	(25)	87	(54)	87	(16)	100	(17)	92	(39)

[a] Data for females ≥4 years old were stratified based on the location of caribou east and west of the Sagavanirktok River using locations from the current summer.

[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 Unit 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.

TABLE 3 Central Arctic Herd caribou late June and summer calf cow ratios (calves:100 cows)[a] of radiocollared females ≥4 years old, 1988–2002

		Late June calf cow ratios (calves:100 cows) 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)
2002	23–25 Jun	75	(28)	83	(24)	79	(52)	82	(17)	88	(17)	82	(40)

[a] Late Jun calves:100 cows was estimated during 15 Jun–30 Jun for years 1994–2002. Summer calves:100 cows was estimated during 15 Jun–15 Aug 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 using locations from the current summer.

[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 Unit 26B) may exceed the combination of Unit 26B West and Unit 26B East.

TABLE 4 Central Arctic Herd caribou known-age percent parturition of radiocollared females, 1994–2002

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)
2002	4–7 Jun	0 (0)	83 (12)	75 (12)	100 (9)	100 (20)

TABLE 5 Central Arctic Herd caribou known-age late June calf cow ratios (calves:100 cows) of radiocollared females, 1994–2002

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)
2002	23–25 Jun	0 (0)	57 (14)	75 (12)	100 (11)	81 (21)

TABLE 6 Central Arctic caribou herd fall composition counts, 1976–2002

Survey date	Bulls:100 cows	Calves:100 cows	Percent calves	Percent cows	Percent small bulls (% bulls)	Percent medium bulls (% bulls)	Percent large bulls (% bulls)	Percent bulls	Composition sample size
Oct 1976	122	44	17	38				46	1223
Oct 1977	118	55	20	37				43	628
Oct 1978	96	58	23	39				38	816
Oct 1980	132	49	18	35				47	1722
Oct 1981	81	64	26	41	22	41	36	33	1712
16–18 Oct 1992	96	47	19	41	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
24 Oct 2002[a]	67	72	30	42	36	43	21	28	1732

[a] This survey was conducted later in the fall than usual and caribou were more widely distributed; thus we were unable to obtain a large sample size.

TABLE 7 Central Arctic Caribou Herd harvest and hunter success, regulatory years 1984–1985 through 2001–2002

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	40	200–250	515–565
1999–2000	343	17	2	362	(136)	722	43	200–250	562–612
2000–2001	464	28	1	493	(215)	808	51	200–250	693–743
2001–2002	495	16	4	515	(192)	918	47	200–250	715–765

[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 2001–2002[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
2001–2002	28 (5)	217 (42)	117 (23)	127 (5)	7 (1)	0 (0)	0 (0)	2 (<1)	5 (1)	7 (1)	0 (0)	0 (0)	5	515

[a] Includes only harvest from harvest report cards.

TABLE 9 Central Arctic caribou herd successful hunter transport methods, regulatory years 1992–1993 through 2001–2002

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 (<1)	0 (0)	302 (61)	5 (1)	493
2001–2002	108 (21)	7 (1)	68 (13)	1 (<1)	0 (0)	4 (<1)	324 (63)	3 (<1)	515

[a] Includes airboats.

The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge and attitudes for responsible hunting.

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