Moose
Management Report
of survey-inventory activities
1 July 1999–30 June 2001

Carole Healy, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2002

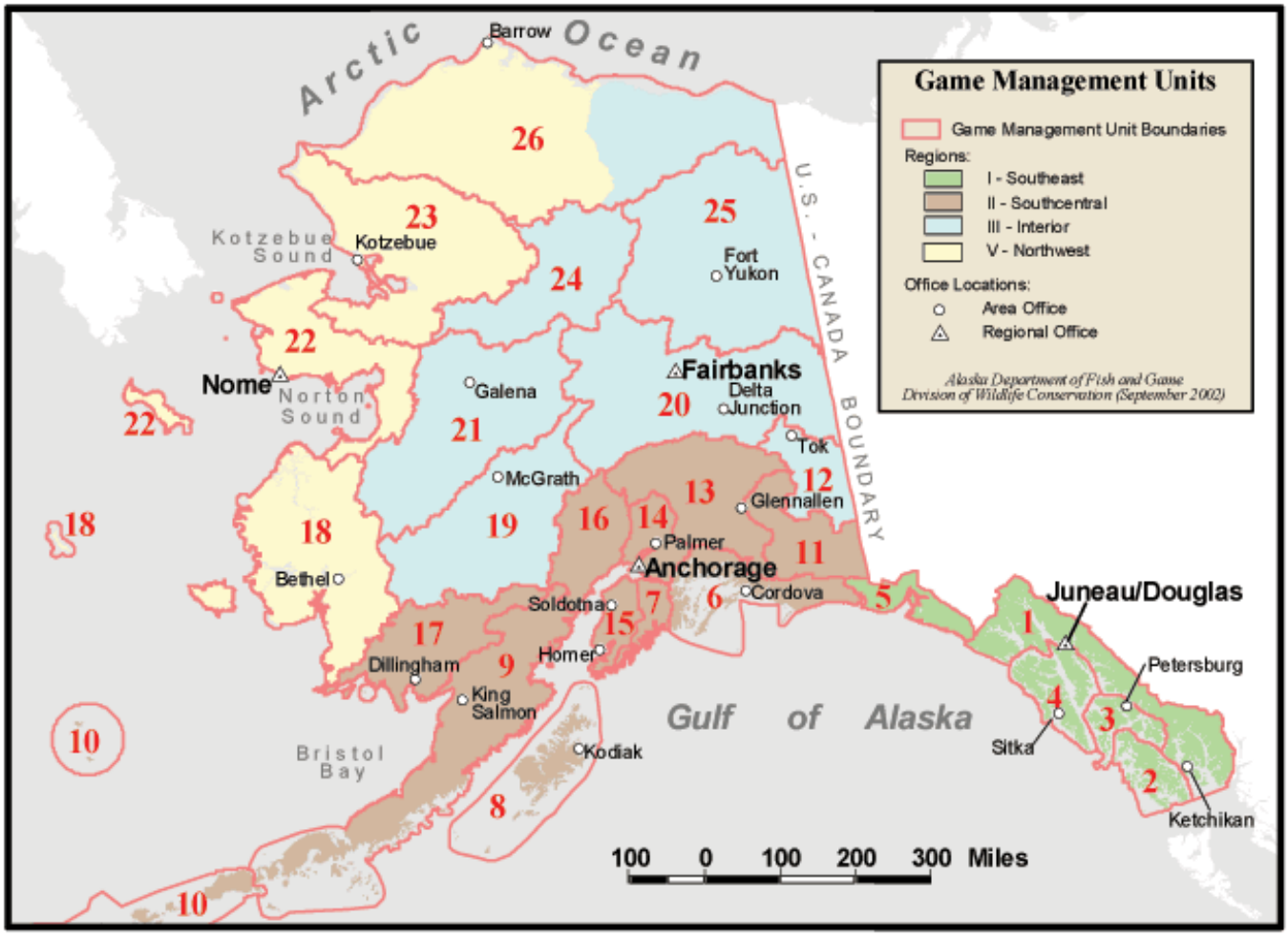
ADF&G

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

If this report is used in its entirety, please reference as: Alaska Department of Fish and Game. 2002. Moose management report of survey-inventory activities 1 July 1999–30 June 2001. C. Healy, editor. Project 1.0. Juneau, Alaska.

If used in part, the reference would include the author's name, unit number, and page numbers. Authors' names and the reference for using part of this report can be found at the end of each unit section.

Funded in part through Federal Aid in Wildlife Restoration, Proj. 1, Grants W-27-3 and W-27-4.


Arctic Ocean
Barrow
Kotzebue Sound
Kotzebue
Nome
Norton Sound
Galena
McGrath
Bethel
Fairbanks
Delta Junction
Fort Yukon
Tok
Glennallen
Palmer
Anchorage
Cordova
Soldotna
Homer
Dillingham
King Salmon
Kodiak
Bristol Bay
Gulf of Alaska
Juneau/Douglas
Petersburg
Sitka
Ketchikan
U.S. - CANADA BOUNDARY
100 0 100 200 300 Miles
Game Management Units
Game Management Unit Boundaries
Regions:
I - Southeast
II - Southcentral
III - Interior
V - Northwest
Office Locations:
Area Office
Regional Office
Alaska Department of Fish and Game
Division of Wildlife Conservation (September 2002)

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

MOOSE MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 18 (42,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Yukon-Kuskokwim Delta

BACKGROUND

Moose were thought to have begun immigrating to the Yukon-Kuskokwim Delta during the mid-to-late 1940s. Local elders from the Yukon River have confirmed this timing. The Yukon population occupies most of the available riparian habitat and the population is growing. The Kuskokwim population is small and is still in the process of colonizing the available riparian habitat. Most of the Yukon-Kuskokwim Delta is lowland treeless tundra, which is not suitable as winter habitat for moose. During the winter, moose are generally confined to riparian zones (forest and willow habitats) along the major rivers.

Moose densities are moderate and growing in the Yukon River drainage, but very low throughout the entire lower Kuskokwim River drainage. Although moose are now more common than in the past, overall densities are low in Unit 18 relative to habitat availability.

Heavy hunting pressure from communities along the Kuskokwim River has effectively limited moose population growth along that riparian corridor. While moose population growth along the Yukon River had been slowed for similar reasons, compliance with hunting regulations has improved and moose populations there have responded. Extensive habitat is available for moose colonization and range expansion along most of the lower Kuskokwim River and larger tributaries. Moose densities in adjacent Units 17, 19 and 21E remain higher than moose densities in Unit 18.

The boundaries of Unit 18 and those of the Yukon Delta National Wildlife Refuge nearly coincide. The southern tip of Unit 18 is within the Togiak National Wildlife Refuge. ADF&G shares common interests with the Refuge and we regularly cooperate during surveys, field projects, and public meetings.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Allow the Unit 18 moose populations to increase to the levels the habitat can support.
- Maintain healthy age and sex structures for moose populations within the Yukon and Kuskokwim River drainages.
- Determine population size, trend, and composition of Unit 18 moose populations.
- Achieve a continual harvest of bulls without hindering population growth.
- Improve harvest reporting and compliance with hunting regulations.
- Minimize conflicts among user groups interested in moose within and adjacent to Unit 18.

MANAGEMENT OBJECTIVES

- Allow the lower Yukon River moose population to increase above its estimated size of 2,500–3,000 moose. Allow the lower Kuskokwim River moose population to increase above its estimated size of 150–250 moose to at least 2,000 moose.
- Maintain the current age and sex structure for both populations, with a minimum of 30 bulls: 100 cows.
- Conduct seasonal sex and age composition surveys as weather allows.
- Conduct winter censuses and recruitment surveys in the established survey areas on a rotating basis.
- Conduct fall and/or winter trend counts to determine population trends.
- Conduct hunts for bulls consistent with population goals.
- Improve knowledge of and compliance with harvest reporting requirements and hunting regulations through education and incentives.
- Address user conflicts through education and hunter contacts.

METHODS

We monitor moose harvests and hunting activity in Unit 18 using hunter check stations and harvest tickets/reports. In 1999 and 2000 from late August through September we operated a hunter check station at Paimiut Slough along the Yukon River near the border of Units 18 and 21E. In 2000, we contacted Unit 18 hunters within the Kuskokwim River drainage by boat. Whenever possible, we collect incisors for aging and take antler measurements. Hunter participation is voluntary.

We've conducted an incentive program to encourage hunters to turn in their harvest reports annually since 1998. Local license vendors donated prizes and the department purchased prizes that were randomly distributed to hunters selected from a list of those who returned harvest reports. Prizes had values up to $200. We held the drawing in August just prior to the upcoming hunting season.

Prior to 1999, censuses were conducted using methods developed by Gasaway et al. (1986). Beginning in 1999, we've conducted moose censuses using census methods developed by Ver Hoef (1998, personal communication). The survey boundaries using Gasaway methods and Ver Hoef methods are shown in figures 1 and 2. Each area is scheduled to be censused on a rotational basis and will be modified to accommodate the newer methods in turn. The census areas are delineated within Unit 18 as follows:

- Paimiut Area: The Yukon River from Pilot Station upriver to old Paimiut Village, previously censused in late February and early March 1992 and again in winter 1998.

- Lower Kuskokwim Area: The Kuskokwim River corridor between Kalskag and Kwethluk, previously censused in March 1993, and again surveyed in winter 2000.

- Lowest Yukon Area: The Yukon River downstream from Mountain Village, where moose populations on 1700 square miles of forested habitat were estimated with intensive surveys in March 1994.

- Andreafsky Area: The Yukon River from Pilot Station downstream to Mountain Village, previously censused in March 1995 and again in winter 1999.

- NYAC Area: The uplands of the eastern tributaries of the lower Kuskokwim River. This census area was delineated for a Gasaway style survey but has not yet been surveyed. Delineation for a Ver Hoef style survey is pending.

We continued discussions of a cooperative strategy to improve the moose population along the Lower Kuskokwim River with the Lower Kuskokwim Fish and Game Advisory Committee, the Association of Village Council Presidents, interested individuals, and the Fish and Wildlife Service.

We provided public information and education through public service announcements made available to the media, regular newspaper articles, and informal hunter contacts. We distributed coffee cups (emblazoned with an educational logo portraying the potential production of one cow moose) to hunters, advisory committee members, village leaders, Board of Game members, and others influential with hunters. This "moose circle coffee cup" has become a valuable focus for our educational efforts.

We provided enforcement information to the Fish and Wildlife Protection Troopers (FWP) in Bethel and Aniak. The Bethel FWP position, which was vacant during the previous reporting period, was filled and a supervisory position was transferred to Bethel. Consequently, our cooperation with FWP increased during this reporting period.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We conducted a moose population census in the Lower Kuskokwim survey area in March 2000 (Figure 2). We surveyed 36 of 36 high-density strata and 24 of 105 low-density strata from March 8 through March 12. The midpoint of the population estimated was 84 ±29.7% at the 95% confidence interval.

The Lower Kuskokwim survey area was previously censused in 1993. Observers found 216 ±44.6% moose (95% confidence interval). The available census methods are not robust at extremely low densities. It is more appropriate to interpret these data as revealing persistent, extremely low moose numbers rather than a declining trend.

The Lower Kuskokwim survey area is 907 mi^2 in size with a density of 0.09 moose/mi^2. The moose habitat in this area is comparable to that in the Paimiut count area where the moose density in 1998 was 1.27 moose/mi^2. Clearly, the moose habitat in the Lower Kuskokwim survey area is underutilized.

Censuses were planned for the three count areas along the Yukon River in March 2001. However, only the stratification portion of these surveys was completed because survey conditions deteriorated as warm weather spoiled the snow cover.

During January 2000 and March 2001, we conducted moose trend counts to assess and compare moose densities within the Kuskokwim River drainage to those along the Yukon River within the Paimiut Area. We flew 4 passenger aircraft and flew at 80 mph, 700 feet above ground level and counted moose in the best moose habitat near the rivers. The observers included a pilot, a biologist, and 1 or 2 observers from Kuskokwim River villages per flight. An additional goal of these trend counts was to educate the village observers by giving them a perspective of the potential for larger moose populations within the Kuskokwim River drainage.

Within the Kuskokwim River drainage, we found an average of 9.9 moose/hour in January 2000 and 5.6 moose/hour in March 2001. Within the Yukon drainage, we found an average of 229 moose/hour in January 2000 and 266 moose/hour in March 2001.

In June 2001, we conducted a composition survey within the Lowest Yukon Area that lasted 4.6 hours and revealed 11.9 moose per hour. The most recent census in this area occurred in 1994 when 65 moose were seen during 38.7 hours, or 1.7 moose per hour. While these surveys are not directly comparable, the great difference in the number of moose observed per hour suggests that the moose population in the Lowest Yukon Area has grown considerably since the last census.

Population Composition

We counted 70 moose, 11 of which were calves (19 calves:100 adults) during the 1998 Lower Kuskokwim Area census. No sex composition information is available because the survey was conducted during the winter.

We conducted composition counts during calving within the Paimiut Area on May 30, 2001. We saw 146 moose during 3.6 hours of flying, including 26 bulls, 45 cows, 12 unknown adults, 37 yearlings, and 22 calves including 2 sets of twins.

We conducted composition counts during calving within the Lowest Yukon Area on June 7, 2001. We saw 55 moose during 4.6 hours of flying, including 12 bulls, 5 cows >2 years, 11 2-year-old cows, 19 yearlings, and 8 calves from 4 sets of twins.

Distribution and Movements

Moose are distributed throughout the Yukon River riparian corridor. The highest concentrations occur during the winter. Within this riparian corridor, the densities are greatest toward the east and decline toward the west. Moose are usually found at low density near the villages. Some moose are also found along the tributaries and distributaries of the Yukon and in the highlands north of the Yukon River.

Moose can be found throughout the year along the riparian corridor of the Kuskokwim River within the unit from Lower Kalskag to Bethel. They exist at extremely low densities given the available habitat. Moose are seen in the downriver third of this corridor only sporadically.

The area drained by the tributaries of the Kuskokwim River and those rivers draining into Kuskokwim Bay support small numbers of moose as colonizing animals from adjacent areas arrive. However, these moose have not survived to establish localized populations.

We have some radiotelemetry data, which show that moose are entering Unit 18 from adjacent Unit 17. Two cow moose radiocollared in the Togiak drainage by Togiak National Wildlife Refuge staff were found dead in Unit 18 in winter 1999. One was found in the upper Kwethluk drainage and the other, along with her calf, was found in the upper Goodnews drainage. Both radiocollared cows were killed illegally. Two other moose radiocollared in Unit 17A, including a cow with twins, were found in Unit 18 during this reporting period (Aderman and Woolington, 2001).

During the summer, moose are found in low numbers throughout the Unit. Moose have been reported along the Manokinak River, near Chevak, and even swimming in the ocean beyond the mouth of the Yukon River. While these reports are unusual, they make the point that moose move about broadly throughout the Yukon-Kuskokwim Delta.

MORTALITY

Harvest

Season and Bag Limit. Historic seasons and bag limits can be found in the 2000 Moose Management Report. Seasons and bag limits for this reporting period can be found in Table 1. Federal seasons in Unit 18 were the same as State of Alaska seasons with two exceptions. The federal season within the Kuskokwim River drainage was from 25 Aug–25 Sep. Also, there is no federal season in Unit 18 south of and including the Kanektok River drainages.

The winter season was open from 27 Dec–5 Jan during 1999–2000 and from 1 Feb–10 Feb during 2000–2001. The bag limit throughout Unit 18 is one bull.

1999–2000 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18, that portion north and west of a line from Cape Romanzof to Kusilvak Mountain, and then to Mountain Village, and west of (but not including) the Andreafsky drainage		
1 bull	5 Sep – 25 Sep	5 Sep – 25 Sep
Remainder of Unit 18		
1 bull per regulatory year; during the period 1 Dec–28 Feb, a 10-day season may be announced by emergency order	1 Sep–30 Sep 27 Dec–5 Jan	1 Sep – 30 Sep

2000–2001 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18, that portion north and west of a line from Cape Romanzof to Kusilvak Mountain, and then to Mountain Village, and excluding all Yukon River drainages upriver from Mountain Village		
1 bull	1 Sep – 25 Sep	1 Sep – 25 Sep
Remainder of Unit 18		
1 bull per regulatory year; during the period 1 Dec–28 Feb, a 10-day season may be announced by emergency order	1 Sep–30 Sep 1 Feb–10 Feb	1 Sep – 30 Sep

Board of Game Actions and Emergency Orders. A 10-day winter season during the period from 1 Dec–28 Feb may be announced by emergency order when weather and travel conditions are safe. The season dates are selected after polling the affected villages. This season was opened from 27 Dec–5 Jan in 1996–1997, 1997–1998, 1998–1999, and 1999–2000. Most villages prefer to have this season just after Christmas to allow time for travel conditions to improve and to avoid interference with the holiday. They also prefer to hunt prior to Slavic since feasting is an important part of the Russian Orthodox celebration. This explains the rather static nature of these emergency order openings.

During 2000–2001 the winter season was opened along the Yukon River upriver from Mt. Village from 1 Feb–10 Feb. It was not opened earlier due to unsafe travel conditions.

This season was not opened within, and south and east of the Kuskokwim River drainage. This was the first year the winter season remained closed in this portion of Unit 18 and follows a request to leave it closed for at least 5 years. The decision to leave this area closed was made after considerable discussion with the Lower Kuskokwim Advisory Committee, the US Fish and Wildlife Service, and other interested parties. This is part of an overall strategy to improve moose numbers within the Unit 18 portion of the Kuskokwim River drainage.

The Board of Game clarified the description of the moose hunt area below Mountain Village during their fall 1999 meeting. The new definition of this hunt area is that portion of Unit 18 north and west of a line from Cape Romanzof to Kusilvak Mountain, to Mountain Village, and excluding all Yukon River drainages upriver from Mountain Village.

The Board of Game also clarified the area description of the Kalskag Controlled Use Area during the fall 1999 meeting. The board's action clearly identified Tucker's Slough as part of this area.

The fall season in the hunt area downriver from Mountain Village was opened on 1 September rather than 5 September to provide additional opportunity to harvest moose in response to poor salmon returns. The board increased this season with the understanding that future population growth could be jeopardized. However, an economic disaster had been declared and the board felt the risk to future population growth was outweighed by the need for moose meat.

Human-Induced Harvest. Hunting (both legal and illegal) remains the most significant source of moose mortality in Unit 18. During the 1999–2000 open season, 436 hunters reported a harvest of 143 moose**.** For the 2000–2001 season, 421 hunters reported a harvest of 175 moose. Nearly all of this reported harvest comes from the fall seasons (Table 2). Harvest reporting for moose taken during the winter season has typically been very poor.

Local demand for moose in Unit 18 is high. The annual combined reported and unreported harvest is estimated at 10–15% of the population on the Yukon River. Harvest probably exceeds annual recruitment on the Kuskokwim River and moose only survive there due to continual immigration from adjacent areas. Estimated unreported harvest probably equals or exceeds the reported harvest in the Kuskokwim drainage. We estimate the unitwide unreported harvest is approximately 100–200 moose annually.

It is clear that the reported harvest of moose in Unit 18 does not reflect the actual harvest, but only shows the harvest by people who operate within the regulatory system. The percentage of local residents hunting during established seasons with valid hunting licenses and harvest tickets is increasing, particularly during the fall. On the Yukon River, we believe that harvest reporting has improved largely because of the presence of the Paimiut hunter check station, the acceptance of harvest tickets/reports, and the willingness of most hunters to harvest only bulls. Although reporting has improved along the Yukon River, in Unit 18 there are hunters who do not report. Because of the unreported harvest, moose harvest data from Unit 18 must be regarded as incomplete and should be viewed as minimum estimates.

During the 1999–2000 season, approximately 80% (112 moose) of the reported harvest occurred in the Yukon River drainage with the remainder in the Kuskokwim River drainage. During the 2000–2001 season, 82% of the harvest (144 moose) was reported taken in the Yukon River drainage with the remainder in the Kuskokwim River drainage or elsewhere within the Unit (Table 3).

A 5-year moratorium on moose hunting in the hunt area downriver from Mountain Village ended when a season was reopened in 1994–1995. Since then, 129 bull moose have been reported harvested. This includes 16 bulls harvested in 1999–2000 and 34 bulls harvested in 2000–2001. This is particularly interesting since as recently as 1988, no moose were observed during an intensive survey of this area.

During September 1999 and 2000, we operated the Paimiut moose hunter check station for the fourteenth and fifteenth consecutive years, respectively, at the junction of Twelve-Mile Slough and Paimiut Slough on the Yukon River. The check station is located near the border of Units 18 and 21E. In the summer of 1998 the Fish and Wildlife Service and the department built a cabin on the check station site. This cabin has greatly improved the comfort and safety of workers at Paimiut. It also provided an opportunity to honor the previous area biologist who died in 1996 while doing moose composition counts on the Yukon River. This cabin was dedicated to the memory of Randy Kaycon.

We estimate between 30–100 moose were harvested each year from an area extending from the upper Innoko River and Iditarod River in Unit 21E to Russian Mission in Unit 18. Many of these moose were brought through or processed near the Paimiut check station. The moose examined at the check station each season were primarily young bulls in good condition and were harvested in Unit 21E.

In 1999, we examined 37 moose at the Paimiut hunter check station. We collected incisors from 31 of these moose. The average age of the harvest as determined by sectioning these teeth was 2.5 years. Average antler width of 35 of these moose was 36.5 inches. In 2000, we examined 27 moose and collected 22 incisors. The average age of the harvest was 3.5 years and the average antler width was 35.9 inches. Tooth sectioning data indicated that the moose examined at the Paimiut check station typically are young animals (Table 4). These data suggest that hunters are not selective but rather harvest the first legal animal available to them.

Determining the exact number of hunters using the area is difficult since some boats make multiple trips, some pass during the evening, and some hunters chose to stop only on their way

out of the hunt area. We estimate that 75–100 boats carrying 175–225 hunters passed the check station with the large majority electing to stop at least once during their hunt.

We operated a floating check station within the Unit 18 portion of the Kuskokwim River drainage during the 2000–2001 hunting season and contacted 49 people. We provide information regarding the importance and benefits of not killing cow moose and distributed coffee mugs emblazoned with the moose reproduction circle logo. We did not encounter any successful Unit 18 moose hunters within the Kuskokwim drainage.

There is a growing use of Alaska State Statute 5 AAC 92.019 in Unit 18. This statute allows moose to be taken outside established seasons for customary and traditional Alaska Native funerary or mortuary religious ceremonies. Typically, Unit 18 hunters contact the department prior to hunting under this statute and we provide them with a letter outlining the statute, informing them which animals are legal, and describing how to accomplish harvest reporting. We also provide the hunters with a copy of the statute. We then contact Fish and Wildlife Protection and inform them of the arrangement.

This statute requires the department to publicize a list of big game populations and areas, if any, for which the taking of a big game animal would be inconsistent with sustained yield principles. A big game animal from a population on this list would not be available for harvest under this statute. The list for Unit 18 includes all cow moose and all moose within and south and east of the Kuskokwim River drainage.

During 1999–2000, 4 hunters contacted the department regarding mortuary moose and 1 bull was reported harvested. During 2000–2001, 4 hunters contacted the department and no moose were reported harvested. The statute does not require hunters to notify the department if they are unsuccessful. However, all but one of the unsuccessful hunters reported.

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

Hunter Residency and Success. As reported in past years, Alaska residents accounted for most of the hunting activity in Unit 18 with the vast majority being Unit 18 residents. Of 436 hunters who reported hunting in Unit 18 during the 1999–2000 season, 10 were nonresidents. Of 421 hunters who reported hunting in Unit 18 during the 2000–2001 season, 13 were nonresidents. The low moose densities and high cost generally make Unit 18 an unattractive destination for nonresident moose hunters.

Hunter success rates based on harvest reports were 33% for the 1999–2000 season and 32% for the 2000–2001 season. Successful hunters spent an average of 6.4 days hunting moose in Unit 18 in 1999–2000 and 7.1 days in 2000–2001. Unsuccessful hunters spent an average of 8.4 days hunting moose in Unit 18 in 1999–2000 and 8.1 days in 2000–2001.

Many Unit 18 residents are aware that hunting opportunities are better in adjacent Units 19 and 21E. Hunters from Unit 18 regularly use boats during the fall season to access hunting areas upriver in adjoining units. On the Kuskokwim River, many of the residents hunting moose between Kalskag and McGrath (in Unit 19) are from Unit 18. Similarly, on the Yukon River, a large number of hunters use boats to travel from Unit 18 into Unit 21E. All of the hunters at the

Paimiut hunter check station who reported hunting in Unit 21E were residents of Unit 18. As a consequence, harvest allocation has been controversial among residents of Unit 18 and residents of Units 19 and 21E.

Harvest Chronology. The majority of reported moose harvest occurs during September when the general season is open. Only small numbers of moose have been harvested in the winter season (Table 2).

Transport Methods. During the reporting period, boats were by far the most frequently used mode of transportation by moose hunters in Unit 18. Other minor reported modes of transportation were snowmachines and aircraft. There has been virtually no change in the method of access reported by moose hunters in Unit 18 since moose harvest reporting began.

Other Mortality

Black and grizzly bears occur along the major river corridors and large tributaries in Unit 18. During calving surveys in spring 2001 within the Paimiut Area, we saw several black bears among calving moose and local residents have complained of heavy predation on calves by black bears. However, little direct information is available regarding this type of predation in Unit 18. Certainly, some predation occurs, but the effect bears have on moose numbers, particularly through predation on calves, is unknown.

Reports indicate that wolf numbers have increased considerably during this and the previous 2 reporting periods. This is expected since caribou have become more available, trapping pressure has declined, and moose numbers have increased. We estimate 100–150 wolves in 15–20 packs reside in Unit 18. Throughout most of Unit 18 the distribution of wolves reflects the distribution of moose, especially in the Yukon River drainage. In the lower Kuskokwim River drainage, caribou are the main prey item for wolves and the distribution of wolves is not as closely linked to moose.

HABITAT

Assessment

We estimate a minimum of 8,000 mi^2 of moose habitat exists in Unit 18. Approximately 4,500 mi^2 of this habitat occurs along the riparian zone of the Yukon River and the remaining 3,500 mi^2 is found along the Kuskokwim River and its tributaries. The islands and adjacent sloughs along the Yukon River corridor from Paimiut to Mountain Village represent the most productive moose habitat in Unit 18. No overbrowsing is evident in this area. The willows downriver from Mountain Village in the Yukon Delta are overgrown and senescent, except for willow bars and those islands in the Yukon flooded each spring. The Yukon Delta has many distributaries fringed by willows and cottonwoods but has fewer moose than could be supported by the available forage.

The riparian corridor along the Kuskokwim River in Unit 18 downstream of Kalskag is excellent moose habitat. Between Lower Kalskag and Akiachak, the forest and brush along the Kuskokwim provides some escape cover for moose. Downstream of Akiachak toward the mouth of the Kuskokwim, the riparian corridor narrows and escape cover is lacking. Along the

Kanektok, Goodnews, and Arolik Rivers, moose are rarely found in the riparian corridor because cover and browse are very sparse.

Tributaries of the Kuskokwim bordered by spruce and cottonwood, interspersed with willow and alder, extend onto the tundra along the Gweek and Johnson Rivers to the west, and along the Tuluksak, Fog, Kisaralik, Kasigluk, Akulikutak, Eek, and Kwethluk Rivers, and smaller unnamed rivers to the east. In each of these drainages, the habitat could support more moose. Lack of escape cover from illegal hunters is the limiting factor affecting moose numbers in these low-density areas.

Enhancement

There were no habitat enhancement activities in Unit 18 during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

The most important management need is to improve moose numbers within the Kuskokwim River drainage. We have initiated discussions with the Lower Kuskokwim Advisory Committee, the US Fish and Wildlife Service, village and tribal leaders, and other interested parties to develop a strategy to increase moose numbers that is acceptable to local residents and managers alike.

An issue that had greater importance during previous reporting periods is the allocation of hunting effort and harvest by local residents of Units 18, 19 and 21E. This is a “downriver resident” versus “upriver resident” issue along the Yukon and Kuskokwim Rivers. This issue has not been resolved but has lessened along the Yukon River as more moose have become available within Unit 18 and as understanding of upriver land ownership has grown. We hope to address this issue along the Kuskokwim through the Kuskokwim River moose strategy described above.

CONCLUSIONS AND RECOMMENDATIONS

Within living memory, moose have colonized the Yukon-Kuskokwim Delta in moderate densities along the Yukon River from Paimiut to the mouths of the Yukon, but remain at low to very low densities throughout the remainder of the unit. Although much of Unit 18 is lowland tundra unsuitable as moose winter habitat, moose could be present in higher numbers because areas of riparian habitat remain unoccupied. Although calf production and yearling recruitment are high, hunting pressure from the relatively dense human population in the unit has slowed moose population growth.

The illegal harvest, particularly of cows, remains the most serious moose management problem in Unit 18. Although compliance is improving, a poorly developed cash economy, declining commercial fishing opportunities, and high density of people and villages along the major rivers complicate moose management considerably. Over 20,000 rural residents live in 42 communities throughout Unit 18 and we need continued effort to curb illegal harvest of moose.

Differing state and federal seasons and bag limits for moose had previously hampered our ability to effectively manage moose and enforce hunting regulations. Recently however, there has been very good cooperation among federal and state wildlife managers to work toward common

solutions for moose management. In general, throughout Unit 18, state and federal seasons now coincide.

Recent actions by user groups to shoulder some responsibility for the growth of local moose populations are welcome signs of increasing participation with existing management systems. Continued efforts to work with local user groups are vital for effective management. However, individuals continue to submit or support proposals liberalizing moose seasons and harvest opportunities in Unit 18, regardless of the biological status of the moose population.

The growth of the Mulchatna caribou herd and recent movements of the Western Arctic caribou herd into Unit 18 may eventually reduce hunting pressure on the local moose population. However, we anticipate the demand for moose will continue to exceed the supply.

We recommend that monitoring and taking inventory of the moose population remain a priority in Unit 18, especially the continuation of the population censuses along the Yukon and Kuskokwim rivers. We should continue to conduct composition counts and trend counts. The census results, in conjunction with composition surveys, will provide the department with baseline demographic information and recruitment rates to properly manage the moose population.

The poor harvest reporting rates in Unit 18 are being addressed through an incentive that uses harvest reports as entry forms for a prize drawing. This raffle was initiated during the 1998–1999 hunting season and it has been well received by area hunters. Table 5 shows a trend of increasing use of harvest tickets/reports that began prior to the initiation of this program and has continued. The credit this program deserves for this continued increase is unknown, however, there are educational components associated with this program that provide additional value. We recommend that this program be continued.

LITERATURE CITED

ADERMAN, A. AND J. WOOLINGTON. 2001. Population Identity and Movements of Moose in the Togiak, Kulukak, and Goodnews River Drainages, Southwest Alaska. April 2000–April 2001 Progress Report.

GASAWAY W.C., S.D. DUBOIS, D.J. REED AND S.J. HARBO. 1986. Estimating moose population parameters from aerial surveys. Biology Paper No. 22. University Alaska Fairbanks, Alaska.

VERHOEF J. 1998. Personal Communication.

PREPARED BY:

Roger J. Seavoy
Wildlife Biologist III

SUBMITTED BY:

Peter J. Bente
Survey-Inventory Coordinator

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

Seavoy, R.J. 2002. Unit 18 moose management report. Pages 273–292 *in* C. Healy, editor. Moose management report of survey and inventory activities 1 July 1999–30 June 2001. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.

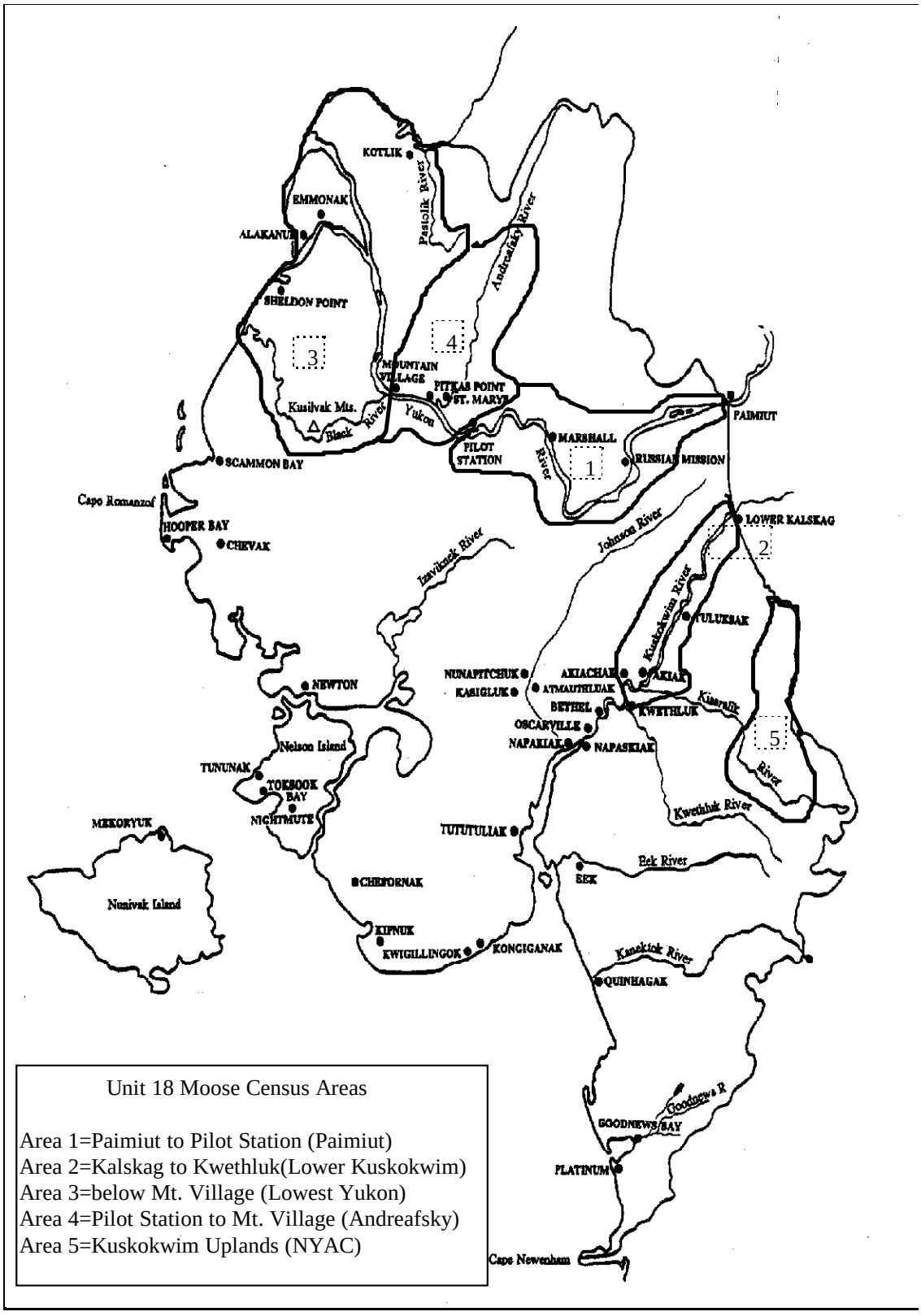


Figure 1 Unit 18, showing major drainages, communities, and Gasaway census areas

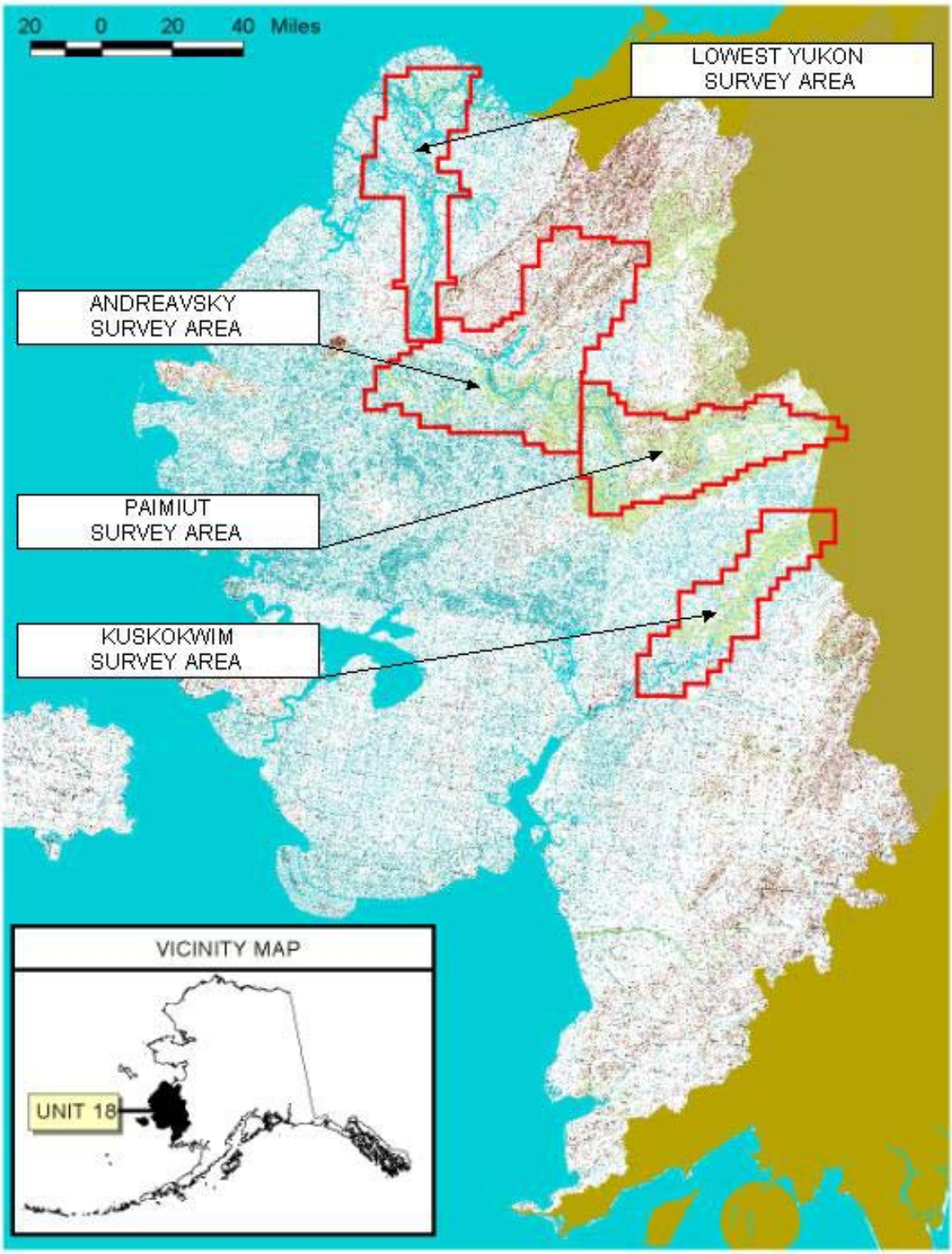


Figure 2 Unit 18 showing geostatistical population census areas (Ver Hoef style survey areas)

Table 1 Summary of moose hunting regulations and harvest in Unit 18, 1999–2001

Regulatory year	Season dates	Bag limit and area affected
1999–2000	5 Sep–25 Sep	1 bull; Yukon River Delta[a]
	1 Sep–30 Sep	1 bull; remainder of Unit 18
	27 Dec–5 Jan[b]	1 bull; excluding Yukon River Delta[a]
2000–2001	1 Sep–25 Sep[c]	1 bull; Yukon River Delta[d]
	1 Sep–30 Sep	1 bull; remainder of Unit 18
	1 Feb–10 Feb[a]	1 bull; excluding Yukon River Delta[d] and the Kuskokwim River drainage[e]

[a]That area north & west of a line from Cape Romanzof to Mountain Village, & west of & excluding the Andreafsky River drainage.

[b] A 10-day winter season is announced by emergency order between 1 Dec–28 Feb.

[c]This season was changed by emergency regulation to address an economic emergency caused by poor salmon returns.

[d]That portion of Unit 18 north & west of a line from Cape Romanzof to Kusilvak Mountain, to Mountain Village, and excluding all Yukon River drainages upriver from Mountain Village.

[e] The Kuskokwim River drainage includes the Kuskokwim River drainage proper and that poriton of Unit 18 south and east of the Kuskokwim River drainage.

Table 2 Fall and winter moose harvests for Unit 18, 1978–1999

Regulatory	Fall harvest		Winter harvest		Unknown harvest		Total
Year	(N)	(%)	(N)	(%)	(N)	(%)	Harvest (N)
1978–1979	42	88	6	12	0	0	48
1979–1980	11	92	1	8	0	0	12
1980–1981	45	94	3	6	0	0	48
1981–1982	72	90	8	10	0	0	80
1982–1983	54	93	4	7	0	0	58
1983–1984	61	97	2	3	0	0	63
1984–1985	63	87	7	10	2	3	72
1985–1986	43	83	8	15	1	2	52
1986–1987	54	90	6	10	0	0	60
1987–1988	40	83	8	17	0	0	48
1988–1989	67	98	0	2	0	0	68
1989–1990	31	94	1	3	1	3	33
1990–1991	55	90	6	10	0	0	61
1991–1992	63	94	4	6	0	0	67
1992–1993	64	83	13	17	0	0	77
1993–1994	93	97	3	3	0	0	96
1994–1995	76	87	11	13	0	0	87
1995–1996	71	96	3	4	0	0	74
1996–1997	97	100	0	0	0	0	97
1997–1998	95	100	0	0	0	0	95
1998–1999	124	99	1	1	0	0	125
1999–2000	136	95	7	5	0	0	143
2000–2001	166	95	5	3	4	2	175

Table 3 Moose harvest in the Yukon River, Kuskokwim River and Johnson River drainages, Unit 18, 1981–2001

	Moose harvest (%)		
Regulatory year	Yukon River	Kuskokwim River	Johnson River
1981–1982	57	32	11
1982–1983	58	36	6
1983–1984	63	33	4
1984–1985	62	32	6
1985–1986	67	17	16
1986–1987	66	34	0
1987–1988	52	42	6
1988–1989	81	19	0
1989–1990	55	39	6
1990–1991	80	15	5
1991–1992	75	24	1
1992–1993	64	33	3
1993–1994	77	24	2
1994–1995	86	14	0
1995–1996	85	15	0
1996–1997	72	28	0
1997–1998	75	24	1
1998–1999	78	12	6
1999–2000	80	18	2
2000–2001	82	14	3
Average	71	25	4

Table 4 Summary of moose ages from teeth collected at the Paimiut moose hunter check station 1986–2000

Year harvested																
	00	99	98	97	96	95	94	93	92	91	90	89	88	87	86	
DOB																TOTAL
00	0															0
99	4	0														4
98	4	8	0													12
97	6	12	13	0												31
96	4	7	7	21												39
95	0	2	8	9		1										20
94	2	1	1	7		14	0									25
93	1	0	4	2		11	14	0								32
92	0	0	1	0		8	13	21	1							44
91	0	0	0	2		1	9	6	12	1						31
90	0	0	0	1		7	4	15	16	17	0					60
89	0	1	2			0	3	5	8	12	17	1				49
88	1					5	3	3	3	14	13	7	0			48
87						1	3	3	4	5	10	21	22	1		70
86							4	2	2	2	4	6	12	12	0	44
85							0	1	0	0	4	3	4	5	0	17
84							1	0	1	2	1	2	2	3	6	18
83							0	0	0	0	0	0	0	0	8	8
82							1	1	1	1	4	3	1	1	2	15
81							0			0	1	0	1	5	3	10
80							1			2	1	1	0	1	2	8
79										1	1		0	0	0	2
78													0	2	1	3
77													0	0	1	1
76													1	0		1
75														1		1
Total	22	31	36	42		48	56	57	48	57	56	44	43	31	23	597

Table 5 Number of hunters and reported harvest since the 1993–1994 regulatory year. A harvest reporting incentive program was initiated in 1998–1999.

Regulatory year	Number of hunters	Reported Harvest
1993–1994	249	96
1994–1995	247	87
1995–1996	301	74
1996–1997	350	97
1997–1998	363	95
1998–1999	383	125
1999–2000	436	143
2000–2001	421	175

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

MOOSE MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 22 (25,230 mi^2)

GEOGRAPHIC DESCRIPTION: Seward Peninsula and the adjacent mainland drained by all streams flowing into Norton Sound

BACKGROUND

Before 1930 very few moose were observed on the Seward Peninsula. However, by the late 1960s much of the suitable habitat in Unit 22 contained moose. Moose populations grew rapidly in the 1960s through the early 1980s and peaked in the mid 1980s in most parts of the unit. Severe winters in 1989, 1990 and 1992 caused declines in moose densities because winter browse was insufficient to maintain such large populations in Units 22B and 22D (Nelson 1995). Populations in these areas never recovered and recent data indicates these populations and others in the unit are currently declining. Habitat is no longer believed to be a major limiting factor at current population levels, rather brown bear predation on calves is thought to be a significant factor suppressing Unit 22 moose populations.

Although moose have been present in Unit 22 for a relatively short time, they rapidly became an extremely important food source for many Seward Peninsula residents, and demand for moose by subsistence and sport hunters is high throughout the unit. Gravel roads, trails, navigable rivers and snow machines provide hunters with easy access to suitable moose habitat (Machida, 1997). Annual harvests reported from 1969 through 2000 ranged from a low of 44 moose in 1972 to a high of 408 moose in 1986 (Table 1). However, in November 2001 declining moose populations prompted the Board of Game to implement restrictions intended to reduce harvest in the most accessible parts of Unit 22. In recent years unit residents have accounted for 70% or more of the annual reported harvest.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

The following population objectives and bull:cow ratios presented to the Board of Game are the management goals for Unit 22:

- Maintain a combined population of 5100–6800 moose in Unit 22.

- Maintain a population of 600–800 moose in Unit 22A.
- Increase and stabilize the population at 1000–1200 moose in western Unit 22B.
- Insufficient data exists to develop a specific management goal for eastern Unit 22B, however increased recruitment rates and population growth are desired.
- Slightly reduce and maintain a population of 450–475 moose in Unit 22C.
- Increase and stabilize the population at 2000–2500 moose in Unit 22D.
- Increase and stabilize the population at 200–250 moose in Unit 22E.

- Maintain a minimum bull:cow ratio of 30:100 in Units 22A, 22B, 22D, and 22E.
- Maintain a minimum bull:cow ratio of 20:100 in Unit 22C.

The Unit 22 population objective (5100-6800 moose) recommended by the department was adopted by the Board of Game in November 2001 (after the reporting period). This objective was revised downward slightly from our previous management goal of 5700–7300 moose, which may be slightly larger than the habitat can support. In Unit 22A, the current population size in unknown, but is believed to be below our goal. In western Unit 22B, Units 22D and 22E our goal is to increase and stabilize the population from a period of steady decline in total moose numbers. In Unit 22C, the goal is to slightly reduce numbers and maintain a population within winter browse carrying capacity. We attempt to maintain a minimum bull:cow ratio of 30:100 in all units except Unit 22C where a minimum bull:cow ratio of 20:100 is acceptable.

MANAGEMENT OBJECTIVES

The management objectives for survey and inventory activities in Unit 22 are:

- In selected areas of the unit, make annual estimates moose abundance, sex and age composition, and yearling recruitment and determine trends in population size and composition.
  - Complete censuses in the 5 subunits of Unit 22 on a rotational basis to estimate moose abundance.
  - Complete late fall and/or early spring aerial surveys in selected portions of the unit to provide an index of moose population status and trends, sex and age composition, and yearling recruitment.
- Monitor human and natural mortality factors affecting the population.
  - Evaluate hunting mortality by analyzing all moose harvest data.
  - Improve harvest reporting through public education, vendor support and improved communication, and by conducting community-based harvest assessment surveys in selected villages.

- Evaluate hunting regulations and recommend changes if necessary for conservation purposes.

- Improve public understanding of hunting regulations and the reasons they are necessary.

METHODS

We conducted aerial surveys in the spring and fall to estimate sex and age composition and short yearling recruitment in portions of Unit 22 during the report period. In March of 2001, a moose census of Unit 22C was completed using the geostatistical population estimator technique (J. VerHoef, ADFG, pers. commun.). A thorough survey of all riparian habitat in Unit 22E was completed during April 2001 to estimate population size and recruitment. We summarized harvest reports returned by hunters and harvest data collected during big game harvest surveys in Brevig Mission, Elim, Shaktoolik, Shishmaref, Teller, Wales and White Mountain. Numerous public meetings were held throughout the unit to discuss declining moose populations and to form recommendations to the Board for changes to hunting regulations.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

In Unit 22A, censuses in 1989 and 1994 show the population remained stable at 600–800 moose. Since no recent density data have been obtained for Unit 22A the current status of moose in the subunit is unknown. In spring 2000, when Unit 22A drainages were surveyed, recruitment estimates were low, similar to those in Units 22B and 22D. These data and reports of declining numbers of moose from longtime unit residents suggest the population may now be below our management goal of 600–800 moose for the unit. Historically moose densities have been lower in Unit 22A than in many other parts of the unit, possibly due to less suitable habitat and higher predator densities. No collaring studies have been conducted in Unit 22A and we lack data on moose movements, however longtime local residents report that some of the moose present in the Unalakleet River drainage in the summer and fall, spend the winter in the Anvik and Yukon River drainages in Unit 21.

Moose densities in Units 22B and 22D have declined since the dramatic increases observed in the 1980s. The winters of 1989, 1990, and 1992 were particularly severe on moose, and winter mortality was reported to be higher than normal during those years. Census data from western Unit 22B show a 50% decline between 1987 and 1999 with continued low recruitment. The 1999 population estimate for western Unit 22B was 802 moose (90% C.I. ±19%). Although we have no density estimates for eastern Unit 22B, recruitment estimates in 1999 and 2000 in the Koyuk drainage were similar to those in the western portion of the unit. Based on this information and comments by local residents we suspect poor calf survival may also be affecting moose densities in eastern Unit 22B.

In Unit 22D census data from the Kuzitrin and American river census areas showed a 35% decline in moose numbers between 1988 and 1993. A census in 1997 indicated the population had stabilized 35% below 1988 densities. However, since 1999 surveys in the Kuzitrin River drainage have shown poor recruitment and low calf:cow ratios, and the public has become

increasingly concerned about fewer moose in the area. We believe that moose are declining in the Kuzitrin drainage.

The Unit 22C moose population has grown steadily throughout the 1990s and in spring 2001 was estimated at 557 moose. This estimate exceeds our management goal by 18% and adds to concern that the population may exceed the carrying capacity of the winter range. Yearling recruitment is highest in Unit 22C and generally exceeds 20%. However, the bull:cow ratio is low, varying between 10–20 bulls:100 cows.

A spring 2001 survey of moose habitat in Unit 22E indicates the population declined by 23% to 169 moose since the last population survey in 1996, and is below our management goal.

Population Size

A census of Unit 22A scheduled for March 2000 was cancelled due to poor flying weather.

In March 2001 a census of Unit 22C was completed using the geostatistical population method developed by Jay VerHoef. An estimate of 557 moose (90% C.I. 491–623, ±11.9%) indicates the population increased since 1995 when an estimate of 479 moose was obtained. Also 34 calves:100 adults were found. The recruitment rate was 25%. Unit 22C is currently the only place in Unit 22 where recruitment is consistently high enough to result to steady population growth, and the only place where moose are believed to be at or above our population goal. The large number of moose wintering in the Snake River drainage, high recruitment rates and condition of browse create concern that the population in Unit 22C may be approaching the carrying capacity of the winter range.

In April 2001 a survey of moose habitat in Unit 22E was completed to determine population size and short yearling recruitment. This survey resulted in a direct count of 169 moose (157 adults and 12 calves. The recruitment rate was 8%.

Records from the previous Unit 22E surveys in 1991 and 1996 indicate moose were not previously surveyed in the Nugnugalugtuk drainage. When the 17 moose found in the Nugnugalugtuk drainage in 2001 are removed from the 2001 estimate, the population of 152 moose showed a 23% decline since the 1996 estimate of 196 moose. The recruitment rate was half the previous estimate of 16%. Survey data indicates the Unit 22E moose population has been declining steadily since the first population survey in 1991 when 226 moose were counted.

In spring 2001 snow cover was unusually deep throughout Unit 22E. Moose habitat west of the Serpentine River drainage was largely snow covered with little browse available. The number of moose found in the western part of the Unit was down by 35% (from 60 in 1996 to 39 in 2001). The moose that were present generally appeared to be in poor condition. Moose in the Serpentine drainage had more available browse and appeared to be in better condition.

Population Composition

In November 2000, for the first time since the mid 1990s, adequate snow cover enabled us to complete fall composition surveys in portions of Units 22B, 22C and 22D. In November 2001, we surveyed the same areas, but snow cover was light and moose were still widely dispersed throughout the upper drainages. As a result our sample sizes in Units 22B and 22D were small

(Table 2). Fall composition surveys were flown during both years in an R44 helicopter, which greatly improved our ability to find moose in willow thickets. In spring 2000, recruitment surveys were flown in Units 22A, 22B, 22C and 22D. Results from these surveys were reported in the previous management report. A recruitment survey of the Snake River drainage in March 2001 was the only other composition survey completed (Table 3).

In November 2000 we surveyed portions of the Niukluk River drainage in western Unit 22B, finding 8 calves:100 cows and 27 bulls:100 cows (N=115). In fall 2001 the same area was surveyed and we found 14 calves:100 cows and 30 bulls:100 cows (N=81). These data indicate the bull:cow ratio has remained close to our management goal in spite of population declines in this area. The low calf :cow ratio continues to be of concern.

A fall 2000 survey of the Snake and Eldorado/Flambeau River drainages in Unit 22C found 25 calves:100 cows and 10 bulls:100 cows (N=85). In 2001 we surveyed the Snake River drainage again and the Stewart River drainage for the first time. In the Snake and Eldorado/Flambeau drainages the bull:cow ratio (17 bulls:100 cows) remains below our management goal of 20 bulls:100 cows, which has been the case for over 10 years. However in 2001, in the nearby Stewart River drainage we observed 39 bulls:100 cows (N=64). The Stewart drainage is relatively inaccessible and receives little hunting pressure, but is in close proximity to the Snake and Eldorado/Flambeau drainages. The discovery of numerous bulls, including large, mature bulls in the Stewart drainage alleviates some of our concern about other parts of Unit 22C where bull:cow ratios are chronically very low. In 2001, the overall calf:cow ratio for Unit 22C was 21calves:100 cows (N=164). This is down somewhat from previous years, but not unexpected due to affects of greater than normal snow accumulation and delayed breakup in spring 2001. Many moose in Unit 22C appeared to be in poor condition by March, as a result, by April winter mortality was thought to be higher than normal and observations indicated calving was generally delayed until the second week of June.

In November 2000 and 2001 (after the reporting period) we surveyed portions of the Kuzitrin River drainage in Unit 22D. In 2000 16 bulls:100 cows were found (N=216) and in 2001 15 bulls:100 cows were seen (N=114). The bull:cow ratio in the Kuzitrin River drainage declined substantially since the mid 1990s and is well below our management goal of 30 bulls:100 cows, necessitating regulatory action. In November 2000 we found 11 calves:100 cows in the Kuzitrin drainage. This low calf:cow ratio, low recruitment rates in the springs of 1999 and 2000, and reports of few calves seen in recent years by long time users of the area alert us to a probable decline in moose numbers in the Kuzitrin drainage since our last census in 1997. Our most recent survey in November 2001 found improved calf survival; 19 calves:100 cows.

In November 2000 and 2001 (after the reporting period) we also surveyed portions of the American and Agiapuk River drainages in Unit 22D, which are relatively remote and receive less hunting pressure than many other parts of the unit. In 2000 we found 44 bulls:100 cows (N=318) and in 2001, 30 bulls:100 cows (N=112). In 2000 we found 23 calves:100 cows, but in 2001 only 6 calves:100 cows were seen.

In the past we have used composition data from the Snake River drainage in Unit 22C as an indicator of composition in Unit 22C as a whole. For purposes of comparison we flew a recruitment survey of the Snake River drainage immediately after completing the Unit 22C

census in March 2001. The Unit 22C census found 34 calves:100 adults and a recruitment rate of 25%. The recruitment survey of the Snake River drainage found 26 calves:100 adults and a recruitment rate of 21%.

Distribution and Movements

No specific studies were undertaken during this reporting period to evaluate distribution or movements of moose in Unit 22. However, some observations were made during census work.

During spring 2001, the southern Seward Peninsula had greater than normal snow accumulation. During the March 2001 census of Unit 22C we noted an unusual winter distribution of moose. Although some riparian areas were being used, many moose were dispersed on relatively barren hillsides and in upland valleys where food was sparse. Presumably, these animals left lowland areas to avoid deep snow in favor of upland sites where wind-packed snow allows easier movement. Many moose in Unit 22C were noted to be in poor condition in April and May and overwinter mortality appeared to be higher than normal.

MORTALITY

Harvest

Season and Bag Limit. The 1999–2000 seasons and bag limits were unchanged from the previous reporting period. In 2000–2001, changes were implemented in Units 22B, 22C and 22D.

1999–2000 Units and Bag Limits	Resident/Subsistence Hunters	Nonresident Hunters
Unit 22A		
Residents: 1 bull	1 Aug–30 Sep 1 Dec–31 Jan	
Nonresidents: 1 bull with 50-inch antlers or with 4 or more brow tines on at least one side		1 Aug–30 Sep
Unit 22B, that portion west of the west bank of the Fish River and west of the southwest shore of Golovin Bay from the mouth of the Fish River to Rocky Point		
Residents: 1 antlered bull	1 Aug–31 Jan	
Nonresidents: 1 bull with 50-inch antlers or with 4 or more brow tines on at least one side		1 Aug–31 Jan
Remainder of Unit 22B		
Residents: 1 antlered bull or 1 moose	1 Aug–31 Jan 1 Dec–31 Dec	
Nonresidents: 1 bull with 50-		1 Aug–31 Jan

1999–2000 Units and Bag Limits	Resident/Subsistence Hunters	Nonresident Hunters
inch antlers or with 4 or more brow tines on at least one side		
Unit 22C		
Residents: 1 bull	1 Sep–14 Sep	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side		1 Sep–14 Sep
Unit 22D,that portion within the Kougarok, Kuzitrin and Pilgrim River drainages		
Residents: 1 antlered bull	1 Aug–31 Jan	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side		1 Aug–31 Jan
Remainder of Unit 22D,		
Residents: 1 antlered bull or	1 Aug–31 Jan	
1 moose	1 Dec–31 Dec	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side however, antlerless moose may be taken only from 1 Dec–31 Dec.		1 Aug–31 Jan
Unit 22E		
Residents: 1 moose, however no person may take a cow accompanied by a calf	1 Aug–31 Mar	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side however, antlerless moose may be taken only from 1 Dec–31 Dec.		1 Aug–31 Mar

2000–2001 Units and Bag Limits	Resident/Subsistence Hunters	Nonresident Hunters
Unit 22A		
Residents: 1 bull	1 Aug–30 Sep 1 Dec–31 Jan	

2000–2001 Units and Bag Limits	Resident/Subsistence Hunters	Nonresident Hunters
Nonresidents: 1 bull with 50-inch antlers or with 4 or more brow tines on at least one side		1 Aug–30 Sep
Unit 22B, that portion east of the Darby Mountains, including the drainages of the Koyuk and Inglutalik Rivers		
Residents: 1 bull	1 Aug–30 Sep 1 Nov–31 Dec	
Nonresidents: 1 bull with 50-inch antlers or with 4 or more brow tines on at least one side		1 Nov–31 Dec
Remainder of Unit 22B		
Residents: 1 bull	1 Aug–30 Sep 1 Dec–31 Jan	
Nonresidents: 1 bull with 50-inch antlers or with 4 or more brow tines on at least one side		1 Sep–30 Sep
Unit 22C		
Residents: 1 bull Or one antlerless moose by registration permit	1 Sep–14 Sep 15 Sep–30 Sep	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side		1 Sep–14 Sep
Unit 22D, that portion within the Kougarok, Kuzitrin and Pilgrim River drainages		
Residents: 1 antlered bull	1 Aug–31 Jan	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side		1 Sep–30 Sep
Remainder of Unit 22D		
Residents: 1 antlered bull or 1 moose	1 Aug–31 Jan 1 Dec–31 Dec	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side however, antlerless moose may		1 Aug–31 Jan

2000–2001 Units and Bag Limits	Resident/Subsistence Hunters	Nonresident Hunters
be taken only from 1 Dec–31 Dec.		
Unit 22E		
Residents: 1 moose, however no person may take a cow accompanied by a calf	1 Aug–31 Mar	
Nonresidents: 1 bull with 50–inch antlers or with 4 or more brow tines on at least one side however, antlerless moose may be taken only from 1 Dec–31 Dec.		1 Aug–31 Mar

Board of Game Actions and Emergency Orders. In October 1999 the Board of Game made a number of changes to Unit 22 moose seasons and bag limits that went into affect in regulatory year 2000–2001: 1) in all of Unit 22B the antlerless moose season was eliminated due to the continued decline in moose densities; 2) in Unit 22B west of the Darby Mountains (Remainder of Unit 22B), the resident moose season was shortened to 1 Aug–30 Sep and 1 Dec–31 Jan. and the nonresident season was shortened to the month of September; 3) in Unit 22B east of the Darby Mountains, the resident season was shortened to 1 Aug–30 Sept. and 1 Nov–31 Dec and the nonresident season was shortened to 1 Nov–31 Dec; 4) in Unit 22D the nonresident moose season was shortened to the month of September to prevent increased harvest by nonresident hunters displaced by the shortened nonresident season in Unit 22B; and 5) in Unit 22C a registration hunt for up to 20 antlerless moose was established from 15 Sep–30 Sep to help stabilize the growing population and prevent over utilization of winter habitat.

In October 2000 the resident moose season in the Kuzitrin River drainage in Unit 22D was closed by emergency order from 21 Oct–30 Nov, 2000. This action was taken because the September closure of the Unit 22B moose season, increased harvest pressure in Unit 22D and the moose population in the Kuzitrin drainage could not support increased harvest.

After the reporting period in July 2001 an emergency order was issued shortening the upcoming resident and nonresident moose seasons in the most heavily hunted parts of Units 22B and 22D. In western Unit 22B, Unit 22D in the Kuzitrin River drainage and in southwestern Unit 22D, the resident season was shortened to 20 Aug–14 Sep. The nonresident season was reduced to 1 Sep–14 Sep. In Unit 22E the shortened season for all hunters was 1 Aug–31 Dec and the bag limit was changed from 1 moose to one antlered bull.

After the reporting period in November 2001, after a lengthy process of public input and review, the Department recommended permanent regulatory changes for the areas which we believe cannot support recent harvest levels. The board adopted the following regulations, which will go into affect in regulatory year 2002–2003:

In Unit 22B, west of the Darby Mountains two resident registration permit hunts with quotas were established. The fall season is 10 Aug–23 Sep for any antlered bull and there is a winter hunt from 1 Jan–31 Jan for any bull. The nonresident moose season in western Unit 22B was closed.

In the portion of Unit 22D that includes the Kuzitrin drainage and the area west of the Tisuk River drainage a resident registration moose hunt with a quota was established. The season is 20 Aug–14 Sep for any antlered bull. If the quotas for these areas are not reached, a winter season from 1 Jan–31 Jan will be announced. The nonresident moose season in these portions of Unit 22D was closed. In the remainder of Unit 22D the resident season was shortened to 10 Aug–14 Sep and 1 Oct–31 Jan. The nonresident season will be 1 Sep–14 Sep. This was an attempt to prevent increased harvest by displaced hunters from other areas of Unit 22D where seasons were shortened.

The resident moose season in Unit 22E was shortened by 3 months to 1 Aug–31 Dec and the bag limit was changed from one moose to one antlered bull. The nonresident season was closed.

In 1999 and 2001 the board also liberalized brown bear hunting regulations in Unit 22, partly in an attempt to reduce predation on moose. In 1999 the resident tag fee requirement was eliminated for all of Unit 22 and the number of nonresident brown bear drawing permits was increased for Units 22B/22C and Units 22D/22E. After the reporting period in 2001 the bag limit for residents and nonresidents was changed from 1 bear every 4 years to one every year except in Unit 22C where the bag limit remains 1 bear every 4 years. The subsistence and general seasons were lengthened by one month and will open on 1 Aug. Unit 22C was added to the Northwest Brown Bear Management Area and the number of nonresident brown bear drawing permits for Units 22D and 22E was increased.

Hunter Harvest. During the 1999–2000 season, harvest ticket data shows that 581 hunters harvested 252 moose (244 males, 5 females and 3 of unknown sex). A harvest of 221 moose (194 males and 27 females) was reported taken by 536 hunters during the 2000–2001 season (Table 1).

Hunter effort and harvest peaked in the mid 1980s when the Unit 22 moose population was at its height. Harvests during this reporting period were slightly higher than recent years, but were 38%–46% lower than the peak harvest of 408 moose in 1986. The number of moose hunters also increased over recent years, but is still 57% below the peak of 1,292 hunters in 1983. Declining numbers of moose in easily accessible areas is largely responsible for the reduction in hunter effort and harvest. Although the size of the harvest and the number of hunters declined in Unit 22, hunter success rates have remained fairly constant and relatively high over the last 16 years, ranging from 39–50%. During this reporting period the hunter success rate was 42% (Table 1).

Compliance with license and harvest reporting requirements by Nome residents is believed to be high, but harvest reporting by village residents has always been incomplete. During this reporting period, the department and Kawerak Inc. continued a community-based harvest assessment program begun in April 1999 to obtain more accurate big game harvest data from Unit 22 villages. In April 2000 household surveys were conducted in Elim, Shaktoolik and White

Mountain. Elim residents reported harvesting 14 moose and 42% of the households that hunted moose were successful. None of the harvest was reported through our traditional harvest ticket reporting system. Shaktoolik residents reported harvesting 14 moose and 68% of the households that reported hunting moose were successful. Only 14% (2 moose) of the moose taken by Shaktoolik residents was reported with harvest tickets. White Mountain hunters reported a harvest of 17 moose. Success rate in White Mountain was 55%. Ninety-four percent of the White Mountain harvest (16 moose) was reported with harvest tickets (Georgette 2000).

In Spring 2001, community-based harvest assessments (big game harvest surveys) were conducted in Brevig, Teller, Shishmaref and Wales (Georgette 2001). Brevig residents reported harvesting 23 moose, and 79% of the households that hunted moose were successful. Seventeen percent of the harvest (4 moose) was reported by harvest ticket. Teller residents reported a harvest of 7 moose and a 32% success rate. In Teller 86% of the harvest (6 moose) was reported by harvest ticket. In Shishmaref 44 moose were reported harvested and the success rate was 76%. Only 23% of the moose (10) were reported by harvest ticket. Wales residents reported harvesting 14 moose, 69% (9) of which had been reported by harvest ticket. The success rate of Wales hunters was 78%. Compliance with harvest ticket reporting varies widely between villages, but it is clear that actual harvest is likely significantly higher than reported harvest in Unit 22. Although community-based harvest assessments are costly and labor intensive to conduct, it is the most reliable method we have found to collect accurate harvest data in Unit 22.

The reported cow harvest in Unit 22 increased noticeably in 2000, because 16 cows were harvested in a new registration hunts for antlerless moose in Unit 22C. Since the early 1990s when antlerless moose seasons were shortened, the reported cow harvest in Unit 22 has been small. In 1999–2000, 2% (5 cows) of the reported harvest was cows and in 2000–2001 the harvest of cows was 12% (27 cows) (Table 1). However big game harvest surveys show that more cows are harvested than are reported and in some areas the cow harvest is significant. In 2000 Elim reported a harvest of 3 cows, Shaktoolik hunters harvested 4 cows and a White Mountain hunter harvested one cow. In 2001 community-based harvest assessment reported the harvest of 2 cows in Teller, in Brevig 6 cows were harvested, in Shishmaref 18 cows were harvested and in Wales 3 cows were harvested. Of the 29 cow moose reported in these 4 villages, 9 (31%) were reported on harvest tickets.

Permit Hunts. In September 2000 two registration permit hunts were initiated for antlerless moose in Unit 22C. Hunt RM850 occurs in the portion of Unit 22C in the Nome and Snake River drainages with up to 5 available permits. RM852 is in the remainder of Unit 22C and up to 15 permits may be available. In 2000 all 20 permits were issued, with 4 cows taken in RM850 and 12 cows taken in RM852. In 2001 only 10 permits were issued (3 in RM850 and 7 in RM852) due to concern about higher than normal winter mortality in spring 2001. In RM850, 3 cows were harvested and 5 cows were harvested in RM852.

Hunter Residency and Success. During 1999–2000 Unit 22 residents accounted for 69% of the harvest and in 2000–2001, 71% of the harvest (Table 4). The proportion of the harvest attributable to local residents has remained remarkably constant during the last 10 years, ranging from 69%–74% of the harvest. Nonresidents accounted for 11%–13% of the harvest during this reporting period.

Harvest Chronology. During this reporting period most of the hunter effort and reported harvest (85%) occurred during August, September, and October when access by roads and rivers is most favorable (Table 5). In 2000 the October harvest was greatly reduced because the season in Unit 22B closed 30 Sept. and the season in the Kuzitrin drainage in Unit 22D was closed by emergency order 21 Oct. Some hunting activity also occurred during December and January when snow machine access is possible and antlerless moose hunting is allowed in December in parts of Unit 22D. In Unit 22E where there are no roads and river access to moose habitat is limited, most of the harvest occurs during January, February and March when hunting is possible by snowmachine.

Data from 1999 and 2000 community-based harvest assessment in Koyuk, Shaktoolik, Elim and White Mountain indicate August is the favored month for moose harvest in those villages. Most of the remaining harvest there occurs in September (Georgette 1999 and 2000). The 2001 surveys of Teller, Brevig, Shishmaref and Wales found different harvest timing in the western villages. In Teller October was the favored month for moose harvest, followed by Sept. and August. In Brevig the highest harvest was in September, followed by December and October. In Shishmaref and Wales harvests were highest in March (Georgette 2001).

Transport Methods. During this reporting period 32% of successful moose hunters used four wheelers, 29% used boats, 17% used highway vehicles and 13% used snowmachines (Table 6). Only 3% of the harvest was by hunters using airplanes. The number of moose harvested by hunters using only highway vehicles for transportation has declined steadily over the last decade. Moose densities are now very low along the road corridor and hunters often must travel to areas far from the road system for successful hunts. Four-wheel-drive four wheelers provide access to remote areas, particularly areas characterized by open terrain, such as Unit 22D.

Other Mortality

No surveys were attempted to determine natural mortality rates of Seward Peninsula moose. The winter of 1999–2000 was colder than average with little snowfall until mid January. Moose remained dispersed at higher elevations until snow accumulation late in January drove them to the river bottoms. Snow accumulation for the remainder of the season was average and moose observed during spring surveys in Units 22A, 22B, 22C and 22D generally were lively and appeared to be in good condition. In the winter 2000–2001 heavy snow accumulation and late spring snow melt on the Seward Peninsula west of the Darby Mountains appeared to result in higher than average overwinter mortality. During the Unit 22C and 22E censuses, moose were found in areas with little available browse and many appeared to be in poor condition. Examination of bone marrow from leg bones of 19 dead moose found in the Snake, Penny and Nome River drainages in April and May 2001 indicated most of those moose either died of starvation or were severely malnourished when they died.

We believe that bear density in Unit 22 has increased over the last decade and that predation by bears on calf and adult moose is a significant factor suppressing moose populations in many parts of the unit. Recruitment rates are generally very low. A 1996–1998 radio collar study of cow moose in western Unit 22B found that up to 75% of the moose calves observed, died within 3 months of birth and 71% of calf mortality occurred within a month of birth. Although calf viability may be a factor, such high mortality shortly after birth suggests points to predation (Persons 1998). During years such as spring 1999 and 2001 when deep, soft snow persists well

into May, bear predation on adult moose may be significant. Wolves are becoming more numerous on the Seward Peninsula, especially in areas occupied by wintering caribou from the Western Arctic herd. Predation by wolves was not previously believed to be a significant factor in moose mortality, but that may be changing as wolves become more abundant.

HABITAT

Assessment

No browse surveys or quantitative range assessments were undertaken to determine availability and quality of winter range in Unit 22. In the past during winters of heavy snow accumulation, winter ranges have been heavily browsed but at current population levels, in most parts of the unit we do not believe that habitat limitations are suppressing moose populations. However, the growing moose population in Unit 22C and the increasingly heavy utilization of winter habitat there raises concerns that the carrying capacity may be exceeded.

Enhancement

There were no habitat enhancement activities conducted in Unit 22 during the reporting period. Members of the public have requested that the department investigate possibilities for habitat enhancement in Unit 22C.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

In Units 22B and 22D the Federal Subsistence Board adopted regulations or special actions that differ from state moose regulations. While this has not resulted in biological problems, it has increased the complexity of the regulations and created significant public confusion. State and federal managers need to work cooperatively to produce and distribute maps and simplified explanations on which regulations apply where.

CONCLUSIONS AND RECOMMENDATIONS

The moose population on the Seward Peninsula grew steadily in size from the 1960s, through the early 1980s and began to decline during the late 1980s and early 1990s. We estimate the population reached a maximum size of 7000–10,000 moose on the Seward Peninsula during the mid to late 1980s. Subsequent declines likely caused by a combination of winter mortality, reduced productivity, low recruitment and increased predation reduced the population size to between 4500 and 6500 animals. Low recruitment rates found in Units 22A, 22B, 22D and 22E indicate a widespread problem with calf survival in the unit. In a large portion of Unit 22 it is likely that harvest and natural mortality are currently exceeding recruitment and populations are believed to be declining.

Results from a research study in western Unit 22B in the late 1990s indicate several factors are contributing to low recruitment in that portion of the unit. Predators, especially bears, are believed to be increasing in numbers in the area, and bear predation on calves is probably the most significant factor in calf mortality. However, the factors of a population dominated by older cows, frequent severe winter snow conditions, and poor winter range quality may be acting in combination to lower productivity and produce calves that are less vigorous at birth and with

subsequent lowered survival (Persons 1998). Some or all of these factors may influence recruitment in other parts of the unit.

Concern about declining moose numbers in the most accessible parts of Units 22B, 22D and 22E, led the Board in November 2001 (after the reporting period) to adopt significant changes to hunting regulations in the most heavily hunted portions of these units. The nonresident seasons were closed, resident seasons were shortened, registration hunts with quotas were established in Units 22B and 22D, and in Unit 22E the antlerless season was closed. In other parts of the unit, although moose are believed to be declining, access is limited and harvest rates are low. In those areas moose abundance and population trends are probably regulated by natural factors such as weather, range and predation, so reductions in hunting opportunity were not recommended. The public is well aware of declining moose numbers and played an active role in developing the regulations adopted by the Board. Additionally, brown bear hunting regulations were liberalized in Unit 22.

Unit 22C is the only portion of Unit 22 where recruitment estimates remain high and the increasing population has exceeded our management goal. In 2000 an antlerless moose hunt in Unit 22C was initiated to help stabilize the population and prevent over-utilization of the limited winter habitat.

Declining population trends and the importance of moose to local users point to the need for more frequent population estimates throughout the unit. Presently, if weather is not a factor, each subunit is censused, at best, once every 5 years. This is not often enough to identify and respond promptly to downward trends. More frequent censuses over larger areas need to occur. This may necessitate reducing time and money spent on assessment of other species in the unit. During this reporting period we were able to resume fall composition counts in heavily hunted drainages of Units 22B, 22C and 22D in spite of less than ideal snow conditions, using an R-44 helicopter.

Compliance with regulations and harvest reporting is thought to be reasonably high in the Nome area. However, in the remainder of the unit some residents do not acquire licenses and/or harvest tickets prior to hunting and much of the harvest is unreported. Public education programs and a visible enforcement effort improve compliance with regulations, but we have found the community-based harvest assessment programs started in 1999 to be the most effective way to collect accurate harvest data from village residents. This program should be continued and expanded to provide more accurate estimates of moose harvest and subsistence use of moose by village residents. Eventual replacement of the harvest ticket reporting system with systematic community surveys is worthy of consideration.

If staff time and money permit, assessment of moose habitat in Units 22B and 22C should be initiated. It would be desirable to examine critical wintering areas and determine the quantity and quality of available browse and ultimately attempt to estimate carrying capacity for the most heavily hunted portions of the unit. In response to public interest, staff should consult with habitat specialists about the feasibility of moose habitat enhancement in Unit 22.

LITERATURE CITED

GEORGETTE S. 1999. Subsistence harvests in Northwest Alaska: caribou, moose, bear, wolf, wolverine May1998 through April 1999. Unpublished. Maniilaq Association, Kawerak, Inc., and Alaska Department Fish and Game. Kotzebue. 20pp.

GEORGETTE S. 2000. Subsistence Harvests in Northwest Alaska: caribou, moose, bear, wolf, wolverine 1999–2000. Unpublished. Alaska Department Fish and Game. 16pp.

GEORGETTE S. 2001. Subsistence Wildlife Harvests in Four Communities on the Western Seward Peninsula, Alaska: 2000–2001. Unpublished. Alaska Department Fish and Game. 19pp.

MACHIDA S. 1997. Unit 22 moose survey-inventory progress report. Pages 38–39 in MV HICKS, ed. Moose. Survey-Inventory Management Report. Alaska Department Fish and Game. Federal Aid Wildlife Restoration. Progress Report. Grant W–24–5 Study 1.0 Juneau. 43pp.

NELSON RR 1995. Unit 22 moose survey-inventory progress report. Pages 405–419 in MV HICKS, ed. Moose. Survey-inventory management report. Alaska Department Fish and Game. Federal Aid Wildlife Restoration. Progress. Report. Grant W–23–1, W–24–1 and W–24–2. Study 1.0. Juneau. 510pp.

PERSONS K. 1998. Unit 22 moose survey-inventory progress report. Pages 378–397 in MV HICKS, ed. Moose. Survey-Inventory Management Report. Alaska Department Fish and Game. Federal Aid Wildlife Restoration. Progress Report. Grant W–24–4 and W–24–5 Study 1.0 Juneau. 485pp.

PREPARED BY:

Kate Persons
Wildlife Biologist III

SUBMITTED BY:

Peter Bente
Management Coordinator

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

Persons, K. 2002. Unit 22 moose management report. Pages 475–495 *in* C. Healy, editor. Moose management report of survey and inventory activities 1 July 1999–30 June 2001. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.

Table 1 Unit 22 historical moose harvest by sex, hunter effort, and success rate for regulatory years 1969–2001

Regulatory year	Males	Females	Unknown sex	Total harvest	Total hunters[a]	Percent success
1969–1970	69	1	2	72	182	40
1970–1971	70	0	1	71	139	51
1971–1972	59	0	1	60	168	36
1972–1973	44	0	0	44	99	44
1973–1974	103	32	1	136	317	43
1974–1975	149	72	1	222	479	46
1975–1976	136	0	2	138	389	25
1976–1977	186	51	3	240	611	39
1977–1978	151	88	5	244	457	53
1978–1979	198	97	2	297	596	50
1979–1980	193	75	2	270	760	36
1980–1981	156	71	1	228	492	46
1981–1982	225	72	1	298	696	43
1982–1983	244	100	0	344	904	38
1983–1984	291	68	46	405	1292	31
1984–1985	298	91	6	395	1086	36
1985–1986	279	92	3	374	876	43
1986–1987	306	101	1	408	892	46
1987–1988	286	20	4	310	775	40
1988–1989	332	36	7	375	748	50
1989–1990	208	82	0	290	713	41
1990–1991	280	70	0	350	700	50
1991–1992	207	95	0	302	656	46
1992–1993	217	72	0	289	645	45
1993–1994	225	21	1	247	553	45
1994–1995	201	10	0	211	486	43
1995–1996	169	13	3	185	469	39
1996–1997	176	20	2	198	456	43
1997–1998	197	6	0	203	423	48
1998–1999	195	13	3	211	510	41
1999–2000	244	5	3	252	581	43
2000–2001	194	27	0	221	536	41

[a]Minimum known number of hunters.

Table 2 Unit 22 aerial moose composition surveys, fall of 1992, 1994, 2000 and 2001

Survey area	Year	Bulls per 100 cows	Calves per 100 cows	Total calves	Percent calves	Total adults	Total moose
Unit 22B							
American Creek	1992	58	10	4	10	38	42
	1994	28	28	8	18	37	45
Niukluk River	2000	27	8	7	6	108	115
	2001	30	14	8	10	73	81
Unit 22C							
Snake River	1992	11	30	11	21	41	52
	1994	14	32	12	22	42	54
	2000	10	25	16	20	69	85
	2001	17	24	17	17	83	100
Stewart River	2001	39	17	7	11	57	64
Unit 22D							
Henry/Washington Ck.	1994	40	23	22	14	133	155
Kougarok/Noxapaga	2000	16	11	19	9	197	216
	2001	15	19	16	14	98	114
Agiapuk	2000	44	23	43	14	275	318
	2001	30	6	5	4	107	112

Table 3 Unit 22 short yearling recruitment surveys, spring 1991–2000

Survey area and survey year	No. calves	No. adults	Total	Percent calves
Unalakleet, Egavik, Tagoomenik, Shaktoolik, Ungalik (Unit 22A)				
2000	14	160	174	8
Fish River (Unit 22B)				
1991	12	202	214	6
1993	11	227	238	5
1994	15	255	270	6
1995	16	384	400	4
Niukluk River (Unit 22B)				
1991	30	319	349	9
1995	13	133	146	9
1997	6	77	83	7
2000	9	81	90	10
Koyuk River (Unit 22B)				
1999	21	208	229	9
2000	19	223	242	8
Snake River (Unit 22C)				
1993	15	63	78	19
1994	18	39	57	32
1999	33	92	125	26
2000	21	98	119	18
2001	20	76	96	21
Lower Kougarok River (Unit 22D)				
1991	14	103	117	12
1994	33	153	186	18
1995	42	227	269	16
2000	16	168	184	9
Kuzitrin/Noxapaga River (Unit 22D)				
1991	23	191	214	11
1994	16	71	87	18
2000	14	203	217	6
Kuzitrin Below Bridge (Unit 22D)				
2000	17	271	288	6
American River (Unit 22D)				
1995	51	248	299	17

Table 4 Residency and success of moose hunters in Unit 22, regulatory years 1999–2000 and 2000–2001

Regulatory	Residency of successful hunters					Residency of unsuccessful hunters				
Year/Unit	Unit[a]	State[b]	Nonresident	Unknown	Total	Unit[a]	State[b]	Nonresident	Unknown	Total
1999–2000										
22A	31	0	9	1	41	49	4	4	0	57
22B	34	16	17	0	67	64	14	5	0	83
22C	32	3	1	2	38	45	10	6	1	62
22D	62	21	7	2	92	88	21	8	1	118
22E	14	0	0	0	14	2	0	0	0	2
22 unknown	0	0	0	0	0	4	2	1	0	7
Total	173	40	34	5	252	252	51	24	2	329
2000–2001										
22A	12	0	3	0	15	44	4	9	0	57
22B	25	16	11	2	54	45	17	6	1	69
22C	47	5	1	0	53	56	5	3	0	64
22D	54	13	9	0	76	89	21	2	2	114
22E	20	2	0	0	22	3	1	1	0	5
22 unknown	0	0	1	0	1	6	0	0	0	6
Total	158	36	25	2	221	243	48	21	3	315

[a] Resident of Unit 22

[b] Other Alaska resident

Table 5 Chronology of Unit 22 moose harvest, regulatory years 1999–2000 and 2000–2001

Regulatory year/ Unit	Month of harvest									
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Unknown	Total
1999–2000										
22A	4	32	0	0	4	1	0	0	0	41
22B	9	41	8	7	1	1	0	0	0	67
22C	0	35	1	0	0	1	0	0	1	38
22D	8	48	25	2	5	0	0	0	4	92
22E	1	0	1	1	2	0	0	9	0	14
Total	22	156	35	10	12	3	0	9	5	252
2000–2001										
22A	2	13	0	0	0	0	0	0	0	15
22B	4	39	0	6	3	0	0	0	2	54
22C	0	52	0	0	0	0	0	0	1	53
22D	7	54	7	1	5	2	0	0	0	76
22E	3	4	0	1	1	0	2	11	0	21
Unknown	0	1	0	0	0	0	0	0	0	1
Total	16	163	7	8	9	2	2	11	3	220

Table 6 Means of transportation reported by successful Unit 22 moose hunters, regulatory years 1997–2000

Regulatory Year/Unit	Aircraft	Horse	Boat	3 or 4 Wheeler	Snowmobile	Off-road vehicle	Highway vehicle	Unknown	Total
1997–1998									
22A	0	0	16	3	2	0	1	0	22
22B	3	0	22	26	11	1	7	2	72
22C	1	0	2	9	0	3	10	2	27
22D	1	0	22	21	3	1	17	0	65
22E	1	0	4	3	7	0	0	1	16
Unknown	0	0	1	0	0	0	0	0	1
Total	6	0	67	62	23	5	35	5	203
1998–1999									
22A	0	0	10	6	0	0	0	0	16
22B	3	0	16	21	16	1	1	0	58
22C	0	0	11	6	0	3	19	0	39
22D	1	0	26	30	10	2	20	0	89
22E	0	0	1	2	6	0	0	0	9
Total	4	0	64	65	32	6	40	0	211
1999–2000									
22A	1	0	23	11	5	0	1	0	41
22B	6	0	25	24	5	1	5	1	67
22C	1	0	10	10	0	2	14	1	38
22D	3	0	17	42	4	0	22	4	92
22E	0	0	2	0	12	0	0	0	14
Total	11	0	77	87	26	3	42	6	252
2000–2001									
22A	0	0	12	3	0	0	0	0	15
22B	4	0	18	18	10	0	3	1	54
22C	0	1	10	13	0	5	23	1	53
22D	1	0	15	30	7	7	16	0	76
22E	0	0	4	2	15	1	0	0	22
Unknown	0	0	0	1	0	0	0	0	1
Total	5	1	59	67	32	13	42	2	221

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

MOOSE MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 23 (43,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Western Brooks Range and Kotzebue Sound

BACKGROUND

Moose began to recolonize the eastern portion of Unit 23 during the 1920s (J. Magdanz, personal communication) and had expanded their range to the Chukchi Sea coast by the mid- to late 1940s (W. Uhl, personal communication). Moose currently rank second to caribou as a source of meat for most residents of the unit. Moose are also avidly sought by resident and nonresident recreational hunters who live outside Kotzebue Sound. Commercial services associated with moose hunting provide substantial income to guides, outfitters and transporters who operate in Unit 23. The wide distribution and accessibility of moose throughout the Unit makes them important to nonconsumptive users, e.g., viewers and photographers.

From the time moose reappeared in Unit 23 through the late 1980s, public comments, trend count surveys and observations by department staff suggested moose populations increased throughout the region. Severe winters and extensive spring flooding occurred during 1988–1991. These factors, combined with high populations of grizzlies and wolves, likely caused moose populations to stabilize or begin declining throughout the Kotzebue Basin.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Maintain healthy age and sex structures for moose populations within Unit 23.
- Determine population size, trend, and composition of Unit 23 moose populations.

MANAGEMENT OBJECTIVES

- Monitor the size and sex/age composition of moose populations in the Noatak, Squirrel, Kobuk, Selawik/Tagagawik Rivers and Northern Seward Peninsula drainages through aerial censuses.

- Maintain a minimum November ratio of 40 bulls:100 cows and a minimum density of 0.5–1.0 moose/mi^2 in each major Unit 23 drainage.

METHODS

Population trend and sex/age composition data were obtained from aerial moose censuses. The Alaska Department of Fish and Game (ADF&G) with assistance from the National Park Service (NPS) and Selawik National Wildlife Refuge (SNWR) conducted censuses during April–May in the lower Noatak drainage (2000 and 2001) and in the lower Noatak/upper Squirrel drainages (2001). During spring censuses we used the geostatisical (spatial) population census technique (Ver Hoef, unpublished): 1) sample units were stratified as 'high' or 'low;' 2) 'desktop' stratification with aerial confirmation of questionable sample units (SUs) was employed; and 3) sightability was not estimated. In 2001 we expanded the lower Noatak spring moose census area to include the Kaluktavik drainage, the entire Eli and Aggasashok drainages, the upper portion of the Squirrel River drainage above and including the North Fork of the Squirrel, and Igichuk Hills/Cape Krusenstern area. I report results for the 2111 mi^2 subset of the expanded area as well as for the entire 5230 mi^2 area for temporal and spatial comparisons.

The SNWR with assistance from ADF&G and NPS conducted a fall census using the Gasaway technique (Gasaway et al. 1986) during November 1999 in the Tagagawik drainage.

The cooperative ADF&G/NPS Noatak moose telemetry project was terminated in 1999. Department involvement in the ADF&G/SNWR Tagagawik moose telemetry project was phased out during the last reporting period.

Harvest information was derived from statewide hunter harvest reports for nonlocal hunters and from community harvest assessments for unit residents. The term "nonlocal hunter" refers to all hunters who reside outside Unit 23 and "local hunter" refers to residents of Unit 23.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

Census results indicate Unit 23 moose densities are currently 0.3–1.0 moose mi^2 (Tables 1 and 2). This is lower than many other portions of Alaska (ADF&G 1998). Although we began conducting rigorous Gasaway-type censuses in Unit 23 almost 10 years ago, most census areas have been completed only once or twice since that time. Therefore, these data are inadequate to evaluate population trends (J. Ver Hoef, personal communication) Even in the middle and lower Noatak drainage where we have the most census data, interpretation of density estimates is confounded by repeated modification of census areas.

The potential effect of modifying a census area on density estimates was illustrated in spring 2001. In April–May we estimated adult density was 0.63 moose/mi^2 in the 2111 mi^2 area (Table 2). This estimate relative to the November 1993 density estimate (Table 1) suggested the moose population had been stable. However, that interpretation was inconsistent with spring density estimates from 1999 and 2000, my observations, and many reports from the public all of which

suggested the lower Noatak moose population had declined since the early 1990s. In spring 2001 deep snow concentrated moose in riparian habitat that comprises much of the 2111 mi^2 census area. Although we probably estimated density within the 2111 mi^2 census area reasonably accurately, I felt movement of moose into that area had masked the overall population decline. I added 3209 mi^2 to the 2111 mi^2 census area thus making the total size 5320 mi^2. The additional area included a lower proportion of high quality habitat than the 2111 mi^2 area. We found few moose in the additional area and adult density in the total area was only 0.30 moose/mi^2. I feel the density estimate for the expanded area better reflects overall density in the lower Noatak and upper Squirrel River drainages than the 2111 mi^2 census area.

The relatively small size of census areas we delineated prior to 2001 in relation to movements of moose, the limited number of replicate censuses within drainages, and inconsistent census boundaries have made the value of census data limited for monitoring abundance of moose in Unit 23.

My observations and many public reports suggest moose populations are declining throughout Unit 23. This decline appears to be most rapid and pronounced in the Noatak drainage and on the Seward Peninsula. Moose density has declined almost 50% in other portions of the Seward Peninsula (Unit 22) since about 1990 (K. Persons, personal communication). Moose may be stable in the Selawik drainage; however, my observations of fewer moose and fewer shed antlers in marginal habitat compared to the early 1990s suggests they are slowly declining in this area, too. Moose have reportedly declined in the upper Kobuk drainage since the early 1990s (G. Loughridge, E. Ward, R. Snyder and G. Bamford, personal communication) and calf recruitment has been low during this reporting period (G. Loughridge, personal communication).

Population Composition

Although census data are of limited value for monitoring density of moose in Unit 23, estimates of population composition (i.e., bull:cow, calf:cow and calf:adult ratios) are probably reasonably accurate. The mean 1997–2001 spring calf:adult ratio in the Noatak River drainage was 9:100 (Table 2). This is consistent with my observations and reports from many local residents and some long-term commercial operators that recruitment rates have been low in this portion of the unit. Similarly, we observed 10 calves:100 adults in the spring 2001 Tagagawik census (Table 2). Parturition rates appear to be high (B. Shults, personal communication) and I have observed more twins since 1998 than during the previous 10 years. During capture operations in the lower Noatak drainage during April 1998 cow moose were in excellent body condition which is consistent with high parturition rates. My observations are consistent with many local hunters and most commercial operators view that brown bear predation on calves is probably substantially contributing to low recruitment.

Fall censuses indicate bull:cow ratios are above or near the population objective of 40:100 throughout Unit 23 (Table 1). The low bull:cow ratio in the Noatak River drainage compared to other drainages in Unit 23 is probably attributable to its long history of commercial activity and trophy hunting by nonlocal hunters.

Distribution and Movements

Almost no moose now reside year round in that portion of the Noatak drainage above the Cutler and Aniuk Rivers. In April 2001 while on a snow machine trip through Ivishak Pass to the headwaters of the Noatak River and many tributaries I saw a total of 2 moose (both bulls) and no other tracks. Although large riparian willow thickets occur in this portion of the unit, the absence of spruce forests probably makes this marginal moose habitat. Additionally, both wolves and brown bears are abundant in the upper Noatak drainage.

Telemetry information collected during 1992–1997 from moose collared in the mid–lower Noatak drainage indicated moose occasionally moved from this area as far west as Cape Thompson, southwest to the mouth of the Noatak River, east to Howard Pass and southeast to the lower Salmon and Squirrel River area. A few moose collared in the lower Tagagawik drainage moved north to the Waring Mountains (L. Ayres, personal communication). Generally, though, moose collared in the Tagagawik and Selawik drainages showed greater fidelity to their annual ranges than Noatak moose.

Although moose densities have probably declined throughout Unit 23 during this reporting period, their general distribution has not substantially changed except possibly in the upper Noatak drainage.

MORTALITY

Harvest

Seasons and Bag Limits.

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
1999–2000 & 2000–2001		
Unit 23 north of and including the Singoalik River drainage One moose; cows with calves may not be taken	1 Jul–31 Mar	
One antlered moose with spike-fork or 50-inch antlers or antlers with 4 or more brow tines on one side		1 Sep–20 Sep
Noatak drainage One moose, however, antlerless moose may be taken only from 1 Nov–31 Mar.; cows with calves may not be taken	1 Aug–15 Sep 1 Oct–31 Mar	

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
One antlered moose with spike-fork or 50-inch antlers or antlers with 4 or more brow tines on one side		1 Sep–15 Sep
Remainder of Unit 23 One moose, cows with calves may not be taken	1 Aug–31 Mar	
One antlered moose with spike-fork or 50 inch antlers or antlers with 4 or more brow tines on one side		1 Sep–20 Sep

Board of Game Actions and Emergency Orders. The board reauthorized antlerless moose seasons for the 1999–2000 and 2000–2001 regulatory years. At the fall 2001 meeting (after this reporting period) the board: 1) shortened the resident antlerless moose season in the Noatak drainage to 1 Nov–31 Dec; 2) shortened the nonresident moose season in the Noatak drainage to 6–15 Sep; and 3) eliminated calf harvests throughout the unit. The board also made it illegal to bone the meat from the front or hindquarters of moose and caribou taken during July 1-September 30 in Unit 23. These changes became effective during the 2002–2003 regulatory year.

The board also implemented the second phase of the Intensive Management process during the November 2001 meeting (the board implemented the first phase at the fall 1999 meeting by identifying moose throughout Unit 23 as important for consumptive use). We estimated the long-term unitwide sustainable moose population ranges from 3545–9207 moose (Table 3). This was based on crude estimates of potential habitat by drainage and our best guess of high and low densities that could prevail or be sustainable on the order of decades.

Hunter Harvest. Community-based harvest assessments indicate approximately 335 moose were harvested annually by unit residents during this reporting period (Table 4). This is substantially higher than the 23 and 30 moose unit residents reported taking through the statewide harvest ticket system in 1999–2000 and 2000–2001, respectively. Although moose harvest ticket data appears to capture <10% of the actual harvest by unit residents, it probably reflects temporal trends in local harvests reasonably well. We think the accuracy of harvest ticket data is much better for nonlocal hunters than for local hunters. Combining harvest ticket data (to estimate harvests by nonlocal hunters) and community harvest assessment estimates (to estimate harvests by local hunters after subtracting moose reported through the harvest ticket system) indicates a minimum annual harvest of 451 moose in 1999–2000 and 470 moose in 2000–2001.

The community-based estimate of unit resident harvest was determined during a period when caribou were readily available. If caribou availability decreases through shifts in distribution or

population decline, harvest of moose by local residents will almost certainly increase. Most Unit residents explain the 1979–1994 decline in local moose harvest as a function of increased availability of caribou during that time. Currently, subsistence need for moose in Unit 23 is 325–400 moose annually.

Total reported harvest generally increased from 1979–1980 through 1988–1989, then declined through 2000–2001 (Table 5, Fig 1). In contrast, total number of hunters increased from 1979–1980 through 2000–2001. There was a positive linear relationship between total number of hunters and total reported harvest during 1979–1980 through 1988–1989 ($F = 19.81$, $P = 0.002$, $n = 10$). There was no linear relationship between these parameters during 1989–1990 through 2000–2001 ($F = 1.08$, $P = 0.32$, $n = 12$). Since 1988–1989, as hunter numbers increased, total reported harvest decreased as hunter success declined. The total number of moose hunters reported during the 2000–2001 regulatory year (410 hunters) was the highest ever recorded, yet the reported harvest (165 moose) was substantially below the upper range recorded in 1988–1989 (222 moose) when the number of hunters was much lower (320 hunters; Table 5). As in the past, the reported harvest of female moose was small during 1999–2000 and 2000–2001 in terms of absolute numbers (11 females reported taken during each regulatory year, Table 5), and in relation to total harvest (8% and 7%, respectively).

Trends in hunter numbers have varied among drainages. The Noatak is the only drainage in Unit 23 where number of hunters has declined (Fig 2). Prior to the mid 1990s, more hunters used the Noatak drainage than any other drainage in Unit 23. During this reporting period more hunters used each of the Kobuk and Selawik drainages than the Noatak drainage. Hunter numbers have increased most rapidly in the Kobuk drainage although they increased in the Selawik drainage as well. Hunter numbers remained low and stable in Wulik/Kivalina drainages and northern Seward Peninsula drainages. The decline in effort in the Noatak River drainage is probably at least partly attributable to restricted access (i.e., Noatak Controlled Use Area). Also, moose hunting seasons and bag limits have been incrementally restricted there since the 1988–1989 regulatory year. Declines in effort and moose harvest in the Noatak drainage may also be partly attributable to declining numbers of moose and crowded hunting conditions causing highly mobile nonlocal hunters to find more productive and aesthetically pleasing portions of the Unit to hunt.

Not surprisingly, trends in reported harvest among drainages have generally followed trends in effort. Since the mid 1980s the reported moose harvest declined in the Noatak drainage and increased in the Kobuk and Selawik drainages. There has been no temporal trend, and harvest levels have been low, in the Wulik/Kivalina drainages and on the Seward Peninsula.

Hunters harvested a mean annual average of 14% (SD = 3) of collared bulls in the Noatak drainage between 1992 and 1997. This probably overestimates the actual harvest rate for bulls because only large bulls, which are strongly selected by nonlocal hunters, were collared.

Permit Hunts. There were no permit hunts for moose in Unit 23 during the reporting period.

Hunter Residency and Success: Numbers of nonresident and nonlocal Alaskan resident moose hunters continued to increase during this reporting period ($R^2 = 0.89$; Fig 3). The strength of this relationship is surprising given annual variability in hunting conditions (weather, onset of freeze-up, water levels, etc), regulatory changes, availability of commercial services, economic

considerations (e.g., the cost of airline tickets) and other factors that affect hunting in Unit 23. Factors contributing to these trends include: 1) increasing commercial services in Unit 23; 2) increasingly restrictive hunting regulations for moose and other species outside of Unit 23, especially for nonresident hunters; 3) word of mouth advertisement of good hunting in Unit 23; and 4) the scarcity of trophy bulls in other units. The number of nonlocal hunters who reported hunting in Unit 23 during 2000–2001 was the second highest on record.

Numbers of unit resident moose hunters were low during this reporting period compared to levels reported during the late 1970s and early 1980s. Although the number of local moose hunters has slowly increased since 1993–1994, the trend from 1979–1980 to 2000–2001 has generally declined ($R^2 = 0.69$; Fig 3).

Success rates peaked in 1988 at 69% but have declined since that time ($R^2 = 0.82$, all hunters). Success rates have been <50% since 1993–1994 ($n = 8$ years). Prior to 1993–1994 hunter success was <50% in only 2 of 14 years (1982 and 1983). During 1998–1999 through 2000–2001 hunter success was 39–40%, the lowest ever recorded.

The decline in hunter success has been most pronounced for nonresident hunters (Fig 4). This could be because disproportionately more nonresidents are hiring transporters rather than guides since 1992–1993. Prior to 1992–1993 nonresident hunters consistently had higher success rates than nonlocal Alaskan or Unit 23 resident hunters. Since 1992–1993 success rates have been similar and have generally declined for all 3 groups of hunters.

Recent widespread use of float-equipped airplanes by transporters, greater use of 4-wheelers by guides and increasing numbers of village residents transporting nonlocal hunters via boat continued to reduce the number of refugia available to moose in Unit 23. Nonlocal demand for transporter services continued to exceed availability despite growth of this industry. As in the past, we continued to receive reports of illegal transport of hunters via boat and airplane during this reporting period. The large disparity between transporter supply and demand by nonlocal hunters means Unit 23 could experience rapid and substantial increases in numbers of nonlocal hunters if transporter services suddenly increased. This could further reduce the quality of hunting in Unit 23, intensify conflicts between local and nonlocal hunters and increase moose harvests.

Harvest Chronology. As in the past, despite an 8-month moose season in most of the unit, the majority of moose were harvested in September during this reporting period. Virtually all sport hunting occurs during this time because weather is mild and conducive to airplane and boat access, it entirely encompasses the nonresident season, and bulls have completely developed antlers free of velvet. In 1999–2000, 85% of the reported harvest occurred during September, and in 2000–2001 this percentage was 84%. The percentage of total harvest taken during September has generally increased since the 1979–1980 regulatory year. This probably reflects increasing numbers of nonlocal hunters in Unit 23.

Transport Methods: Airplanes continued to be the primary mode of transportation for most hunters who reported hunting moose in Unit 23 (Table 6). Sixty-nine percent of all hunters reported using airplanes to access moose hunting areas in 1999–2000; in 2000–2001 this percentage was 65%. Most nonlocal hunters at least initially access hunting areas using

airplanes. The number of hunters who reported using airplanes has steadily increased since 1983–1984. This is probably correlated with increasing numbers of nonlocal hunters in Unit 23. As in the past, boats were the next most common means of transportation for hunting moose during this reporting period.

Other Mortality

From 1992–1997 the mean annual adult cow mortality rate was 15% in the Noatak moose telemetry study. No collared cows were harvested by hunters during the study; therefore, this estimate represents natural mortality. The age structure of the collared sample of moose was older than the overall population because we did not collar cows <24 months old or collar moose annually. Even so, we think these limitations did not substantially bias our estimate of adult cow mortality.

HABITAT

Assessment

Moose habitat was not evaluated by ADF&G in Unit 23 during this reporting period. In 2000 the NPS began to monitor moose browse through range exclosures in portions of the Noatak National Preserve (B. Shults, personal communication).

Enhancement

There were no habitat enhancement activities for moose in Unit 23 during the reporting period.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

'User issues' continued to be the major nonregulatory management problem in Unit 23 during this reporting period. In previous years user issues were primarily conflicts between local and nonlocal hunters for hunting sites as well as airplanes disturbing local hunters and possibly wildlife. In recent years additional concerns have also been expressed:

1) New air transporters are reportedly impacting guides and established transporters by competing for hunting areas, dropping clients near existing camps and intentionally hazing wildlife away from their competitors' clients.

2) Village-based transporters using boats are disturbing subsistence users, guides and nonlocal hunters through high levels of boat traffic and high noise levels associated with some types of jet boats.

3) Waste of meat by trophy hunters has long been a sensitive issue in Unit 23. During this reporting period several blatant examples of waste by nonlocal clients of one transporter heightened concerns of local residents.

4) As numbers of nonlocal hunters have increased in Unit 23 the incidence of trespass on Native corporation lands and on private Native allotments has increased as well. The ADF&G, with assistance from the Department of Natural Resources, developed a map showing land ownership in the middle and upper Kobuk drainage. The SNWR produced a similar map for the Selawik drainage (J. Roberts, personal communication).

The Unit 23 user issues planning process initiated in January 1999 was temporarily suspended until a planner is hired in Region V.

CONCLUSIONS AND RECOMMENDATIONS

Declining moose and increasing hunter effort necessitate we improve our biological understanding of moose populations in Unit 23. I recommend we:

1. Census large areas (4,000–10,000 mi^2) to minimize the effects of moose movements on density estimates.

2. Census moose every 2–3 years in each census area. Potential census areas include 1) lower Noatak/upper Squirrel drainages, 2) Selawik/Tagagawik drainages, 3) upper Kobuk drainage, and 4) northern Seward Peninsula.

3. Reduce confidence intervals around density and composition estimates through intensive sampling and by incorporating trend information into point estimates as soon as possible.

4. Conduct spring and fall censuses to prevent long gaps between density estimates. Supplement spring censuses with low-intensity fall surveys to monitor bull:cow ratios.

5. Resume the Unit 23 user issues planning process once a planner has been hired for Region V.

6. Continue community-based harvest assessments in villages throughout Unit 23 to monitor local harvests, and employ the statewide harvest ticket system to monitor nonlocal harvests.

LITERATURE CITED

GASAWAY WC, SD DUBOIS, DJ REED AND SJ HARBO. 1986. Estimating moose population parameters from aerial surveys. Biology Paper No. 22. University Alaska Fairbanks, Alaska.

ALASKA DEPARTMENT OF FISH & GAME. 1998. Moose management progress report of survey-inventory activities. M. V. Hicks, editor. Federal Aid in Wildlife Restoration Grants W–24–4 and W–24–5. Study 1.0. Juneau, Alaska.

PREPARED BY:

Jim Dau
Wildlife Biologist III

SUBMITTED BY:

Peter Bente
Management Coordinator

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

Dau, J. 2002. Unit 23 moose management report. Pages 496–515 *in* C. Healy, editor. Moose management report of survey and inventory activities 1 July 1999–30 June 2001. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.

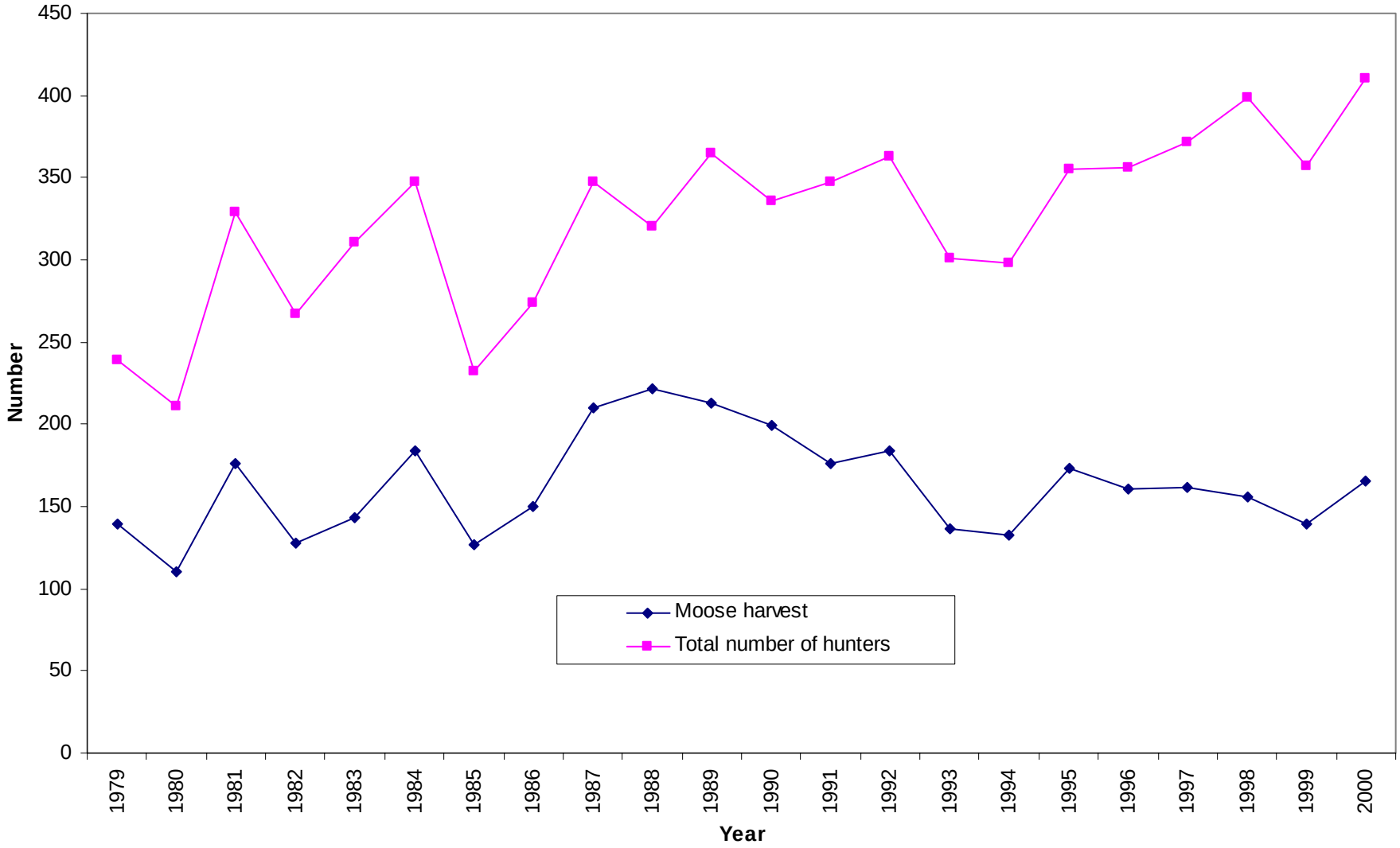


Figure 1 Unit 23 moose hunters and harvests reported through the statewide harvest ticket system, 1979–1980 through 2000–2001

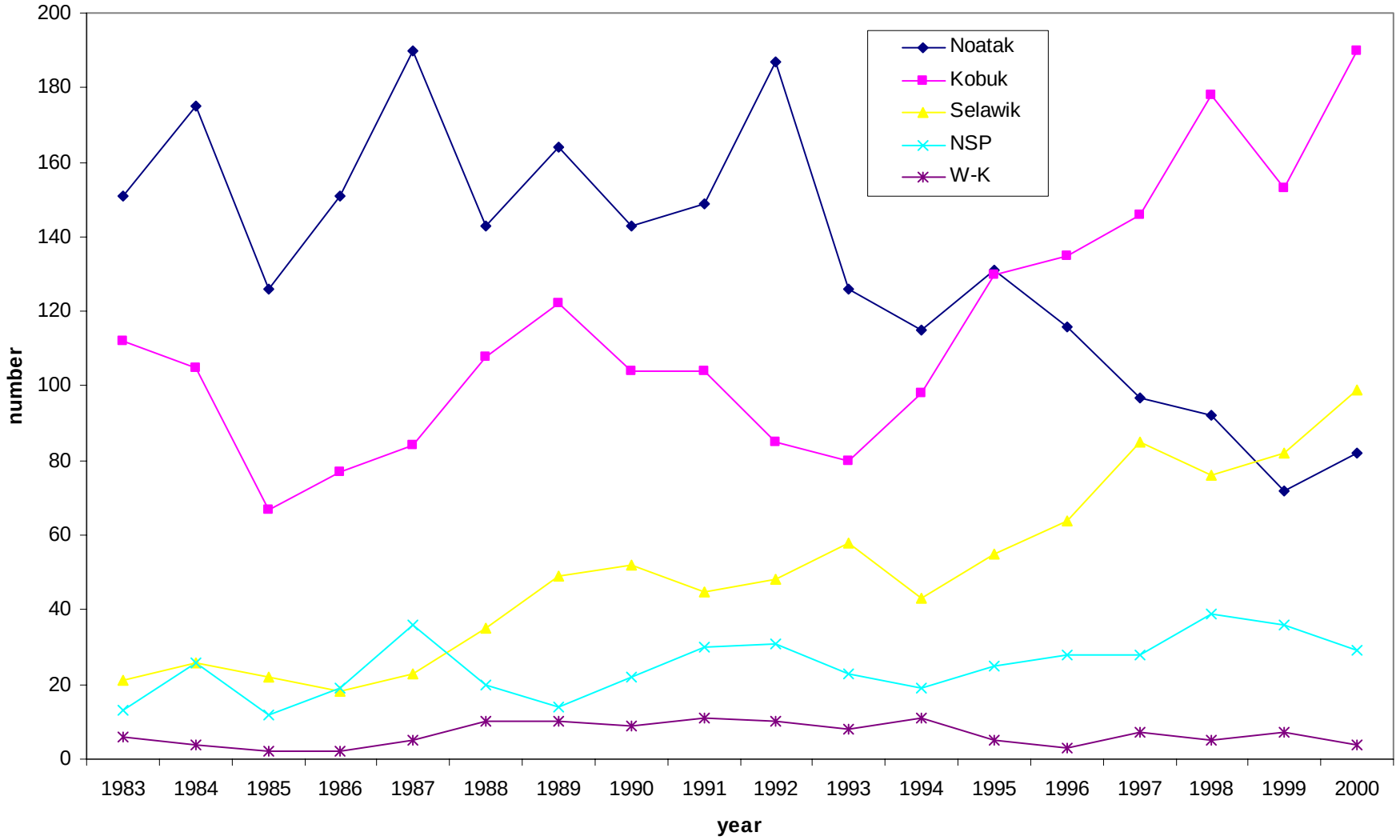


Figure 2 Unit 23 moose harvest by drainage (statewide harvest ticket system data), 1983–1984 through 2000–2001

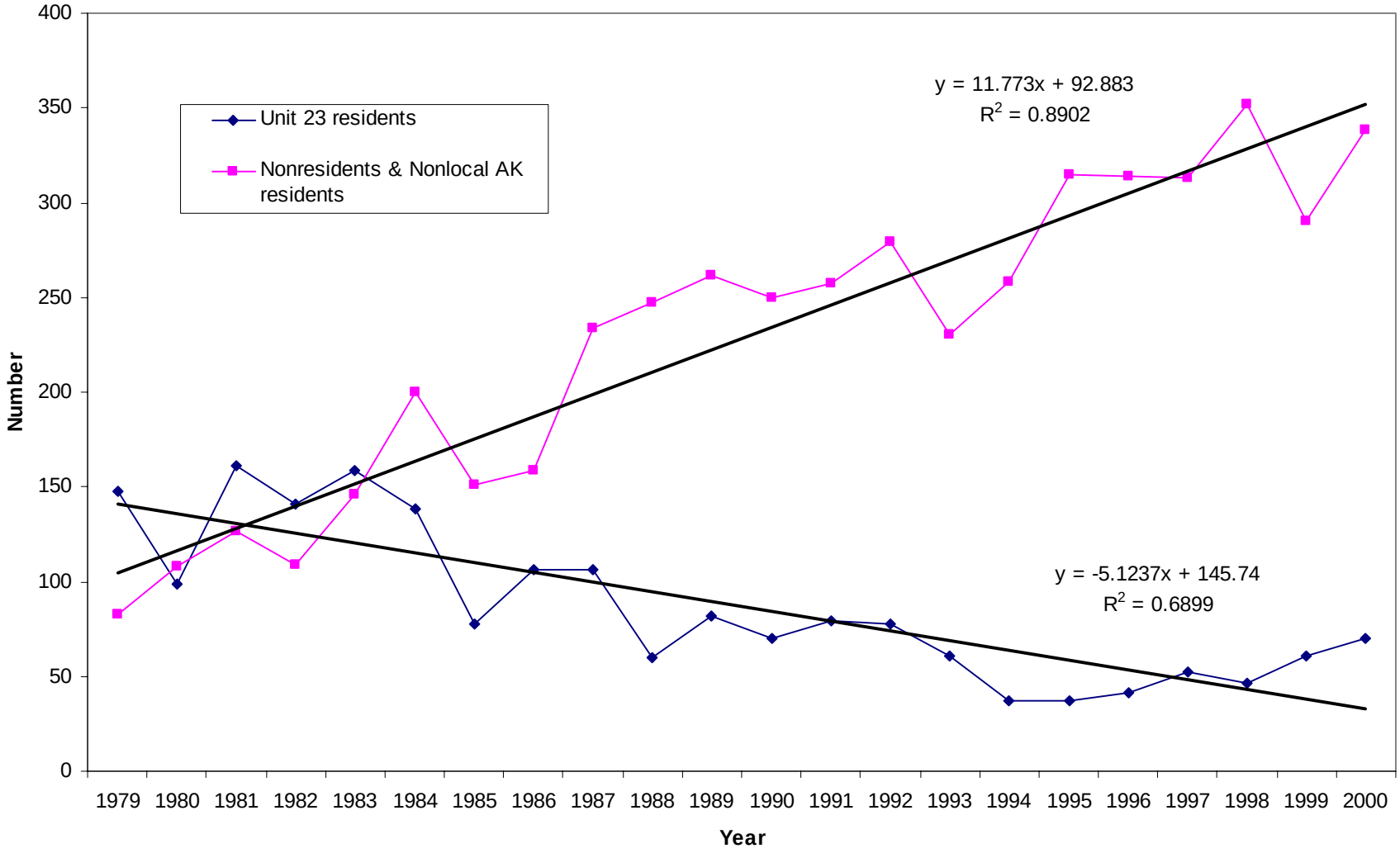


Figure 3 Numbers of Unit 23 moose hunters by residence (harvest ticket data), 1979–1980 through 2000–2001

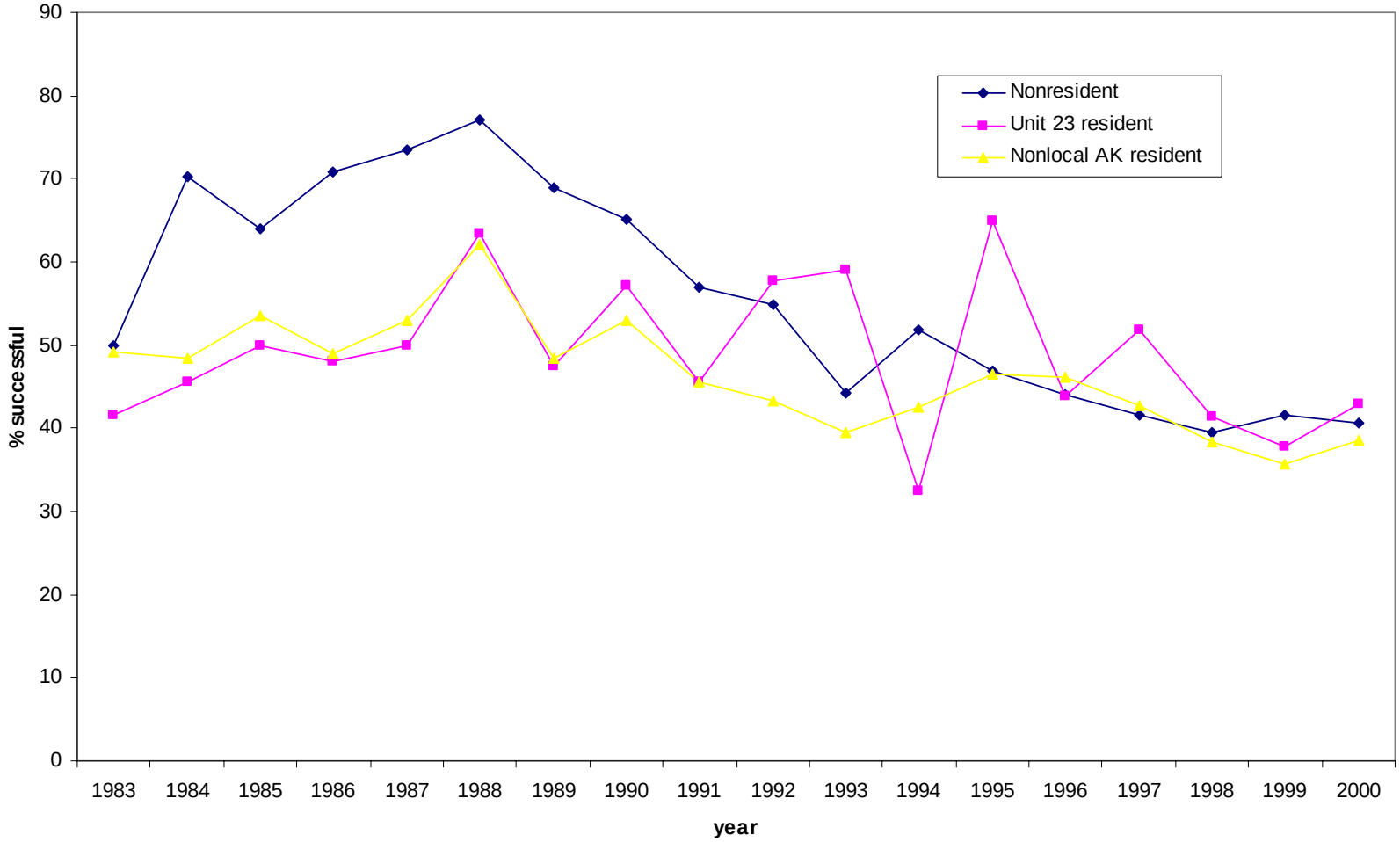


Figure 4 Unit 23 moose hunter success rate by residence (harvest ticket data), 1983–1984 through 2000–2001

Table 1 Summary of Unit 23 fall moose censuses, 1992–2001

Area	Year	Size (mi^2)	Est. # adults	Est. # calves	Total estimate	Total density ($no.mi^2$)	Adult density ($no.mi^2$)	Bulls:100 Cows	Calves: 100 Cows	Methods
Squirrel	1992	1440.9	1110	262	1372	0.95	0.77	37	33	Std. Gasaway
Squirrel	1998	1440.9	1304	233	1537	1.07	0.90	50	27	Spatial
Middle Noatak	1993	1627.9	956	169	1125	0.69	0.59	43	24	Std. Gasaway
Salmon	1995	891.4	594	186	780	0.87	0.67	78	56	Mod. Gasaway
Salmon	1997	891.4	895	129	1024	1.15	1.00	60	23	Std. Gasaway
Upper Kobuk	1995	1438.0	730	85	815	0.57	0.51	62	19	Linear Regression
Upper Selawik	1999	1045.9	569	80	648	0.62	0.54	68	23	Std. Gasaway

Table 2 Summary of Unit 23 spring moose censuses, 1997–2001

Area	Year	Size (mi^2)	Est. # adults	Est. # calves	Total estimate	Total density (no. mi^{-2})	Adult density (no. mi^{-2})	Calves:100 Cows	Method
Tagagawik	1997	1000.9	952	191	1145	1.14	0.95	20	Std. Gasaway
Tagagawik	2001	1692.6	1259	115	1374	0.76	0.70	9	Std. Gasaway
Lower Noatak	1997	1627.9						8	Mod. Gasaway
Lower Noatak	1998	1627.9						12	Mod. Gasaway
Lower Noatak	1999	2111.2	1126	65	1191	0.56	0.53	6	Mod. Spatial
Lower Noatak	2000	2111.2	710	59	779	0.37	0.34	8	Mod. Spatial
Lower Noatak	2001	2111.2	1325	130	1453	0.69	0.63	10	Mod. Spatial
Noatak/Squirrel	2001	5230.2	1580	151	1731	0.33	0.30	10	Mod. Spatial

Table 3 Unit 23 Intensive Management moose population objectives identified for the Board of Game, November 2001

Area	Total area (mi^2)	Area of Potential Moose Habitat (mi^2)	Low Adult Density (moose/ mi^2)	High Adult Density (moose/ mi^2)	Low Population Size (# moose)	High Population Size (# moose)
Noatak: mouth to Nimiuktuk	10440	4176	0.25	0.70	1044	2923
Noatak: Anisak to headwaters	2520	252	0.10	0.20	25	50
Wulik, Kivalina, Lisburne Hills	5940	594	0.05	0.10	30	59
Kobuk: mouth to Kiana	3096	1548	0.25	0.70	387	1084
Kobuk: Kiana to Ambler	4248	2124	0.25	0.70	531	1487
Kobuk: Ambler to headwaters	5292	2117	0.25	0.50	529	1058
Selawik (including Tagagawik)	6840	2736	0.25	0.70	684	1915
Northern Seward Peninsula	5040	1260	0.25	0.50	315	630
Total	43,416	14,807			3545	9207

Table 4 Estimated moose harvest in Unit 23 villages from community harvest estimates (Subs. Div. unpub. data except as noted)

Village	Year of	Village pop. in survey year	No. moose reported harvested	Per capita moose harvest	Estimated village pop. in 2000	Estimated moose harvest in 1999-2001
Kotzebue	1986	2681	65	0.024	3082	71
Noatak	1999	428	4	0.005	428	4
Kivalina	1992	344	17	0.049	377	19
Point Hope[a]	1992	685	14	0.020	757	15
Noorvik[b]	1998	598	37	0.062	634	39
Kiana[c]	1999	388	8	0.021	388	8
Ambler[d]				0.082	309	25
Shungnak	1998	257	21	0.082	256	21
Kobuk[d]				0.082	109	9
Selawik	1999	772	64	0.083	772	64
Buckland[e]				0.102	406	41
Deering	1994	148	15	0.102	136	15
Total					7654	335

[a] North Slope Borough, unpub. data
[b] Noorvik IRA, unpub. data
[d] estimated from Shungnak 1998 data
[e] estimated from Deering 1994 data

Table 5 Numbers of moose hunters by residency and success, and moose harvests by sex for Unit 23, 1979–1980 through 2000-2001

	Hunter residency					Hunter success			Sex of moose harvested		
Year	Unit 23 resident	Nonlocal resident	Non-resident	Unk	Total hunters	Succ.	Unsucc.	Succ. rate	Males	Females	Unk. Sex
1979–1980	148	51	32	8	239	139	100	58	129	10	0
1980–1981	99	61	47	4	211	110	101	52	97	6	7
1981–1982	161	80	47	41	329	176	153	53	160	15	1
1982–1983	141	81	28	17	267	128	139	48	119	8	1
1983–1984	159	116	30	6	311	143	168	46	131	12	0
1984–1985	138	126	74	9	347	184	163	53	162	17	5
1985–1986	78	101	50	3	232	127	105	55	112	12	3
1986–1987	106	94	65	9	274	150	124	55	142	8	3
1987–1988	106	102	132	7	347	210	137	61	194	15	1
1988–1989	60	116	131	15	320	222	98	69	207	15	6
1989–1990	82	120	142	21	365	213	152	58	200	11	2
1990–1991	70	115	135	16	336	199	137	59	185	14	1
1991–1992	79	136	121	11	347	176	171	51	143	33	0
1992–1993	78	157	122	6	363	184	179	51	159	25	0
1993–1994	61	144	86	10	301	136	165	45	118	17	1
1994–1995	37	148	110	3	298	133	165	45	127	6	0
1995–1996	37	189	126	3	355	173	182	49	164	8	1
1996–1997	41	178	136	1	356	161	195	45	145	15	1
1997–1998	52	171	142	7	372	162	210	44	154	8	0
1998-1999	46	167	185	1	399	156	243	39	146	8	2
1999-2000	61	129	161	6	357	139	218	39	127	11	1
2000-2001	70	166	172	2	410	165	245	40	154	11	0

Table 6 Number of moose hunters by transportation type in Unit 23, 1983-1984 through 2000-2001

Year	Airplane	Boat	Snow machine	Horse/dog team	3- or 4-wheeler	Off-road vehicle	Highway vehicle	Unknown	Total hunters
1983-1984	111	131	11	1	0	3	4	50	311
1984-1985	173	103	17	1	2	3	2	46	347
1985-1986	137	59	10	1	6	0	0	19	232
1986-1987	121	89	14	1	6	2	3	38	274
1987-1988	165	93	25	0	21	0	4	39	347
1988-1989	207	63	13	1	13	0	1	22	320
1989-1990	229	89	16	1	7	0	2	21	365
1990-1991	224	61	19	0	10	1	1	20	336
1991-1992	231	65	28	2	7	0	3	11	347
1992-1993	248	63	23	1	7	0	3	18	363
1993-1994	193	72	17	0	9	1	2	7	301
1994-1995	191	74	13	2	5	1	4	8	298
1995-1996	240	77	11	0	16	0	1	10	355
1996-1997	234	77	20	1	16	0	2	6	356
1997-1998	250	74	19	2	13	0	2	12	372
1998-1999	289	76	10	1	11	1	0	0	388
1999-2000	245	78	18	2	11	0	2	0	356
2000-2001	260	113	17	3	7	1	2	0	403

Alaska Department of Fish and Game
Division of Wildlife Conservation
(907) 465-4190 PO BOX 25526
JUNEAU, AK 99802-5526

MOOSE MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT : 26A (56,000 mi^2)

GEOGRAPHICAL DESCRIPTION: Western North Slope

BACKGROUND

Archaeological evidence indicates moose have been present on the North Slope either sporadically or at low densities for many years. Since about 1940, moose populations have increased in size and have become well established in Unit 26A. Nearly all moose are confined to riparian habitat along river corridors during winter. During summer, many moose move into small tributaries and hills surrounding riparian habitat, and some disperse as far as the foothills of the Brooks Range and across the coastal plain. The largest winter concentrations of moose are found in the inland portions of the Colville River drainage.

Since 1970, late-winter surveys have been conducted annually to assess population status and short yearling recruitment. Complete surveys of all major drainages in Unit 26A were completed in 1970, 1977, 1984, 1991, and 1995. The population increased steadily from a count of 1219 moose in 1970 to 1535 in 1991, then declined to 757 in 1995 (Trent, 1989; Carroll, 1998).

Census and trend counts indicated that the population declined by 75% between 1992 and 1996. Adult mortality was high and fall surveys indicated poor calf survival during 1993 (4% calves), 1994 (2% calves), and 1995 (0%). The decline appeared to be a combination of malnourishment, disease, mineral deficiency, predation, weather factors, and competition with snowshoe hares (Carroll, 1998). Samples were collected from hunter-killed moose and those that were found dead in 1995 and 1996. In addition, we captured, examined, sampled, and radiocollared 45 female and 5 male moose in 1996 and 1997. Analysis indicated that nearly all of the moose tested to be marginally deficient in copper. Several cows captured in 1996 and 1997 tested positive for antibodies to the bacteria *Brucella suis Biovar 4* (8 of 43) and *Leptospira interrogans serovar pomona* (6 of 30). Both diseases cause abortions and weak calves. Relatively high moose populations in the 1980s and early 1990s may have led to over-browsing. Snowshoe hares moved into the area in the early 1990s and irrupted, placing further stress on the browse plants. Wolf and grizzly bear numbers were at relatively high levels during the time of the decline

The population began to recover in 1996. Radiotracking surveys indicated that the adult and calf survival rates increased substantially. Short yearling counts indicated recruitment of 23% during

1997, 26% in 1998, and 17% in 1999. The trend area count increased from 152 moose in 1996 to at least 210 moose in 1999 (Carroll, 2000)

Hunters have used aircraft to hunt moose since the early 1970s (Trent 1989) Most local hunters travel by boat along the Colville River to hunt moose. The mean reported harvest from 1985 to 1993 was 59 moose per year, with a high of 67 in 1991. The harvest decreased to 40 during 1994–1995 and 14 in 1995–96 as the moose population declined and regulations became more restrictive. Hunters harvested 0 moose in 1996, 2 in 1997, 5in 1998, and 2 moose in 1999.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Allow for the recovery of the Unit 26A moose population and maintain a population of over 1000 moose, with a bull: cow ratio of over 30:100.

- Maintain a moose population capable of satisfying subsistence and general hunt needs.

MANAGEMENT OBJECTIVES:

- Conduct a unitwide spring census every 5 years and a spring trend area count to assess population trend and recruitment on subsequent years.

- Conduct a yearly fall aerial sex and age composition survey of the Colville River population.

- Conduct radiotelemetry surveys to examine calf production and survival, distribution, and mortality rates each summer, fall, and spring.

- Monitor predator populations and other mortality factors through field observations and public contacts.

- Examine dead moose to look for causes of death, disease, mineral deficiencies, and contaminants.

- Develop updated population objectives in cooperation with the public and other agencies.

METHODS

We used a Cessna 185 and a Piper PA–18 aircraft to survey trend count areas along the Colville, Chandler, and Anaktuvuk Rivers during 6–9 November 1999, 4–7 April 2000, 5–6 April 2001, and 24–26 October 2001 (after the report period). For all surveys we flew over suitable riparian habitat and attempted to locate all the moose in the survey areas. We determined sex and age composition and estimated the antler size of bulls during the fall surveys and short yearling recruitment and total number of moose during spring surveys.

Surveys to locate and observe radiocollared moose were flown in conjunction with the above mentioned fall and spring surveys. In addition we conducted calving success surveys each year

during the first week of June. We obtained GPS locations for all moose that were observed during radiotracking surveys and noted whether the females had 0, 1, or 2 calves.

We compiled harvest data from harvest reports submitted by hunters. In addition we gathered harvest data by contacting hunters in Nuiqsut.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size and Trend

Census results of 1219, 1258, 1447, and 1535 moose in 1970, 1977, 1984, and 1991, respectively, indicate the population was stable and slowly increasing for at least 20 years. A 1995 census indicated a 51% decline in the population between 1991 and 1995 (Table 1). Trend counts indicated that the population continued to decline until 1996 to about 25% of the 1991 population; then, numbers increased from 1997 through 1999 (Table 2).

The population continued to increase in 2000 and 2001 as indicated by trend counts of 325 and 333 moose, respectively. (Table 2). The large increase in number of moose counted in 2000 could have been partially due to deep snow, which pushed the moose into river bottoms more than usual, making them easier to count. The number of moose counted in the trend count area appears to be increasing faster than in the upper part of the drainage.

The increase in population resulted from low adult mortality and high calf survival, probably due to some combination of the following factors: recovery of vegetation after overbrowsing, reduction of bacterial diseases prevalent in the population, reduced predation, weather factors and reduced hunting pressure.

We used radiocollared moose to determine how many moose were missed by observers during the spring count in 1999. We found that we had failed to see between 12% and 18% of the collared moose in the original count (Carroll, 2000). The number missed probably varies from year to year, depending on conditions.

Population Composition

The percentage of short yearlings counted in spring surveys was very low between 1994 and 1996 (3%, 2%, and <1%). However it increased dramatically in 1997, 1998, and 1999 when 23%, 26%, and 17%, were observed. The trend continued in 2000 and 2001 when 25% short yearlings were counted each year. (Table 2).

During the fall 1999 composition surveys we observed 209 moose in the following classes: 51 bulls (49 bulls:100 cows), 104 cows, and 54 calves (52 calves:100 cows). It appeared that, due to late fall conditions, many bulls had not moved into the count area in 1999. We were unable to conduct fall surveys in 2000. In 2001 (after the reporting period) we observed 368 moose, including 132 bulls (74 bulls:100 cows), 179 cows, and 57 calves (32 calves:100 cows). These counts continued the trend we have seen since 1996 of marked increase in summer calf survival compared to 1993 – 1995 (Table 3).

With improved calf survival, the percentage of bulls in the younger age groups gradually increased, and there is now good representation in all bull antler size groups as shown here:

The estimated antler widths of bulls were:

Inches	<30	30–39	40–49	50–59	60+
1996	0%	0%	38%	45%	17%
1997	4%	8%	16%	48%	24%
1998	13%	22%	14%	31%	20%
1999	18%	16%	12%	28%	26%
2001	13%	18%	17%	32%	20%

Distribution and Movements

Bull moose are widely dispersed during the summer months, ranging from the northern foothills of the Brooks Range Mountains to the arctic coast. Most cow moose move out of the river bottoms, but stay near riparian habitat during summer months, while some range onto the coastal plain. During the fall, as snow cover accumulates, moose move back into to the riparian corridors of the large river systems, primarily the Colville River drainage. By late winter most moose can be found in the riparian corridors. During late April, when snow cover begins to disappear in the foothills, moose begin to move away from the riparian corridors. During late May and early June most parturient cows move away from the river bottoms to calve.

During 1996 and 1997 we radiotracked the collared moose several times and obtained the following distribution information:

- 13 June 1996. 25 of 35 collared moose had moved away from the river bottoms into small tributaries or hills surrounding the major rivers. Eighteen of 20 cows seen with calves had moved away from the major rivers before calving. Most pregnant cows stayed on the major rivers until a few days before parturition and then moved away from the river bottoms to give birth. Three cows moved from the Anaktuvuk River to the Tuluga River to give birth. The mean distance that moose had moved away from the river bottoms was 8 miles and ranged from less than a mile to 18 miles. Three of 5 bulls moved away from the river bottoms with 12 miles being the maximum distance traveled.
- 28 July 1996. 16 of the cows were in the riparian corridors and 18 had dispersed away from the river bottoms. Most of the cows were within 8 miles of the rivers, but one cow and calf were 107 miles north and another cow/calf pair was 36 miles north of the Colville River. One bull was located 2 miles from the riparian corridor and 2 were found in the foothills of the Brooks Range. Two bulls were not found and we assumed they moved out of the survey area.
- 5–8 November 1996. 20 cow moose were sighted on the river bottoms and 14 were found on tributaries and hills around the rivers. Three bulls were found in the riparian corridor, 1 was adjacent to the corridor, and 1 was not found in the survey area.

- 1-2 April 1997. 28 cow moose were in the riparian habitat of the river bottoms and 4 moose in the areas adjacent to the rivers. Two bulls were dead, 2 were in the riparian corridor, and one was not found.

MORTALITY

Harvest

Season and Bag Limit.

1999–2000 and 2000–2001 Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 26A: that portion in the Colville River drainage downstream from the Anaktuvuk River		
RESIDENT HUNTERS:		
One bull**	Harvest	1 Aug–31 Aug
NONRESIDENT HUNTERS		No open season
Remainder of Unit 26A		
ALL HUNTERS		No open season

**Hunters may not hunt moose during August using aircraft for transportation or for carrying meat.

Board of Game Actions and Emergency Orders. The Board of Game continued with the regulation passed in 1996 which closed Unit 26A to moose hunting except for a portion of the Colville River downstream from the mouth of the Anaktuvuk River. The portion of Unit 26A open to hunting had a bag limit of one bull from 1 Aug–31 Aug and no aircraft use was allowed for moose hunting.

Hunter Harvest. Hunter harvest reports indicate 2 bull moose were harvested during fall of 1999, 0 in 2000, and 4 in 2001 (after the report period). The low harvests were primarily a result of restrictive regulations (Table 4). Antler size was not reported for most of the harvested moose (Table 5).

Permit Hunts. There were no permit hunts for moose in Unit 26A during the reporting period.

Hunter Residency and Success. All successful hunters and most unsuccessful hunters were local residents. The total number of hunters was low because they were limited to a small section of the former hunting area, and success rates were low because moose numbers in the open area were low (Table 6).

Harvest Chronology. All reported hunting took place during August due to the regulations (Table 7).

Transport Methods. All hunters used boats for transportation (Table 8).

Other Mortality

The Unit 26A moose population declined by approximately 75% between 1991 and 1996. The population declined due to a combination of natural mortality factors including: overpopulation, competition with snowshoe hares, copper deficiency, the bacterial diseases brucellosis and leptospirosis, weather, insect harassment, and predation from bears and wolves.

The mortality rate has been low for both adults and calves since 1996. Among the radiocollared moose the mortality rate was 5.7% for 1996–1997, 2.1% for 1997–1998, 0% for 1998–1999, and 11.9% for 1999–2000 for an average of about 4.5% mortality per year. Calf survival has also increased substantially. The percentage of short yearlings counted during spring surveys increased from an average of 2% from 1994 through 1996 to 23% from 1997 through 2001.

Mortality due to predation has probably decreased substantially during recent years. We conducted wolf surveys in the study area and found that wolf density declined from 4.1 wolves/1000 km^2 in 1994 to 1.6 wolves per 1000 km^2 in 1998. There is no indication that bear numbers have decreased, but is possible that some "specialist" bears that preyed on moose calves during the summer may have died or left the area.

The fact that we have not observed dead moose that appear to have died of starvation indicates that the vegetation may have recovered from the overbrowsing that probably took place when the population was at peak numbers during the late 1980s and early 1990s.

The mortality caused by brucellosis and leptospirosis may be greatly reduced due to the diseases having run their course. The moose that were exposed and were susceptible to the diseases died or did not produce calves that survived. The moose that were resistant to the diseases have survived and are reproducing.

CONCLUSIONS AND RECOMMENDATIONS

After several years of declining population numbers, the Unit 26A moose population began to increase in 1997. As a result of low adult mortality and high calf survival the number counted in the trend count area has increased from 152 in 1996 to 333 in the spring of 2001, an increase of 17 % per year. The recruitment rate for short yearlings has averaged 23% and the adult mortality rate among collared cows has averaged about 4.5% for the last 5 years.

The population increase may have been due to several factors. Vegetation may have recovered from being overbrowsed by moose when the population was at high numbers in the 1980s and early 1990s, allowing for better survival of adults and calves. The bacterial diseases that were prevalent in the population may have run their course. Some "specialist" bears that preyed on moose calves during the summer may have died or left the area. Wolf density in the area is much lower than it was during the decline, so there is less wolf predation. Weather factors have been more favorable during recent years. In addition, some moose may have immigrated into Unit 26A from areas to the south or east.

In response to the severe population decline, we changed the management goal in 1996 from maintaining the population to rebuilding the population. The Board of Game passed regulations that eliminated hunting pressure for most of the area in 1996. While hunting was not the major cause of the decline, it was a contributing factor and one that could be changed to help rebuild the population. The population has increased consistently for 5 years, so we can propose

increasing the season length and hunt area for bulls. Restrictions will be necessary that will allow for an increase in harvest, but allow for the continuing recovery of the population.

LITERATURE CITED

CARROLL GM 1998. Moose survey-inventory management report. Pages 457-451 *in* MV Hicks, ed. Report of survey-inventory activities, 1995-1997. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Progress Report. Grants W–24–4 W–24–5. Juneau, Alaska USA.

_____. 2000. Moose survey-inventory management report. Pages 523-537 *in* MV Hicks, ed. Report of survey-inventory activities, 1997-1999. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Progress Report. Grants W–27–1 W–27–2. Juneau, Alaska USA.

TRENT JN .1989. Moose survey-inventory progress report. Pages 353–360. In SO Morgan, ed. Annual report of survey-inventory activities, 1989. Volumn XIX, Part VIII, Alaska Department Fish and Game. Federal Aid in Wildlife Restoration Progress Report Grant W–23–1, Study 1.0. Juneau, Alaska USA.

Prepared by:

Geoffry Carroll

Wildlife Biologist III

Submitted by:

Peter Bente

Management Coordinator

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

Carroll, G. 2002. Unit 26A moose management report. Pages 567–581 *in* C. Healy, editor. Moose management report of survey and inventory activities 1 July 1999–30 June 2001. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.

Table 1 Number of adult and calf moose from Unit 26A censuses, 1970–1995

Year	Adults	Calves	Total	% Calves
1970	911	308	1219	25
1977	991	267	1258	21
1984	1145	302	1447	21
1991	1231	304	1535	20
1995	746	11	757	1

Table 2 Unit 26A moose trend counts: Anaktuvuk River from the mouth to Sivugak Bluff, Chandler River from the mouth to Table Top Mountain, and Colville River between the mouths of Anaktuvuk and Killik rivers, 1970, 1974–1981, and 1983–2001

Year	Total moose	Adults	Short Yearlings	Short Yearling (%)
1970	750	523	227	30
1974	544	458	86	16
1975	556	386	170	31
1976	650	494	156	24
1977	802	632	170	21
1978	767	623	144	19
1979	644	536	108	17
1980	841	676	165	20
1981	639	594	45	7
1983[a]	315	268	47	15
1984	756	590	166	22
1985	757	613	144	19
1986	866	678	188	22
1987	700	627	73	10
1988	684	602	82	12
1989	699	630	69	11
1990	618	543	74	12
1991	647	516	176	21
1992	510	416	133	18
1993	504	424	85	15
1994	407	396	11	3
1995	307	302	5	2
1996	152	151	1	<1
1997	188	145	43	23
1998	206	153	53	26
1999	210	174	36	17
2000	325	245	80	25
2001	333	251	82	25

[a] Partial counts due to incomplete snow cover and wide dispersal of moose.

Table 3 Unit 26A fall aerial moose composition counts 1983–2001

Year	Bulls:100 Cows	Calves:100 Cows	Calves (%)	Adults	Total moose
1983	54	38	20	150	188
1986	47	18	11	302	339
1987	39	21	13	101	104
1990	33	45	25	277	371
1991	40	39	22	254	325
1992	36	41	23	190	248
1993	36	6	4	381	397
1994	35	3	2	287	293
1995[a]	70	0	0	34	34
1996	60	44	22	126	161
1997	46	40	22	80	102
1998	64	35	18	131	159
1999	49	52	26	155	209
2001	74	32	16	311	368

[a] Partial counts due to incomplete snow cover and wide dispersal of moose.

Table 4 Unit 26A moose harvest, 1985–2001

	Reported hunter harvest		
Regulatory year	Male	Female	Total
1985–1986	50	15	65
1986–1987	46	6	52
1987–1988	49	13	62
1988–1989	51	6	57
1989–1990	41	3	44
1990–1991	60	4	64
1991–1992	59	8	67
1992–1993	52	8	60
1993–1994	53	8	61
1994–1995	36	4	40
1995–1996	14	0	14
1996–1997	0	0	0
1997–1998	2	0	2
1998–1999	5	0	5
1999–2000	2	0	2
2000–2001	0	0	0
2001–2002	4	0	4

Table 5 Percent antler width categories (inches) among moose harvested in Unit 26A, 1983–2001

Regulatory year	Unknown	<20	20–29	30–39	40–49	50–59	60+	*N*
1983–1984	0	0	4	35	15	35	12	26
1984–1985	0	3	5	18	33	30	13	40
1985–1986	0	0	7	11	18	47	19	45
1986–1987	0	0	7	18	29	42	4	45
1987–1988	0	0	0	20	24	47	9	45
1988–1989	0	2	2	0	27	55	14	49
1989–1990	0	0	3	14	14	51	18	39
1990–1991	0	0	4	15	10	59	12	57
1991–1992	16	0	3	3	13	49	16	56
1992–1993	13	0	2	5	7	48	25	52
1993–1994	15	3	2	5	11	49	15	53
1994–1995	10	1	2	8	9	62	8	40
1995–1996	7	0	7	14	7	50	15	14
1996–1997	0	0	0	0	0	0	0	0
1997–1998	0	1	0	0	1	0	0	2
1998–1999	0	1	1	1	1	0	1	5
1999–2000	0	1	0	1	0	0	0	2
2000–2001	0	0	0	0	0	0	0	0
2001–2002	3	1	0	0	0	0	0	4

Table 6 Moose hunter residency and success, Unit 26A, 1987–2001

Regulatory year	Successful hunters						Total hunters				
	Local res[a]	Non-local res[b]	Nonres[c]	Unk[d]	Total	(%)	Local res[a]	Non-local res[b]	Nonres[c]	Unk[d]	Total
1985–1986	–	–	–	–	65	66	29	45	24	0	98
1986–1987	–	–	–	–	52	65	29	33	18	0	80
1987–1988	–	–	–	–	62	61	40	20	39	0	99
1988–1989	–	–	–	–	57	69	12	30	37	5	84
1989–1990	9	13	21	1	44	66	10	23	33	2	68
1990–1991	8	19	35	2	64	65	13	40	43	3	99
1991–1992	9	37	29	1	67	66	13	51	37	1	102
1992–1993	12	16	29	3	60	57	25	35	41	4	105
1993–1994	7	22	29	3	61	79	11	30	32	4	77
1994–1995	8	7	24	1	40	74	11	14	29	0	54
1995–1996	4	3	6	1	14	33	13	12	15	3	43
1996–1997	0	0	0	0	0	0	4	2	0	0	6
1997–1998	2	0	0	0	2	10	20	0	0	0	20
1998–1999	5	0	0	0	5	25	18	2	0	0	20
1999–2000	2	0	0	0	2	14	12	2	0	0	14
2000–2001	0	0	0	0	0	0	UN[e]	UN	UN	UN	UN
2001–2002	4	0	0	0	4	UN	UN	UN	UN	UN	UN

[a] Local resident hunters are residents of the North Slope Borough.
[b] Nonlocal resident hunters are residents of the State of Alaska, but not residing in the North Slope Borough.
[c] Nonresident hunters.
[d] Unknown residency.
[e] Unknown harvest.

Table 7 Percent chronology of moose harvest, Unit 26A, 1987–2001

Regulatory year	Harvest periods						
	Aug	1–7 Sep	8–14 Sep	15–21 Sep	22–31 Sep	Oct–Dec	*N*
1987–1988	9	36	35	6	4	10	62
1988–1989	9	45	34	6	3	0	57
1989–1990	17	48	18	16	0	2	44
1990–1991	4	44	39	6	5	2	64
1991–1992	10	55	22	10	0	3	67
1992–1993	9	58	20	3	8	2	60
1993–1994	7	62	23	3	3	2	61
1994–1995	3	50	19	18	5	5	40
1995–1996	29	7	50	7	0	7	14
1996–1997*	–	–	–	–	–	–	0
1997–1998*	100	–	–	–	–	–	2
1998–1999*	100	–	–	–	–	–	5
1999–2000*	100	–	–	–	–	–	2
2000–2001*	–	–	–	–	–	–	–
2001–2002*	100	–	–	–	–	–	–

*Season only open in August

Table 8 Percent transport methods for moose harvest in Unit 26A, 1987–2001

	Percent method of transportation					
Regulatory year	Airplane	Boat	3 or 4 wheeler	Snowmachine	ORV	*N*
1987–1988	80	15	2	1	2	59
1988–1989	81	18	1	–	–	53
1989–1990	84	14	2	–	–	40
1990–1991	62	28	3	2	3	61
1991–1992	85	7	3	3	2	67
1992–1993	85	13	0	2	0	60
1993–1994	83	17	0	0	0	61
1994–1995	78	18	0	2	2	40
1995–1996	50	43	7	0	0	14
1996–1997	–	–	–	–	–	0
1997–1998	–	100	–	–	–	2
1998–1999	–	100	–	–	–	5
1999–2000	–	100	–	–	–	2
2000–2001	–	–	–	–	–	–
2001–2002	–	100	–	–	–	–