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MOOSE

Mary V Hicks, Editor

COSTELLO

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STATE OF ALASKA
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DEPARTMENT OF FISH AND GAME
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Project Title: **Southeast Moose Population Management**

Overview: Moose are found on the Southeast Alaska mainland and some islands in 11 discrete populations that are managed separately: Unuk-Chickamin River valleys, Stikine River, Thomas Bay, Unit 3 islands, Taku River, Berners Bay, Chilkat Range, Chilkat Valley, Yakutat Forelands, Nunatak Bench, and Malaspina Forelands.

Project Location: Unit 1A (5,300 mi^2)
Ketchikan area including the mainland draining into Behm and Portland Canals

Project Objectives and Activities:

1. Management objectives for Subunit 1A moose include the following:

Posthunt moose numbers	35
Annual hunter kill	3
Number of hunters	20
Hunter days of effort	90
Hunter success	15%

2. Conduct winter sex and age composition surveys and monitor the harvest.

Work Accomplished During the Project Segment Period: Harvest was monitored with registration permits issued to Subunit 1A moose hunters for the third consecutive season. No surveys were flown during this report period.

Progress Meeting Project Objectives: We issued 78 registration permits during this report period, down slightly from 81 last season. A total of 45 permittees hunted and 2 bulls were killed along the Unuk River. One adult cow was illegally killed along the lower Unuk River by a permittee who was prosecuted for the offense. The 4% hunter success rate was down from nearly 15% last season. Numbers of hunters afield more than doubled our objective, but numbers of moose killed and the hunter success rate were below our objectives. Antler spreads of the 2 bulls were 31 and 36 inches, for an average of 33.5 inches. This was down only slightly from last season's average of 35 inches.

Project Location: Unit 1B (3,000 mi^2)
Southeast mainland from Cape Fanshaw to Lemesurier Point

Unit 3 (3,000 mi^2)
All islands west of Subunit 1B, north of Unit 2, south of the centerline of Frederick Sound, and east of the centerline of Chatham Strait

Project Objectives and Activities:

1. Management objectives for Stikine River moose include the following:

Posthunt moose numbers	450
Annual hunter kill	40
Number of hunters	300
Hunter days of effort	2100
Hunter success	13%

2. Management objectives for Thomas Bay moose include the following:

Posthunt moose numbers	200
Annual hunter kill	20
Number of hunters	160
Hunter days of effort	675
Hunter success	12%

3. Conduct winter sex and age composition surveys and monitor the harvest.

We began discussions of project objectives for Unit 3 moose in the report period. We hope to refine objectives during the coming regulatory year.

Work Accomplished During the Project Segment Period: Rutting surveys were conducted at Thomas Bay and on the Stikine River in early October. Sixty moose were classified; 12 (20 %) were calves and 9 were bulls (2 of which would be legal under current antler restrictions). A late winter survey flown on the Stikine River counted 93 moose; 17 (18 %) were calves.

Subunit 1B, Unit 3, and that portion of Subunit 1C south of Point Hobart were included on a single registration permit. We issued 778 registration permits, 509 of which went to Petersburg residents.

Thirty-two incisors were collected for aging from harvested moose. Twelve of the harvested moose were yearlings, 11 were between 2 and 4 years old, and the remaining 9 were between 5 and 8 years old.

Antlers on harvested moose were measured and photographed.

Progress Meeting Project Objectives: The number of hunters was the only project objective met. A total of 576 permittees hunted 2703 days, for a success rate of 6 percent.

The month long season closed 1 week early by emergency order due to a high illegal kill. Ten legal and 5 illegal moose were killed in Thomas Bay. Eight moose were harvested on the Stikine River drainage; 7 of those were taken under federal regulations and several were of questionable

legality. One moose was taken at Point Houghton in Subunit 1C. Twelve legal and 3 illegal moose were killed in Unit 3.

Project Location: Unit 1C (7,600 mi^2)
Southeast mainland and the islands of Lynn Canal and Stephens Passage lying between Cape Fanshaw and the latitude of Eldred Rock, including Sullivan Island and the drainages of Berners Bay

Project Objectives and Activities:

1. Management objectives for Taku River moose include the following:

Posthunt moose numbers	150
Annual hunter kill	20
Number of hunters	100
Hunter days of effort	450
Hunter success	20%

2. Management objectives for Berners Bay moose include the following:

Posthunt moose numbers	90
Annual hunter kill	8
Posthunt bull to cow ratio	25:100
Number of hunters	10
Hunter days of effort	30

3. Management objectives for Chilkat Range moose include the following:

Posthunt moose numbers	150
Annual hunter kill	10
Number of hunters	65
Hunter days of effort	195
Hunter success	15%

Work Accomplished During the Project Segment Period: We issued 385 registration and 15 drawing permits for moose hunts in Subunit 1C, an increase of 38 registration permits. A total of 303 hunters participated in these hunts. Permit results for hunters reporting the location of their hunt are shown in the following table:

Management Area		Hunters	Success	Days Hunted
Chilkat Range (includes Gustavus)		202	17%	808
Taku River		87	16%	305
Berners Bay	(bulls)	7	100%	18
	(cows)	6	86%	28

No aerial surveys were conducted in Subunit 1C during the winter of 1995/96 due to poor snow conditions and workload elsewhere.

Successful Subunit 1C hunters were required to submit lower jaws of moose. Ages were determined by Matson's Laboratory (Milltown, MT). Hunters will be informed of the age of their moose.

Progress Meeting Project Objectives: Management objectives for the Berners Bay herd were met. Thirteen of 14 permittees hunting took moose, surpassing the objective of 80% success. In addition, the desired effort in hunter days was exceeded. Since no aerial surveys were conducted, the posthunt size of the population is unknown.

All Chilkat Range herd management objectives were exceeded. The kill of 27 moose exceeded the goal of 10; 202 hunters hunted; the goal was 65; 808 hunter days were expended instead of the objective of 195; and hunter success was 17%, beyond our objective of 15%. A high take in the Gustavus area (21 moose) for the third year in a row contributed to the success rate for the Chilkat Range. No aerial surveys were conducted, so the posthunt size of the population is unknown.

Management objectives for the Taku River moose population were not met. The number of hunters remained at 87; however, hunter success declined to 16% and the number of hunter days declined to 305. Adverse weather and river conditions probably affected hunter effort. Since no aerial surveys were conducted, the posthunt size of the population is unknown.

Project Location: Unit 1D (2,700 mi^2)
Southeast mainland north of the latitude of Eldred Rock, excluding Sullivan Island and the drainages of Berners Bay

Project Objectives and Activities:

1. Management objectives for Subunit 1D moose include the following:

Posthunt moose numbers	450
Posthunt bull to cow ratio	25:100
Annual hunter kill	30
Number of hunters	250
Hunter days of effort	500
Hunter success	12%

2. Conduct winter sex and age composition surveys and monitor the harvest.

Work Accomplished During the Project Segment Period: In 1995 the Chilkat Valley moose hunt was held for the third time since the Board of Game established a spike-fork/50 inch requirement for this Tier II hunt. Two hundred permits were offered and all were issued. Staff

monitored the hunt, measured antlers, and collected incisors for aging. We also gathered tissue samples for genetic studies being conducted by the department.

Progress Meeting Project Objectives: The third moose season following a 3-year season closure resulted in the harvest of 24 legal and 3 illegal moose, with 17% of the hunters being successful. Although the success rate met management objectives, most other objectives, including the harvest level, were not met. Since hunt conditions only allowed for 200 hunters, the management objective for hunter participation was not met. Hunters spent a total of 459 days hunting, less than the management goal of 500. It should be noted the management objectives in our strategic moose management plan predate the move to a Tier II hunt and should be revised to reflect the restrictions inherent in this hunt. Since no aerial surveys were conducted, the posthunt size and structure of the population is unknown.

Project Location: Unit 5 (5,800 mi^2)
Cape Fairweather to Icy Bay, eastern gulf coast

Project Objectives and Activities:

1. Management objectives for Yakutat Forelands moose include the following:

Posthunt moose numbers	850
Annual hunter kill	70
Posthunt bull to cow ratio	20:100
Number of hunters	250
Hunter days of effort	1025
Hunter success	28%

2. Management objectives for Nunatak Bench moose include the following:

Posthunt moose numbers	50
Annual hunter kill	5
Number of hunters	10
Hunter days of effort	60
Hunter success	50%

3. Management objectives for Malaspina Forelands moose include the following:

Posthunt moose numbers	250
Annual hunter kill	25
Posthunt bull to cow ratio	20:100
Number of hunters	50
Hunter days of effort	200
Hunter success	50%

4. Conduct winter sex and age composition surveys and monitor the harvest.

Work Accomplished During the Project Segment Period: We issued 322 registration permits for Unit 5 moose hunts (265 for Subunit 5A and 67 for Subunit 5B). Hunts were monitored by staff from the Divisions of Wildlife Conservation and Fish and Wildlife Protection, and enforcement officials from the US Forest Service. Harvest and hunter data were analyzed from registration permit reports. Teeth were collected for age determination.

Aerial surveys of the Yakutat Forelands, Nunatak Bench, and Malaspina Forelands were flown from January 12 to 14, 1996. A Cessna 185 was used for all of the surveys since no appropriate survey aircraft (i.e., a PA 18 Super Cub) was available in Yakutat. Thirty-three moose were counted in 0.3 hours in the Nunatak Bench area, with calves representing 18% of the herd. A total of 466 moose were counted on the Yakutat Forelands, with calves representing 17% of the count. A total of 109 moose were counted on the Malaspina Forelands, with calves representing 10% of the herd. Since all surveys were flown in January well after the start of antler drop, it was not possible to determine sex.

Progress Meeting Project Objectives: In the Yakutat Forelands herd, we estimate the posthunt moose population is between 600 and 1000 animals. Hunter kill (45 from the state hunt plus 5 moose taken under federal permits) and the number of hunters (184 plus 6 federally permitted hunters) were below objectives. Hunter effort (571 days) was lower than our objective of 1025 days, and hunter success (24%) was below the objective of 28%.

Management objectives for the Nunatak Bench area were not met. Although a hunt was held for the first time in recent years, no moose were harvested. A total of 19 permits were issued, with 3 hunters expending 3 days unsuccessfully.

Current surveys indicate the number of moose occupying the Malaspina Forelands may be less than the objective. Since hunter effort (111 hunter days), success (41%), and kill (12) are all below the management objectives, we believe the herd status has changed little. Since surveys were conducted after antler drop began, it was not possible to determine the bull to cow and calf to cow ratios.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	28.4	28.8	57.2
Actual	28.4	28.8	57.2
Difference	0.0	0.0	0.0

Project Title: **Southcentral Alaska Moose Population Management**

Project Location: Unit 6 (10,150 mi^2)
Prince William Sound and north Gulf Coast

Project Objectives:

Subunit 6A East
Maintain a posthunting population of 300-350 moose and a minimum bull:cow ratio of 30:100.

Subunit 6A West
Maintain a posthunting population of 300-350 moose and a minimum bull:cow ratio of 15:100.

Subunit 6B
Maintain a posthunting population of 300-350 moose and a minimum bull:cow ratio of 15:100.

Subunit 6C
Increase the posthunting population to 400 moose by 2006 and maintain a minimum posthunting bull:cow ratio of 15:100.

Work Accomplished During the Project Segment Period: We completed censuses in Units 6A East and 6A West. Estimates in each subunit were 282 moose, with 29 (10%) calves and 316 moose, with 45 (14%) calves, respectively.

Total reported harvest in Unit 6 was 108 moose. In Unit 6A East, 9 males, 15 females and 1 of unknown sex were taken by 60 hunters who had a success rate of 42%. In Unit 6A West, 22 males and 10 females were taken by 43 hunters, a success rate of 74%. In Unit 6B, 21 males and 9 females were harvested by 128 hunters, a success rate of 23%. In Unit 6C, 17 males and 4 females were taken by 23 hunters who had a success rate of 91%. In Unit 6D, no moose were taken by 12 hunters.

Progress Meeting Project Objectives: We did not achieve our population objective in Unit 6A East. Number of moose declined below our minimum level of 350 because of heavy harvest and low calf survival during the early 1990s. Bull harvest was reduced during this reporting period by implementing a bag limit requirement for a minimum antler size of 50 inches or 3 brow tines. Recovery of the population will require continuation of this requirement and reduction of cow harvest. We achieved our population objective in Unit 6A West. Progress in other subunits will be measured by censuses planned for the coming year.

Project Location: Unit 7 (3,520 mi^2)
Kenai Peninsula

Project Objectives: To maintain the existing moose population with a posthunting sex ratio of no less than 15 bulls:100 cows.

Work Accomplished During the Project Segment Period: Poor survey conditions precluded surveys of any composition count areas. The moose population seems stable between 1000 and 1500 animals. The winter of 1995-96 was considered mild with light snow pack. Overall winter mortality was considered minimal, including 18 by motor vehicle and 4 by train. There were no reported cases of starvation.

Preliminary harvest statistics indicated that approximately 319 hunters reported hunting in Unit 7 during the 20 August-20 September season and harvested 42 bull moose. Sixteen (38%) hunters reported taking spike/fork bulls (less than 35") compared with 25 (60%) hunters who harvested large bulls (greater than 39"), defined as those with a 50 inch antler spread or with 3 brow tines on at least 1 antler. One additional moose was reported but not classified.

Progress Meeting Project Objectives: The selective harvest program initiated in 1987 has increased and stabilized the bull:cow ratio. The current bull:cow ratio meets the management objective of a minimum of 15:100. However, any management changes in Unit 7 should extend to Unit 15 to avoid shifts in hunting pressure.

Increased logging activities in Unit 7 to combat spruce bark beetles (*Dendroctonus rufipennis*) may provide increased visibility and access to moose hunters. Habitat quality may also be affected when overstory is removed. We need to continue to monitor effects of logging on moose in Unit 7.

Project Location: Units 9 and 10 (36,000 mi^2)
Alaska Peninsula and Unimak Island

Project Objectives:

- To maintain existing moose densities in areas with moderate (0.5-1.5 moose/mi^2) or high (1.5-2.0 moose/mi^2) densities.
- To increase low-density populations (where habitat conditions are not limited) to 0.5 moose/mi^2 by 1995.
- To maintain sex ratios of at least 25 bulls:100 cows in medium to high density populations and at least 40 bulls:100 cows in low density areas.

Work Accomplished During the Project Segment Period: Poor snow conditions during this reporting period prevented any fall composition survey work

Preliminary harvests were 4, 51, 43, and 70 bulls for Units 9A, 9B, 9C and 9E, respectively.

Progress Meeting Project Objectives: Efforts to monitor moose density and composition were hampered in 1994 by poor snow conditions. Bull:cow ratios in all areas counted met or exceeded the desired ratios.

Project Location: Unit 11 (12,800 mi^2)
Wrangell Mountains

Project Objectives: To maintain the existing moose population with a posthunting sex ratio of no less than 15 adult bulls:100 cows.

Work Accomplished During the Project Segment Period: Fall sex and age composition counts were conducted in 1 count area (CA-11) in Unit 11 during 1995. A total of 151 moose were counted at a rate of 34 moose per hour. The bull:cow ratio was 92 bulls:100 cows. Calves composed 10% of the moose counted. The observed density was 0.5 moose per mi^2.

Preliminary harvest figures indicate hunters killed 37 moose in Unit 11 during the 1995-96 season. Of these, nonresidents took 6 (16%) moose; overall hunter success was 32%. The average hunt lasted 7.8 days, a 50% increase (2.6 days) over the time hunters spent in the field during the 1994-95 season. The mean antler size in the harvest was 48.6 inches. Harvest chronology figures show the last week of the season accounted for 54% (n = 20) of the harvest. In 1995 highway vehicles surpassed airplanes as the most used means of transportation for moose hunters in Unit 11.

Staff discussed proposals on land use patterns, access, and development with appropriate and administering agencies. We conducted an annual review and discussed proposed changes in the Copper River Fire Management Plan with participating agencies and landowners.

Progress Meeting Project Objectives: Composition data collected in Unit 11 during 1995 indicated moose numbers are low with an observed density of only 0.5 moose/mi^2. A more intensive Gasaway census conducted in 1993 by NPS personnel resulted in a slightly higher density estimate of 0.58 moose/mi^2. Differences in density estimates between years are attributed to survey methods rather than changes in moose numbers from 1993 to 1995. The bull:cow ratio remained high in 1995 (92:100), and both the number of bulls and cows counted increased substantially from 1994 (35% and 43%, respectively). The calf:cow ratio remained relatively high but dropped from 25:100 in 1994 to 21:100 in 1995. The moose-per-hour figure increased by 44% from 1994 to 1995 (28.3 compared with 34.3) but was still well below the moose-per-hour figures of the mid to late 1980s. With the exception of 1992, count data for the past 4 years indicate a stable or slightly increasing moose population in Unit 11. Data from 1995 showed the highest yearling bull count since 1988, which suggests that calf survival rates have increased.

The bag limit and season dates for the state hunt in Unit 11 were changed in 1993. The definition of a legal bull changed from any bull to one with 50+ inch spread or 3 brow tines, and the season was lengthened by 15 days with season dates of 20 Aug.-20 Sept. Although the harvest increased initially by 30% under the new regulations, the total kill still remains very low and does not exceed harvest levels observed during the late 1980s. Although the season was lengthened, the conservative bag limit may well keep the total harvest low. Harvest chronology figures for 1993 through 1995 indicate the most opportune time to hunt moose is the 5-day extension of the season in September when moose are more vulnerable because of leaf drop and the onset of rut.

The current harvest level is considered sustainable, and human harvests have minimal effect on moose numbers in the unit. Wolf predation continues to be relatively high on moose as wolf sightings are common. During winter moose are the most important food source for wolves because there is a scarcity of an alternate prey species, especially since the Mentasta caribou herd has been moving out of Unit 11 into Unit 12 to winter. Snow depths in Unit 11 averaged 22.7" during the winter of 1995-96, 11% below the 1964-1995 average of 25.5 inches. The winter severity index for 1995-96 was the lowest it has been in 9 years, and the lower snow pack during the past 2 winters may have decreased overwinter moose mortality in the Unit.

Project Location: Unit 13 (23,400 mi^2)
Nelchina Basin

Project Objectives: To increase the moose population to an estimated 20,000-25,000 with yearly sex and age ratios of 30 calves:100 cows and 10 yearling bulls:100 cows and yearly harvests between 1200 and 2000 moose.

Work Accomplished During the Project Segment Period: Staff conducted fall sex and age moose counts in 8 count areas located throughout the unit. A total of 4951 moose were counted at a rate of 44 moose per hour. The overall bull:cow ratio was 17 bulls:100 cows with 11 adult bulls:100 cows. Calves composed 14% of the herd.

Twining rate surveys were flown in early June to determine the percent of cows having twin calves.

Hunting season dates and bag limits remained unchanged from last year, extending from 20 Aug.-20 Sept. for a bull having 50+ inch antler spread or 3 brow tines, or a spike or forked antler, on one side. In addition to the general hunt, we issued 150 Tier II drawing permits.

Snow depths were recorded throughout the Basin to determine a winter severity index for moose. Snow depths varied throughout the unit, but without exception were below the 33 year average in all subunits.

Preliminary harvest figures show hunters killed 908 bull moose in Unit 13 during the 1995-96 season. A breakdown of the moose harvest shows that 882 bulls were taken during the state-regulated fall season, while 26 bulls were taken under a federally regulated fall subsistence hunt held on federal land in Unit 13 for unit residents.

Land use proposals were commented on as to potential effects on moose habitat. Staff attended DNR meetings on forest practices and uses for Unit 13 and submitted comments on habitat improvement for moose.

Staff reviewed the Copper River Fire Management Plan.

Progress Meeting Project Objectives: Moose numbers declined by an estimated 25%-30% in Unit 13 between 1988 and 1991. This decline followed a 9-year period (1978-87) when moose numbers increased at an estimated 5% per year. Analysis of composition data indicated this decline occurred in all sex and age classes. Fall composition count data show moose numbers declined again in 1995 for Unit 13. There were slight increases in young bulls counted in most areas, but overall moose densities remain low in all Count Areas (CA) except CA10 (the upper Gakona River) which had the highest count in most sex and age categories for the past 7 years. This increase was attributed to movement of moose into the CA during the counts. More young bulls in the count suggests overwinter survival may have increased, which could help the depressed moose population recover or at least stop declining. The current bull:cow ratio is below the management objective for Unit 13. Spring 1996 twining rate surveys indicate good initial calf production with the percent of twins ranging from 33% in 13E and 13C to 20% in 13B. These percentages are within the expected range for moose, but lower than spring 1995 numbers (39% for 13E, 28% for 13B and 13C) and lower than expected given the relatively mild winter of 1995-96.

Snow depths were below average throughout Unit 13 and the winter of 1995-96 was considered mild based on the snow severity index rating of 19.9. This figure is 20% below the 33-year average index (24.8), the lowest since the winter of 1986-87, and follows 7 consecutive winters in which the severity index exceeded 30.0. All subunits were below their respective 33-year average index rating with differences ranging from 5% in 13E to 28% in 13A. Consequently, overwinter survival is expected to be high as were twinning rates. As mentioned earlier, twinning rates were actually lower than last year which was surprising, and we will have to wait until after the fall 1996 counts to evaluate overwinter survival in 1995-96.

The 1995-96 bull harvest increased slightly (4%) compared with last year's harvest. There were 5041 reported hunters in Unit 13 for a unitwide success rate of 18%. Hunting pressure was slightly less than last year's which was among the heaviest ever reported in the unit, and hunter success increased 2 percentage points over last year, the lowest ever observed. Initial indications are that the spike-fork 50-inch regulation may be successful in limiting the harvest of large bulls enough to maintain a minimum bull:cow ratio and still allow unlimited hunting. The reason for the decline in the bull:cow ratio has been low calf survival. Even though the winter of 1995-96 was mild and overwinter survival may have increased, the hunting season should be shortened to reduce the harvest until recruitment can keep pace with natural and hunting mortality rates on bulls. Drawing permit hunts for cows should be eliminated until calf recruitment increases.

The 1995 fire season was uneventful due to normal Copper River Basin weather patterns, with no major fires occurring in the unit. The last large fire was in 1991 when 5500 acres burned in Subunit 13D. Wildfire is the only feasible means of enhancing moose habitat in most of Unit 13.

Project Location: Unit 14 (6,600 mi^2)

Unit 14A
Upper Cook Inlet

Project Objectives: To maintain a population of 5000-6000 moose with a posthunting sex ratio of no less than 20 bulls:100 cows. To achieve and maintain an average annual moose harvest of 750 moose.

Work Accomplished During the Project Segment Period: Fall surveys were not conducted due to absence of snow in November and December. On 28 March we classified 471 moose in the Matanuska River, Palmer Hay Flats, and Pt. McKenzie areas and observed 18% short-yearlings. Overwinter calf survival indicated a mild winter.

The Board of Game instituted 3 new hunts in this area. They included a 20 November-15 December general season for spike- or fork-antlered bulls, and drawing permit seasons for any bull during 20 August-20 September and 1-15 November.

Hunter harvest totaled 461 moose. A total of 3033 people reported hunting "spike/fork/50-inch" bulls in the 20 August-20 September and 20 November-15 December general seasons; 300 (10%) were successful. Seventy-three percent of these animals were spike- or fork-antlered bulls, of which 36% were taken in the new late general season. Of the 90 people issued any-bull drawing permits, 78 (87%) hunted and 32 (41%) of those who hunted were successful. Of the 270 individuals holding antlerless drawing permits, 247 (91%) hunted and 129 (52%) of those who hunted were successful. In drawing permit hunts the success rate was higher for late-season hunters.

Between 1 July 1995 and 30 April 1996, 10 moose were killed by trains, and between 1 September 1995 and 30 June 1996, 68 moose were killed by automobiles. The number of moose thought to have been killed illegally was 25-40, while 2 were reported killed in defense of life or property (DLP).

Progress Meeting Project Objectives: Based on the recent population trend and mild winter, we assume the population size and bull:cow ratio are both within the objective level. Human use objectives, established before antler restrictions, will not be met by hunters until 1997. After 3 years with the "spike/fork/50-inch" selective harvest strategy, we should see an increase in the proportion of large bulls in the harvest in 1996. Also, the number of antlerless permits will be increased to 570 for fall 1996, which should add an additional 140 moose to the total harvest. If road, railroad, illegal, and DLP moose kills are added to hunter-killed moose, approximately 570 moose from Unit 14A were consumed by humans during 1995/96.

Project Location: Unit 14B
Western Talkeetna Mountains

Project Objectives: To increase the moose population to an estimated 2500 by 1995 with a posthunting sex ratio of no less than 20 bulls:100 cows. To achieve and maintain an average annual harvest of 200-300 moose by 1997.

Work Accomplished During the Project Segment Period: No aerial surveys were conducted due to absence of snow in November and December. The Board of Game instituted 3 new hunts in this area. They included a 20 November-15 December general season for spike- or fork-antlered bulls and drawing permit seasons for any bull during 20 August-20 September and 1-15 November.

Examination of harvest reports indicates 421 hunters harvested 40 bulls (10% success) during the 58-day (20 August-20 September, and 20 November-15 December) general season. Forty-four percent of these were spike- or fork-antlered bulls, and of these 61% were taken during the late season. Of the 130 people issued any-bull drawing permits, 103 (79%) hunted and 14 (14%) of those who hunted were successful. The success rate was considerably higher for permittees hunting during the early November season. At least 21 moose were killed by trains, and 5 were killed by automobiles.

Progress Meeting Project Objectives: During fall 1994 the moose population was near the objective level (although the confidence interval was large). The winter of 1995-96 was very mild, so we assume the population has remained stable or increased. A stratified random census should be conducted in the next 2 years to accurately determine population size, and evaluate the effectiveness of "Becker" trend surveys and the effects of additional harvest.

The human-use objective was not met. Although we expect harvest to general-season to continue to increase (after the decline resulting from the spike/fork/50-inch selective harvest strategy), it may be very difficult to reach the objective level under this harvest regime. However, access continues to improve in this area, so general season and permit hunters should become more effective over time. Following the 1996 hunting season and population surveys, we should evaluate harvest and population trends to determine other options to increase harvest.

Project Location: Unit 14C
Anchorage area and the Placer and Portage River drainages

Project Objectives: To maintain the existing moose population with a posthunting sex ratio of no less than 25 bulls:100 cows.

Work Accomplished During the Project Segment Period: Snowfall was inadequate for aerial moose surveys throughout Southcentral Alaska during fall and early winter 1995. By the time enough snow cover accumulated in December, many bulls had shed their antlers, and bull:cow and cow:calf ratios could not be determined from the air. However, 1 late winter survey was flown in the Twentymile, Portage, and Placer river valleys on March 8,1996. We observed 199 moose: 160 adults and 39 calves. The current subunit population is stable at 1900 moose.

Hunters were required to report their success on either a harvest or a permit report, depending on whether they participated in the general season or a special permit hunt. The reports require information on harvest location, days hunted, sex of the animal taken, method of transportation, hired services, date of harvest, and antler spread when appropriate.

A total of 94 moose were harvested in 1995-96. Cows composed 35% of the harvest, or 33 animals. All cows were killed during special permit hunts. Hunters also took 61 bulls, 12 from the general season and 49 during special permit hunts. Of bulls taken during the general season hunt, 5 were spike-forks, 3 were over 50 inches, 3 had at least 3 brow tines (mean length = 47.5 inches, range 46-48.5 inches), and 1 was not reported. Overall, hunters (n = 420) were 22% successful. Hunters with drawing permits and general season tags (n = 284) were 33% successful, while those with Eklutna archery registration permits (n = 136) were $\leq$1% successful. Most moose (57%) were taken on either Fort Richardson or Elmendorf Air Force Base; an additional 22% were taken in the Portage area hunts. Bowhunters took 45% and muzzleloaders 14% of the total harvest in primitive-weapon hunts. Seasons ran continuously in various parts of the subunit from 20 August through 15 January, excluding only 16 November to 14 December. Vehicles killed 114 moose in the subunit between 1 June 1995 and 31 May 1996.

Progress Meeting Project Objectives: Aerial surveys conducted during 1994 found an overall ratio of 31 bulls:100 cows, above the project objective of 25 bulls:100 cows.

Project Location: Unit 15 (4,900 mi^2)

Unit 15A
Northern Kenai Peninsula

Project Objectives: To maintain the existing moose population with a posthunting sex ratio of no less than 15 bulls:100 cows.

Work Accomplished During the Project Segment Period: The winter of 1995-96 was one of the mildest on record for the Kenai Peninsula. Favorable survey conditions did not develop until late winter, prohibiting fall surveys in Unit 15A. Seven of 13 count areas in Unit 15A were flown during the 1994 fall sex and age composition surveys, resulting in the following totals and ratios: 1199 moose classified; 32 calves:100 cows; 24 bulls:100 cows; and calves composed 20% of observed moose.

A preliminary total of 944 hunters reported hunting Unit 15A during the August 10 to 17 archery and August 20 to September 20 general 1995 season, harvesting 108 moose. The harvest comprised 65 (60%) spike/fork antlered bulls, 39 (36%) bulls with an antler spread of 50 inches or greater, or possessing at least 3 brow tines on one antler, and 4 (4%) unspecified or illegal bulls.

The department received 1325 applications for 40 permits to hunt antlerless moose and 631 for 20 permits to hunt spike/fork bulls in Skilak Loop Special Management Area (SLSMA). The season was September 15-30 for anterless moose and September 21-30 for spike/fork bulls. Thirty-two of the antlerless permit winners hunted and 7 harvested an antlerless moose. Thirteen of the hunters that won a bull permit hunted and only 1 spike/fork bull was harvested..

Progress Meeting Project Objectives: The Selective Harvest Program, enacted in 1987, has allowed the moose population in Unit 15A to exceed the department's objective of 15 bulls:100 cows. Surveys completed in 1994 indicated the bull to cow ratio averaged 24:100, compared with 13:100 before the Selective Harvest Program.

Additionally, the department would like to maintain the population at approximately 3600 moose in 15A. Loss of habitat through human development or deterioration from natural plant succession is the primary factor controlling moose density. On May 11, 1996 approximately 5200 acres burned in the Hidden Lake area of Skilak Loop Special Management Area, as a result of a wildfire. Attempts to enhance areas through prescribed burning by the US Fish and Wildlife Service and the department have been unsuccessful due to restrictions necessary to safely burn on the Kenai Peninsula.

The winter of 1995-96 was extremely mild compared with the previous winter in Unit 15A. Snow came late with accumulations less than 16 inches over large portions of the subunit. Mortality due to starvation was documented in 1 case in 1995-96 compared with 178 in 1994-95. Ninety moose were reported killed on the road system last winter. The moose population in Unit 15A should have increased moderately due to the mild winter conditions in 1995-96. The fall population is projected to be about 3000 animals.

No change in season or bag limit is recommended for fall 1996. The selective harvest program has again gained support during the 1995 season and should protect mid-sized bulls that survived the severe winter of 1994/95.

Project Location: Unit 15B
Central Kenai Peninsula

Project Objectives: To maintain the existing moose population with a posthunting sex ratio of no less than 15 bulls:100 cows in 15B West and 40 bulls:100 cows in 15B East.

Work Accomplished During the Project Segment Period: Due to the extremely mild weather in fall of 1995 no count areas were surveyed. The most recent sex and age composition surveys were conducted in 15B East in 1994. A total of 489 moose was classified resulting in the following ratios: 29 calves and 57 bulls per 100 cows; calves composed 15 percent of the observed total.

Preliminary harvest reports indicate 213 hunters reported hunting in 15B West during the 20 August to 20 September 1995 season resulting in the harvest of 44 bulls. Hunter success rate was 21%.

The bag limit for 15B West was 1 bull with a spike/fork or 50 inch antlers. The 1995 harvest comprised 21 (70%) spike/fork antlered bulls and 13 (30%) bulls with an antler spread of 50 inches or greater or possessing at least 3 brow tines on 1 antler.

Hunting for moose in 15B East was allowed by permit only with a bag limit of 1 bull with 50 inch or larger antler spread. From 2071 applications, staff issued 100 permits, resulting in the harvest of 19 bulls. The average antler spread was 52 inches and ranged from 39.0 to 60.5 inches. Successful hunters averaged 4 days hunting and observed an average of 4 illegal and 5 legal bulls. The number of bulls observed by successful hunters ranged from 1 to 39.

Progress Meeting Project Objectives: The Selective Harvest Program initiated in 1987 was designed, in part, to increase the bull to cow ratio. Since only areas in Unit 15B East were surveyed during 1994, an assessment of the entire subunit's population status and trend cannot be determined. Due to selective harvest, the bull to cow ratio is suspected to be in excess of 15:100 in Unit 15B West and is in excess of 50:100 in Unit 15B East. Staff observations and comments from permittees hunting the area suggest moose are becoming more difficult to find and trophy-sized bulls are less common compared with 5 years ago. Additionally, commercial transporters are now charging the same price for successful and unsuccessful hunts. This change in costs encourages hunters to take the first legal moose they see to avoid paying the cost of packing without a moose.

Moose habitat in Unit 15B is deteriorating through natural plant succession and human suppression wildfire. Since recent censuses have not been conducted, an accurate assessment of population trend is not available. However, the 1989-1990, 1991-1992 and 1994-1995 winters were severe, causing higher than normal winter mortality, especially in the calf and older bull age classes. The winters of 1992-1993, 1993-1994 and 1995-96 were mild, allowing for normal calf and older bull survival.

In addition to reported harvest, highway vehicles killed 70 moose in 15B West. No moose were documented as winter mortality compared with 35 the previous winter.

No change is recommended for 15B for the 1995 season. The Selective Harvest (15B West) and Permit Drawing (15B East) programs, designed to protect the male segment of the population from overharvest following a severe winter, should be continued.

Project Location: Unit 15C
Southern Kenai Peninsula

Project Objectives: To maintain the existing moose population with a posthunting sex ratio of no less than 15 bulls:100 cows.

Work Accomplished During the Project Segment Period: Poor survey conditions precluded surveys of any composition count areas. One late winter survey was completed in Unit 15C CA29 for the first time and we estimated 88 moose. A second late winter survey was attempted but canceled because of poor survey conditions.

The winter of 1995-96 was considered mild with light snow pack. Overall winter mortality was minimal. There were no reported cases of starvation for the first time since 1987. Survey results indicate the moose population is stable to slightly increasing around 2500 animals.

Preliminary harvest statistics indicated approximately 967 people hunted in Unit 15C during the 20 August-20 September season and took 190 moose. This represented a 32% decline in effort and a 39% decline in harvest from 1994. Uncertainty with federal subsistence regulations and anticipation of fewer bulls because of the previous winter contributed to these declines. The overall hunter success rate was 20%. One hundred twelve (59%) moose were classified in the spike/fork category and 72 (38%) moose were classified in the 50+ category. Six moose had either illegal or unknown antler sizes.

A series of limited permit hunts for antlerless moose was established for an area around the city of Homer. A total of 30 permittees were chosen from 458 applicants. Hunters were required to be assisted by department personnel and could not take a calf or a cow with a calf. Twenty-seven hunters harvested 16 antlerless moose (59%).

Progress Meeting Project Objectives: The selective harvest program initiated in 1987 seems to have increased and stabilized the bull:cow ratio. Hunter reports and general field observations indicate bulls are abundant in Unit 15C and the regulations are generally well supported by a variety of wildlife users. The current bull:cow ratio meets the management objective of a minimum of 15:100. We recommend to maintain the current spike/fork-50 inch restriction to the bag limit. However, any management changes in Unit 15C should follow Unit 7 and the remainder of Unit 15 to avoid any shifts in hunting pressure.

Increased logging activities in Unit 15C to combat spruce bark beetles (*Dendroctonus rufipennis*) may provide increased visibility and access to moose hunters. Over 30,000 acres are scheduled for timber harvest in 1996 including large parcels near the communities of Port Graham and Nanwalek. Habitat quality may be affected when overstory is removed. We need to continue to monitor effects of logging on moose on the Kenai Peninsula.

Project Location: Unit 16 (12,300 mi^2)

Unit 16A
West side Susitna River valley, Yentna-Kahiltna rivers to Chulitna-Tokositna rivers

Project Objectives: To achieve a fall population of 3500-4000 moose by 1995 with a posthunt sex ratio of not less than 20 bulls:100 cows. The human use objective is to achieve an average annual harvest of at least 300 moose by 1997.

Work Accomplished During the Project Segment Period: No surveys were conducted due to absence of snow during November and December. The Board of Game established 2 new hunts, a general season for spike- or fork-antlered bulls during 20 November-15 December and a drawing

permit season for any bull during the 20 August-20 September season (100 permits). In addition, to encourage harvest in less accessible, underutilized areas, the 100 any-bull permit winners hunting during November 1-15 were restricted to that portion of the subunit south of the Petersville road.

Total harvest was 130 bulls. Examination of harvest reports indicates 578 hunters harvested 75 bulls (13% success) during the 58-day (August 20-September 20 and 20 November-15 December) general seasons. Of the 200 hunters issued any-bull drawing permits, 159 (79%) hunted, and 55 (35%) of those who hunted were successful. The success rate for those hunting during 1-15 November was only slightly higher than for those hunting during 20 August-20 September.

During the report period an additional 14 moose were reported killed in collisions with autos, and 1 moose was reported killed in defense of life or property. These figures are minimum numbers.

Progress Meeting Project Objectives: Given the relatively mild winter, we assume the population is at or slightly below the objective, with a bull:cow ratio well above the desired level. Harvest is well below the objective level, primarily due to the combination of difficult access in many parts of the subunit and the spike/fork/50-inch selective harvest strategy. Following the 1996 hunting season and population surveys, we should evaluate harvest and population trends to determine options to increase harvest.

Project Location: Unit 16B
West side of Cook Inlet

Project Objectives: Maintain a population of 6500-7500 moose with a November sex ratio of not less than 25 bulls:100 cows. Human use objectives are to maintain a minimum annual average harvest of 650 moose in Unit 16B and in addition no less than 5 moose from Kalgin Island.

Work Accomplished During the Project Segment Period: We conducted a "Gasaway" census in the southern portion of Unit 16B from 29 February to 3 March, 1996. The population in that area was estimated at 1109 moose (+/-14.5%, 80% CI), with 7% calves. Composition surveys were flown on 27 February in the northern and mid part of Unit 16B; of 1290 moose classified, 11% were calves. Based on a relatively mild winter and census data from fall 1994 in the mid and northern portions of 16B, we estimated the subunit population at 6000-7000 moose.

The Board of Game lengthened the spike/fork/50-inch general season to run from 20 August-30 September and established a drawing permit season (20 August-20 September) for antlerless moose on Kalgin Island. In addition, any bull was legal during the general season on Kalgin Island (20 August-20 September) and several Tier II seasons.

During the general season, 573 hunters took 153 bulls for a 26% success rate. Yearlings composed 5% of the harvest. A total of 160 (61%) Tier II permittees went afield and killed 29 moose. Of the 50 hunters awarded antlerless moose permits on Kalgin Island, 34 hunted and 10 were successful. In total, 189 moose were taken from the subunit, including 16 bulls from Kalgin Island.

Progress Meeting Project Objectives: The total moose population is probably near the low end of the objective range and slowly declining. The bull:cow ratio was well above the objective level during 1994 surveys but is probably declining with successive years of low calf recruitment. The human use objective for Kalgin Island was met, but the harvest for the rest of Unit 16B was far below the objective level. Given the current decline in numbers and spike/fork/50-inch selective harvest strategy, it is unlikely this human use objective will be met. It may be important to maintain this management strategy, at the expense of human harvest, to protect a segment of the bull population as the overall population declines. Fall surveys will be necessary to monitor trends in bull:cow ratios; if ratios remain adequate, the harvest regime should be reconsidered.

Project Location: Unit 17 (18,800 mi^2)
Northern Bristol Bay

Project Objectives:

- To establish a minimum population of 100 moose in Unit 17A.
- To achieve and maintain a density of 1 moose/mi^2 on habitat considered to be good moose range in Unit 17B.
- To maintain a minimum density of 0.5 moose/mi^2 in areas considered to be moose habitat in Unit 17C.

Work Accomplished During the Project Segment Period: I flew late winter aerial surveys along riparian areas of the upper Nushagak and Mulchatna rivers and their major tributaries in March 1996. There were 401 moose on the Nushagak (254 moose/hr) and 90 moose along the Mulchatna (53 moose/hr). These concentrations were lower than average, particularly along the Mulchatna River drainages. Snow levels were extremely low to nonexistent throughout the survey areas. We intended to survey Subunit 17A, but the lack of snow prevented it.

Fall harvest was monitored by personal interviews on the Nushagak and Mulchatna rivers and by analysis of harvest ticket returns.

Data from harvest tickets returned by February 1996 indicated that 430 hunters killed 163 bulls and 1 cow during the 1995-96 general season. No moose were harvested in 17A, but 133 were taken in 17B and 28 in 17C. Three were harvested in unspecified areas. Hunter success was 52% (24/46) for local residents, 24% (34/142) for other Alaska residents, and 46% (100/216) for

nonresidents. Aircraft was the most common mode of transportation (67%). Sixty-seven percent of moose harvested had antlers 50" or larger.

Harvest data from Registration Hunt 583 indicated that 520 permittees harvested an additional 100 bulls during the 1995-96 season. No moose were harvested in 17A, but 31 were taken in 17B and 51 in 17C. Eighteen were harvested in unspecified areas. Hunter success among responding permittees was 71% for local residents (63/89) and 39% for other Alaska residents (36/92). Nonresidents were not eligible to participate in this hunt. Boats were the most common means of access (57%). Fifty-one (51%) moose were killed in August, 42 (42%) in September, and 5 (5%) in December. Thirty-five percent of the moose harvested had antlers 50" or larger.

Progress Meeting Project Objectives: Moose in Unit 17 experienced an extremely mild winter in 1995-96. Overall survival was high, and there were few reports of winter-killed moose. Moose populations were stable to increasing throughout the unit, in spite of increasing harvests by hunters and predators.

Moose populations in Unit 17A were probably near or slightly higher than the minimum population level of 100 moose. The illegal harvest in Unit 17A during 1995-96 was about 10 moose. The Federal Subsistence Board rejected 2 proposals to open a fall moose season in Unit 17A. In response to the proposals, I worked with staff from the Togiak National Wildlife Refuge to delineate our management directions for moose in the subunit. These management directions are currently available for public comment.

Two moose were killed in motor vehicle collisions along the Aleknagik Lake Road during this reporting period. A 2-year-old bull was hit on 29 December 1995 and a young adult female was hit on 1 June 1996. These were among the first reported moose/vehicle accidents ever reported on the Dillingham road system. A combination of increasing moose density along the road and improved road conditions were factors in these collisions.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	226.7	130.6	357.3
Actual	226.7	126.5	353.2
Difference	0.0	4.1[a]	4.1

[a]Poor survey conditions prevented some moose surveys.

Submitted by:

Michael G. McDonald
Assistant Management Coordinator

Project Title: **Interior Moose Population and Habitat Management**

Project Location: Unit 12 (9678 mi^2)

Project Objectives and Activities: Maintain a minimum bull:cow ratio of 40:100 east of the Nebesna River and a minimum of 20 bulls:100 cows in the remainder of the unit.

a. Conduct fall sex and age composition counts in selected trend count areas.
b. Monitor hunting pressure and review harvest report data.
c. Conduct browse surveys to evaluate winter range condition.

Work Accomplished During the Project Segment Period: During November 1995 we completed 4 standard contour (sex and age composition) surveys in southern Unit 12. We had planned to complete 3 other contour surveys but survey conditions were not adequate. The calf, yearling bull, and bull:100 cows ratios were 26:100, 12:100, and 82:100, respectively. The calf ratio was comparable to the area's 5-year average of 23:100 but still below ratios found in the northwestern portion of the unit (28-39:100 cows). The proportion of yearling bulls in the population has declined since 1991, and the bull:100 cow ratio also is declining but is still well above the minimum population objective. Lower survival rates in this portion of the unit are probably due to a higher level of predation. Grizzly bear and wolf harvests are low in this area and densities for these two species are higher compared with the remainder of the unit.

The 1995-96 reported moose harvest was 120 bulls with a 25% success rate. This is the highest reported harvest in over 12 years and exceeded the 10 year average by 28 bulls. During the past 8 years, the Unit 12 success rate for moose ranged between 15% and 27% and averaged 23%. Hunter participation was also higher than average (+68). Preliminary analysis indicates harvest increased in the Tok River valley, along the Nebesna River, and in the Chisana area. The Tok, Little Tok, and Dry Tok drainages and the Chisana and Nebesna areas will be surveyed next year to evaluate effects of increased harvest on the bull:cow ratio. Increased hunter participation is thought to be due to greater harvest restrictions in Units 13 and 14.

ADF&G staff did not conduct formal browse surveys in Unit 12 during 1994-95 due to conflicts with other projects.

Progress Meeting Project Objectives: Both units' bull:100 cows objectives are being met. However, along the north side of the Alaska Range and in the upper Tok River, the bull population has declined due to harvest. If the trend continues, antler restrictions may be enacted. The bull:cow ratio may also be declining in southern Unit 12 due to low yearling bull survival since 1991. In 1995-96, an early season for spike or fork antlered moose was offered in Unit 12. Under this regulation, we had hoped to shift more harvest to this age class, which historically has been underrepresented in the harvest, without causing a decline in the bull:cow ratio. During the first year, only 4-5 yearlings were harvested during the early season. Hunter interest was high and we expect greater harvest in the future. Harvest has had little effect on the ability of the unit's moose population to increase, or on moose sex and age composition. Based on composition data, predation on calves is still the primary limiting factor.

During 1996-97, a prescribed burn designed to improve moose habitat in the Tok River valley is planned.

Project Location: Units 19, 21A and 21E (59,756 square mi^2)

Project Objectives and Activities:

1. Develop statistically sound population estimates for select portions of the area as an ongoing objective.
2. Annually assess population status and trend in portions of the unit where harvest levels significantly affect moose populations.
3. Maintain unitwide reported harvests of at least 500 moose for Unit 19, 150 for Unit 21A, and 125 for Unit 21E.
4. Encourage the U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and Alaska Department of Natural Resources to reduce suppression efforts on wildfires that do not threaten human life, property, or "valuable" resources, in accordance with provisions of the Alaska Interagency Fire Plans, so that fire can fulfill its natural role of maintaining young, highly productive and diverse habitats.

Work Accomplished During the Project Segment Period: Because of a lack of sufficient snow, no composition/trend surveys were conducted in the McGrath area during 1995-1996. However, a comprehensive population estimation survey was completed in an 1800 mi^2 portion of Unit 19D East. An additional winter trend count area was surveyed in March 1996 to count winter concentrations of moose and to assess mortality rates along the Kuskokwim River near McGrath. Hunter harvest reports were analyzed during summer 1995. Staff monitored calving rates and calf survival near McGrath during summer 1994 and 1996. We analyzed moose marrow fat from winter- and wolf-killed animals during winter 1994-95 and again during 1995-96, which indicated that adult moose were not nutritionally stressed. Planning continued in efforts to reduce predation effects in Unit 19D East.

Progress Meeting Project Objectives: A population estimation survey was conducted in an 1800 mi^2 portion of 19D. Moose densities were 0.37 (+ 26%) moose per mi^2. Calf percentage in the herd was 17.

During March 1996 we conducted a survey of the riparian corridor of the Kuskokwim River between McGrath and Selatna River. At that time, 193 moose were observed, of which 8.8% were calves. Eight marrow samples were gathered from wolf-killed moose in the area. Adult moose averaged 69%, while calf marrow samples averaged 45% fat. The winter of 1995-96 was mild, so the relatively high calf marrow fat levels were not surprising.

During summers 1990 through 1996, cumulative calf percentages in the herd remained between 20% and 24%. However, based on a sample of 324 moose during summer 1994, the observed calves in the herd composed 12.7%. This significant drop in calf survival throughout the summer

is probably due to heavy predation rates. Preliminary data from summer 1996 indicate reasonable calf numbers during early June.

Final results of the 1995-96 moose harvests for the area have not been analyzed. Results from the 1994-95 season indicate the objective of maintaining at least 500 moose in the reported harvest from Unit 19 was met. Five hundred thirty-five moose were reported taken by 1030 hunters (success rate = 51.9%). In Unit 21A, 119 moose were reported taken. This is the second year in succession the reported harvest has been below the 125 targeted for the unit. In Unit 21E, 123 hunters were successful. Reporting rates are relatively high in Unit 21A (probably 80+%) while reporting rates remain low from local users in Unit 21E (I suspect less than 70% reporting rate).

Efforts are ongoing to modify fire management options within select areas to ensure wildfires are allowed to maintain or increase available moose habitat. A close working relationship with the Alaska Department of Natural Resources has resulted in very good compliance with the Alaska Fire Management Plan.

Project Location: Unit 20A (6796 mi^2)

Project Objectives and Activities:

1. Manage for a November adult population (i.e., excluding calves) of 10,000 to 12,000 adult moose by 1995.
   a. Annually monitor twinning rates of parturient cows in late May.
   b. Estimate the moose population size on the Tanana Flats and western foothills in November 1995.
2. Manage for at least 30 bulls:100 cows overall and at least 20 bulls:100 cows in the Tanana Flats, western foothills, and eastern foothills census areas.
   a. Monitor composition of moose population in 3 trend areas in November 1995.
   b. Examine composition data from census in November 1995.
3. Maintain an annual harvest of $\leq$300 bulls $\geq$2 years old and a total harvest of <400 bulls until the population objective is reached.
   - Monitor harvest with harvest report cards and hunter check stations. Assume that adult bulls have antlers $\geq$30 inches and that reporting rate for successful hunters is about 85%.
4. Allow the harvest of cow moose when the population is above the population objective of 10,000 adult moose.

Work Accomplished During the Project Segment Period: We conducted short yearling surveys on 8-9 May 1995 in a 200 mi^2 area in the north-central Tanana Flats and classified 648 moose as 437 cows, 114 short-yearlings (11 months old), and 67 bulls. The short-yearling ratio of 33:100 was the highest documented since 1984.

We conducted surveys to determine the proportion of calves in the population in February 1996. Calf percentages averaged 28% for surveys on the flats and central and western foothills.

We conducted twinning surveys in the same area on 21-22 May 1995. Four cows with single calves were observed on 21 May. Three sets of twins were observed from a sample of 46 cows with calves on 22 May. Forty-eight cows without calves and 20 yearlings were also observed on 22 May.

No population estimation surveys or composition surveys were conducted in autumn 1995 because of very low snowfall. However, because short yearling ratios suggested continued growth, we estimate herd size at roughly 15,000 moose for 1995.

Results indicate the moose population is within or slightly above our objective for 10,000-12,000 adults and has increased about 6% per year from 1988 to 1994. Consistent with population and harvest objectives, we again submitted a proposal to the Board of Game to establish a limited drawing hunt for cows. The Board passed this proposal in April 1996 with the necessary advisory committee approval.

According to the preliminary report from the 1995 harvest report cards, 1268 moose hunters harvested 493 bull moose in Unit 20A (39% success rate). Of these bulls, 398 (81%) had antler spreads of 30 inches or larger, 85 (17%) had spreads less than 30 inches, and 10 (2%) had unknown antler spreads.

Progress Meeting Project Objectives: A survey designed to estimate population size planned for November 1995 was not accomplished. The objectives should be changed to conduct this survey in 1996 with eastern Unit 20A as the highest priority.

We were able to establish a cow hunt consistent with management objectives beginning in 1996. The objective of the cow hunt is to take advantage of a harvestable surplus of cows and slow population growth but not arrest it.

We are likely continuing to meet our objectives for bull:cow ratios. In November 1994, we observed 35 bulls:100 cows in the 28 sample units randomly selected from west of the Little Delta River. From 1991 to 1993 in the Central Tanana Flats, the bull:cow ratio increased from 21:100 to 30:100. Even though the 1993 bull:cow ratio in the western foothills (29:100) was slightly lower than in 1991 (32:100), we still met our objective of at least 20:100 in an area. In March 1995 we submitted a proposal which the Board passed to lengthen the bull hunting season throughout Unit 20A by 5 days because we had met our bull:cow ratio objectives for 4 years. In March 1996 the Board approved a reduction in antler restrictions in the Ferry Trail Management Area and the Yanert Controlled Use Area from spike-fork or 50" or 4 brow tines to spike-fork or 50" or 3 brow tines. The Board also approved a November drawing permit hunt for muzzleloading rifles to be held in the Wood River Controlled Use Area.

We exceeded our objectives for a total harvest of <400 bulls, with ≤300 bulls 2 years or older. In 1995 the preliminary reported harvest of 493 bulls included 398 bulls 2 years or older. If we assume that 15% of successful hunters did not report, we estimate 580 bulls were harvested, including approximately 468 bulls 2 years and older. **We recommend objective (3) be deleted** because maintaining bull:cow ratio objectives ensures appropriate harvest levels.

We recommend all other objectives remain current for 1996. However, we expect to surpass our objective (1) of maintaining 10,000-12,000 adult moose, if we are not beyond it already. The limited hunt for cow moose (300 permits) is not likely to stabilize the population.

Project Location: Unit 20B (9114 mi^2)

Project Objectives and Activities:

1. Manage for a population of 10,000 adult moose by 1995, with 4000 in Subunit 20B West, and 6000 distributed over Subunits 20B Central and East.
   a. Complete population and/or composition surveys in Subunit 20B in November 1995.

2. Manage for a minimum of 20 bulls:100 cows in each count area and at least 30 bulls:100 cows overall.

3. Sustain an annual harvest of 300-400 bull moose until the population objective is reached.
   a. Monitor harvest from the general season with harvest report cards and hunter check stations.
   b. Provide additional moose hunting opportunity within the Fairbanks Management Area with Registration Hunt 986 for bowhunters.
   c. Limit the moose hunting opportunity in Minto Flats to Tier II hunters if necessary.

4. Minimize human-moose conflicts near Fairbanks, while accommodating moose for viewing.

Work Accomplished During the Project Segment Period: Because of extremely low snowfall, we did not conduct population or composition surveys, except a recruitment survey completed in the Minto Flats Management Area. Calves composed 28% of a sample from wintering areas taken in February 1996.

In 1995 preliminary reports from all hunts indicated that at least 568 moose were harvested in Unit 20B. This harvest included 525 bulls taken in the general season (2392 hunters) and 10 cows taken in the FMA drawing permit archery hunt. In addition, 60 permittees harvested 19 bulls and 14 cows in the Tier II Hunt TM785 for the Minto Flats Management Area (MFMA), and 33 bulls were taken in the MFMA general hunt. If we assume that hunters reporting by harvest ticket had an 85% reporting rate, the estimated total harvest in Unit 20B was 660 moose.

The FMA archery hunts continue to be popular with local bowhunters, even though success rates in the general hunt are low. The hunt was formerly a registration hunt, but this year a drawing hunt for antlerless moose was instituted and the registration hunt for bulls was turned into a general hunt.

The MFMA Tier II hunt was reduced to 60 permits in 1995; however, those permits allowed the taking of moose of either sex. In addition, a short general hunt for spike-fork or 50" or greater

antlers or antlers with at least 4 brow tines on one side occurred September 6-20. We are not aware of any additional bulls taken under the federal subsistence permits in the MFMA.

Progress Meeting Objectives: Because of the lack of recent moose population surveys in 20B East and West, we are unable to determine whether we are meeting our population objectives. Results from November 1994 surveys in Central 20B should be supplemented with surveys in 1996 in these areas.

We are probably not meeting our objectives for at least 20 bulls:100 cows in each count area. In 1994 we estimated only 18 bulls:100 cows in Central 20B and 14:100 in the FMA. However, we far exceeded our objectives in the MFMA where bull to cow ratios remain high. The antlerless hunt in the FMA may also help improve sex ratios in that area.

We have exceeded our harvest objectives for 300-400 bulls in 6 of the last 7 years. However, we do not plan to reevaluate harvest objectives until we have better information on composition and population objectives.

We have reduced some of the human-moose conflicts near Fairbanks by working with the public to deter moose from invading gardens, to avoid motor vehicle collisions with moose, and to be aware of the danger of approaching moose too closely. We made substantial progress in analyzing moose/vehicle accident data.

Project Location: Units 20C, 20F, and 25C (23,318 mi^2)

Project Objectives and Activities: The management objectives listed in the 1994 moose performance reports for this area are listed:

1. Estimate hunting mortality and document nonhunting mortality when possible.
2. Estimate moose densities in Units 20C, 20F, and 25C by 1996.
   a. Cooperate with BLM to superstratify approximately 1000 mi^2 in central Unit 25C in November 1996.
3. Promote moose habitat enhancement by allowing natural fires to alter vegetation.
4. Establish moose population objectives for Units 20C, 20F, and 25C by 1997.
5. Provide for a sustained yield harvest of these low-density populations until specific population management guidelines have been established.

Work Accomplished During the Project Segment Period: In Unit 20C preliminary data indicate 376 hunters reported taking 119 bulls during 1995. Harvest decreased in 1995 from the 1994 high of 150 bulls, while hunter numbers have remained stable. From 1986 to 1994 the number of hunters ranged from 224-373, and harvest ranged from 56-150 bulls.

In Unit 20F preliminary data indicate 122 hunters reported taking 41 moose during 1995. From 1986 to 1994 the number of hunters ranged from 64 to 129, and harvests ranged from 20 to 38

moose. Harvest increased in 1995 to 41 from 1994 (29), while the number of hunters has remained stable.

In Unit 25C preliminary data indicate 192 hunters reported killing 55 moose in 1995. From 1986 to 1994 the number of hunters ranged from 97 to 186, and harvest ranged from 26 to 55 moose. Harvest has remained stable from 1994 to 1995, while hunter numbers have increased from 155 in 1994 to 192 in 1995.

The village of Tanana is not holding the Nuchalawoyya Potlatch in 1996. They are planning to hold it again in 1997.

There is a federal subsistence season within the Dalton Highway corridor in Unit 20F (Hunt 990). As of the time of this report, I have not been able to acquire any information regarding harvest data.

No surveys were conducted in Units 20F and 25C. Lack of snow inhibited all moose surveys during fall 1995 in the Fairbanks Area.

Staff conducted no activities toward objectives 2-5 this reporting period.

Progress Meeting Project Objectives: We are meeting our objective to estimate hunting mortality and to document nonhunting mortality when possible. We are accomplishing this using harvest ticket reports and the Department of Public Safety moose/motor vehicle collision logs.

We have not collected any density or composition information in any of these units since 1989. We will attempt at least some trend area counts in Units 20C, but survey plans have not yet been finalized for the fall 1996 surveys.

We will probably not be able to do any cooperative moose surveys with BLM during fall 1996 because of higher priority information needs in other areas. However, plans for moose surveys were not final at the time of this report.

We are meeting our objective of promoting moose habitat by allowing natural fires to alter the vegetation. This has been accomplished through input by our Fire Management Liaison working on an interagency fire management team.

We are in the process of establishing definitive moose population objectives. To do this, we must collect, at a minimum, moose composition data for each unit to give a baseline for our objectives. Information from recent surveys and upcoming fall 1996 surveys will help formulate those population objectives.

We are meeting our objective to provide for a sustained yield harvest in Units 20C, 20F, and 25C. Reported harvest data indicate stable hunter success ratios with some increases in hunter effort in some areas. Overall, these low-density populations are providing moose hunting opportunity to local and some nonlocal hunters.

We recommend the following changes to the objectives and activities.

2. Change to "Estimate moose densities in Units 20C, 20F, and 25C by 1998.
2a. Change to "Cooperate with BLM to superstratify approximately 1000 mi^2 in central Unit 25C in November 1997."
4. Change to "Establish moose population objectives for Units 20C, 20F, and 25C by 2000."

Project Location: Unit 20D (5637 mi^2)

Project Objectives and Activities:

1. Manage for a posthunt population of 4000-6000 moose, with 1200-2200 in northern Unit 20D, 2000-2500 in southwestern Unit 20D, and 1000-1500 in southeastern Unit 20D.
2. Manage for a posthunting ratio of 30 bulls:100 cows.
3. Manage for a ratio of no less than 30 calves:100 cows.
4. Increase the bull age structure in southwestern Unit 20D so that by 1993 at least 20% of the bulls observed after the hunting season have an antler spread of >50 inches.

Work Accomplished During the Project Segment Period: In October 1995 the Alaska Board of Game adopted revised moose population and harvest goals as part of a wolf predation control implementation plan for Unit 20D. The revised moose goals were to increase the Unit 20D fall moose population to 8,000-10,000 moose with a sustainable harvest of 240-500 moose per year by the year 2002. In addition to the revised population goal, previous goals for bull:cow ratios, calf survival, and hunter success will be retained. The bull age structure goal for southwestern Unit 20D is being eliminated.

In November 1995 project objectives were assessed with a population estimation survey in Unit 20D south of the Tanana River. The survey resulted in a preliminary mean estimate of 2522 moose (+/-22%). Population parameters from the survey resulted in mean estimates of 21.1 bulls:100 cows, 33.9 calves:100 cows, 9.1 yearling bulls:100 cows, and overall density of 1.9 moose/mi^2. No surveys were flown in northern Unit 20D because all funds were expended during the southern Unit 20D survey.

Reported harvest was also analyzed for the subunit. Reported total harvest increased slightly to 138 moose during the 1995-96 general hunting season. Total number of hunters increased to 645. Overall hunter success was 21.4%. During the TM 787 subsistence moose hunt, 8 hunters reported hunting but were unsuccessful.

Progress Meeting Project Objectives: A population estimation survey was conducted in southern Unit 20D to determine compliance with herd size goals. Herd density and composition ratios were also calculated from survey data. Antler restrictions will remain in effect in southwestern Unit 20D to compensate for low bull:cow ratios. Intensive management of predators was implemented in Unit 20D partially in response to low calf survival. Hunting season harvest was monitored and hunter success met the management goal.

Project Location: Unit 20E (10,681 mi^2)

Project Objectives and Activities:

1. Maintain a posthunting bull:cow ratio of at least 40 bulls:100 cows in all areas.
   a. Conduct periodic population estimate surveys in portions of Unit 20E.
   b. Conduct browse transect surveys to ensure habitat is capable of sustaining increasing moose densities.
   c. Conduct annual composition and trend count surveys within traditional count areas.

Work Accomplished During the Project Segment Period: During November 1995 we conducted a population estimate in a 964 mi^2 area in southcentral Unit 20E. Our methods followed the standard Gasaway techniques, except that we were able to stratify the area based on count data collected during previous surveys. By using the historic count data and foregoing a stratification plane, we were able to save about $4,000. We estimated a population size of 666 +/- 38% (90% CI) and a density of 0.69 moose/mi^2. Based on survey results since 1981, the annual rate of increase in the southcentral portion of the subunit was 1.08 between 1981 and 1988 and 1.01 between 1988 and 1995. We also conducted a standard contour count (sex and age composition) in eastern Unit 20E where we had created a controlled use area during 1992-1993. Preliminary data indicates the bull population is recovering under the new regulation. We will survey most of the area next year to better determine population and composition trend and evaluate the management action.

We were planning to conduct additional sex and age composition surveys but snow conditions were not adequate. Due to conflicts with other projects during 1995-96, we did not conduct the browse surveys. Browse surveys will be conducted in portions of Unit 20E during 1996-97.

During 1995-96 preliminary harvest data indicate 465 hunters harvested 139 bull moose (30% success). The average annual hunter participation rate and harvest during the previous 5 years has been 400 hunters and 86 bull moose, respectively. The average success rate has been 22%. The number of hunters and moose harvested has been increasing the past 5 years. Probable causes of the higher harvest are 1) the Fortymile caribou season is open concurrently with the moose season, attracting hunters for both species, 2) regulations restricting harvest to bulls with spike/fork or antlers >50 inches throughout southcentral Alaska caused a displacement of hunters into the area, and 3) several little known moose concentration areas were found and hunted intensely during this hunting season. The bull:cow ratios in several of the more popular areas are declining due to increased harvest.

Progress Meeting Project Objectives: Based on survey results since 1992, we believe the moose population in central and western Unit 20E remained stable or declined slightly and is currently at a low-density (0.2-0.6 moose/mi^2). The population density in the eastern portion of the unit ranges between 0.8 and 1.0 moose/mi^2 and, based on calf recruitment the past 2 years, is probably stabile. Overall, the moose population in Unit 20E remains at low-density (0.4-0.5 moose/mi^2). Past and ongoing research demonstrated that wolf and bear predation is the primary limiting factor on the moose population, and hunting and habitat quality have little effect. Under current predator levels, the moose population in Unit 20E will remain at a low-density. Managing

for significant growth of Unit 20E's moose population is not a long-term management goal; however, it is desired by the majority of local residents. If in the future the political and social attitudes become more accepting of active predator management or if different management tools become available, management objectives and activities should be developed to increase the area's moose population.

The bull:cow ratio in Unit 20E is above the management objective. However, bull:cow ratios have declined in the most popular hunting areas. To protect against an excessive decline in bull numbers in a portion of Unit 20E, the Alaska Board of Game established the Ladue River Controlled Use Area in the eastern portion of the unit at the spring 1994 meeting. Based on results collected during FY95 and FY96, the bull population will have adequate protection under this regulation because it gives us the flexibility to periodically change hunter distribution. If harvest continues to increase, additional regulations may be necessary to protect against unacceptable bull:cow ratios. No new regulations are necessary, but we will be monitoring intensively hunted areas closely.

Project Location: Unit 21B (4,871 mi^2)

Project Objectives and Activities:

The floodplain Areas of the Yukon and Nowitna Rivers:

1. Maintain or increase November moose densities to 2.5-4.0 moose per square mile.
   a. Conduct annual trend area surveys.
2. Maintain an average annual harvest of 40 moose from the desired population of 1000-1600 moose.
   a. Monitor harvest with harvest reports and check stations.

Remainder of the Nowitna Drainage:

1. Maintain or increase November moose densities to 0.5 moose per square mile.
   a. Conduct annual trend area surveys.
2. Maintain an average annual harvest of 20 moose from the desired population of 1100-1300 moose.
   a. Monitor harvest with harvest reports and check stations.

Remainder of Unit 21B:

1. Maintain or increase November moose densities to 0.5 moose per square mile.
   a. Conduct annual trend area surveys.
2. Maintain a minimum annual harvest of 30 moose from the desired population of 1600-1700 moose.
   a. Monitor harvest with harvest reports and check stations.

Work Accomplished During the Project Segment Period: Fall moose composition surveys were flown in cooperation with USFWS during November 1995. In Unit 21B 264 moose were classified in 205.3 mi^2 along the Novi River for a density of 1.5 moose per mi^2. The bull:cow ratio at 15:100 was lower than in previous years, the calf:cow ratio was 29:100, and the yearling

percent in the herd was improved at 10%. A linear regression population survey was conducted in November 1995 and the population estimate for the 1338 mi^2 area was 908 ±19%.

In Unit 21B, 131 hunters reported taking 64 bull moose. USFWS staff operated a moose hunter check station at the mouth of the Nowitna. Thirty-eight moose were taken by 132 hunters within the drainage which includes part of Unit 21A. Sixteen hunters were unit residents, 107 were Alaska residents, and 9 were nonresidents. The number of hunters using the Nowitna has remained stable.

Progress Meeting Project Objectives: In Unit 21B moose populations within the Nowitna drainage are still below the population objectives. Depressed bull:cow ratios are hindering recovery. The Novi drainage continues to maintain an annual harvest of 40 bulls. The sources of calf mortality are unknown.

Project Location: Unit 21C (3,761 mi^2)

1. Increase the moose population to 2500-3000 in the Melozitna River drainage to increase hunting opportunities.
2. Maintain the moose population of 550-750 in the Dulbi River drainage to sustain hunting opportunities.
   a. Monitor harvest with harvest reports.
3. Develop a population level and density estimate by 1998 for the Melozitna River drainage by conducting a moose stratification survey.

Work Accomplished During the Project Segment Period: I attempted to fly a moose stratification of the Melozitna drainage portion of the unit. After flying 20 sample units we encountered severe turbulence and ended the survey. Over the course of the next 3 days, we attempted to continue the survey but turbulent conditons persisted.

Twenty-one moose were taken by 35 hunters in Unit 21C. Nine hunters were nonresidents, 22 were Alaska residents, and 1 hunter's residency was unknown.

Progress Meeting Project Objectives: The moose population is at or above the population management objective level in Unit 21C.

Project Location: Unit 21D (12,113 mi^2)

Project Objectives and Activities:

1. Maintain a population of at least 4000 moose south and east of the Koyukuk River, including the Three-day Slough floodplain.
2. Maintain an early winter density of at least 6.0 moose per square mile within the Three-day Slough floodplain.

a. Conduct annual trend area surveys.

3. Maintain a posthunting ratio of 30 bulls:100 cows in the population being monitored within the Three-day Slough trend count area.
   a. Monitor harvest with harvest reports and check stations.
4. Develop guidelines for maximum winter browse use within the Three-day Slough area.
   a. Conduct browse surveys.
5. Maintain a moose population level of 900-1000 in the Kateel River drainage and develop a population level for the Gisasa River by 1997.
   a. Conduct a moose stratification survey.
6. Maintain an early winter density of at least 3.0 moose per square mile in floodplain areas along the Yukon River that are subject to both the September and February hunting seasons.
   a. Conduct annual trend area surveys.
7. Develop a population level and density estimate by 1996 for the remainder of the subunit, including the Yuki and Nulato Rivers.
   a. Conduct a moose stratification survey.
8. Forage dynamics of moose will be determined by defining the choice of browse species during winter, measuring the nutritive quality of winter browse, estimating browse consumption as a proportion of current annual growth, and assaying moose body condition by urinary chemistry or ultrasound.
9. Determine the number and residency of hunters using the Koyukuk River to access the Three-day Slough area by operating a moose hunter check station at Ella's cabin.

Work Accomplished During the Project Segment Period: In Unit 21D within the Three-day Slough trend count area, the observed density of moose was 12.6 moose per square mile. Productivity in the area was good with average calf recruitment. The bull:cow ratio was 23:100, the lowest ratio ever recorded, the calf:cow ratio was 36:100, and the yearling percent in the herd was 14%. In the Kaiyuh Slough count area, the bull:cow ratio was 26:100, the calf:cow ratio 43:100, and the yearling percent in the herd was 14%.

In May 1996 we conducted a moose calf twinning survey to determine the percentage of cows producing twins at Three Day Slough. The twinning rate was 26%. Numbers lower than 20% usually indicate environmental stress either from hard winters or poor forage conditions.

In Unit 21D preliminary harvest data shows 426 hunters harvested 330 moose, 315 bulls and 15 females. Harvest has been slowly increasing within the subunit with most of the harvest coming from the Koyukuk River. A moose hunter check station was operated on the Koyukuk River and 446 hunters were checked through. They took 287 moose with residency and harvest as follows: 124 unit residents took 49 moose, 264 Alaska residents took 188 moose, and 63 nonresidents took 50 moose.

Progress Meeting Project Objectives: The moose population is at or above the population management objective in Unit 21D. A study is underway to investigate the foraging dynamics of moose in the Three-day Slough area. Population estimates were not done for the Gisasa, Melozitna, Yuki, and Nulato rivers.

Project Location: Unit 24 (26,055 mi^2)

Project Objectives and Activities:

1. Manage a moose population at the current level of 5000-7000 in the area south of Hughes, including the Koyukuk Controlled Use Area.
2. Increase the moose population to 5000-6000 in the area from Hughes to Bettles, including the Kanuti Controlled Use Area and the South Fork drainage.
3. Increase the moose population north of Bettles, excluding the Gates of the Arctic National Park, to 3000-3500.
4. Maintain the population in the Gates of the Arctic National Park at 1300-1500.
   a. Conduct annual trend area surveys.
5. Determine harvest.
   a. Monitor harvest with harvest reports and check stations.

Work Accomplished During the Project Segment Period: The total reported harvest in Unit 24 was 146 moose by 241 hunters. The number of hunters using the Dalton Highway for access has stabilized at about 119; they took 54 moose.

Progress Meeting Project Objectives: In southern and northern Unit 24, the moose population is at or above the management objective. Predation and out-of-season harvest have kept the population low, but recent fires and caribou as alternate prey are helping the moose population recover in the central part of the unit.

Project Location: Units 25A, 25B, and 25D (48,000 mi^2)

Project Objectives and Activities:

Unit 25 Overall:

1. Continue efforts to communicate with and educate local residents about moose management.
2. In cooperation with USFWS, monitor moose population status as funding permits.

Unit 25A:

1. Evaluate possible effects of increasing hunting moose on major drainages along the Brooks Range.
2. Educate local residents regarding the importance of not taking cow moose.
3. Cooperate with USFWS in periodically determining moose population status.

Unit 25B:

1. Plan and conduct biannual trend counts in selected areas for comparison with previous trend counts.
2. Educate local residents regarding the importance of not taking cow moose.

Unit 25D:

1. In cooperation with USFWS, plan and conduct periodic moose population surveys in the eastern and western portions of the unit.

2. Educate local residents regarding the importance of not taking cow moose.

Work Accomplished During the Project Segment Period: We conducted a population estimate survey in Unit 25D east during October 1995. Weather precluded composition surveys in Unit 25A. FWS staff continued a cooperative study of moose population identity in Unit 25A. The movements of 57 radiocollared moose are being monitored to determine seasonal movements and habitat use. Results show that a high proportion of moose wintering in northern Unit 25A migrate to the Old Crow Flats in Canada in the spring and return to Alaska in the fall.

Progress Meeting Objectives: Our management objectives were met with the exception of surveys in Unit 25A.

Project Location: Subunits 26B and 26C (25,800 mi^2)

Project Objectives and Activities:

1. Conduct trend count surveys with the USFWS to monitor moose population status.
2. Attempt to maintain a population composition that will continue to support the harvest of relatively large bull moose, a hunter success rate of at least 40%, and a ratio of at least 50 bulls:100 cows.

Work Accomplished During the Project Segment Period: FWS conducted composition surveys in Units 26B and 26C during October 1995. These surveys showed a significant and continued decline in moose numbers and extremely poor calf survival. A browse condition and availability evaluation was conducted in Unit 26B during April 1995 to determine if poor habitat is a factor in the decline.

Radiotelemetry studies were conducted in the southern portions of Units 26B and 26C beginning March 1995 when moose were radiocollared by FWS on winter range in the Kongakut and Firth drainages.

Harvest data are being compiled and analyzed. In view of the decline in moose numbers, a regulation establishing a 50 inch minimum antler size for resident hunters took effect in fall 1995, and the season was closed in fall 1996.

Progress Meeting Project Objectives: Substantial progress was made toward meeting objectives. Population status and habitat conditions were monitored. However, objectives relating to hunter success cannot be met in view of the dramatic decline in moose numbers during the last few years.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	113.3	111.3	224.6
Actual	131.8	71.8	203.6
Difference	-18.5	39.5	21.0

Explanation: Operating expenditures were less than planned because population estimation surveys were not conducted as a result of unsuitable snow conditions. Additional staff time was used for midwinter surveys and intensive spring S&I activities, particularly in 20A.

Submitted by:

David James
Management Coordinator

Project Title: **Western Alaska Moose Population Management**

Project Location: Unit 18 (42,000 mi^2)
Yukon-Kuskokwim Delta

Project Objectives and Activities:

1. Increase the moose population in Unit 18 by 10% a year to maintain a population goal for the Yukon River population of 1000-3000 moose. The population goal for the Kuskokwim River population is to increase the population from 200 to 1000 moose. The bull:cow ratio for both populations will be maintained at a minimum of 30 bulls per 100 cows.
   a. Conduct fall sex and age composition surveys and winter recruitment surveys of theYukon River population annually.
   b. Conduct fall and/or midwinter surveys of the Kuskokwim River and its major drainages to assess the status and population size of the Kuskokwim River population.
   c. Conduct a moose census on the Yukon River every 5 years.
   d. Conduct a moose census on the Kuskokwim River every 5 years.

2. Improve harvest reporting and compliance with hunting regulations.

3. Finalize a cooperative moose management plan with local communities along the Yukon River, especially addressing the 3000 moose goal for the Yukon River.

4. Continue working with the Association of Village Council Presidents (AVCP), Kuskokwim Native Association (KNA), The Kuskokwim Corporation (TKC), U.S. Fish and Wildlife Service (FWS), Unit 19 area biologist, the Lower and Central Kuskokwim Fish and Game advisory committees, and local moose hunters to resolve allocation conflicts between upriver and downriver uses.

Work Accomplished During the Project Segment Period: We attempted a Gasaway census of moose in the area between the Tuluksak River and Kisaralik River during late February and early March 1996 but canceled the census due to lack of snow and poor sightability. Midwinter surveys were completed along the Yukon River between Ohagamiut and Paimiut on 9 February 1996. Lack of snow cover and poor aggregations of moose made finding moose difficult and since moose were not 'yarded up,' it is difficult to make comparisons to previous survey years. We believe that moose numbers have not changed markedly at least along the Yukon portion of the survey area.

The department and FWS discontinued monitoring the moose that were collared during March 1991. In the Yukon drainage, 8 of the original 10 moose collared have either been shot out-of-season by hunters or died of unknown causes. Similarly, in the Kuskokwim drainage, 10 of 15 collared moose have been removed from the population, presumably by similar causes. Sequential locations of collared moose show that moose do not move more than a few square miles each year.

We set up a hunter check station on the Yukon River during September 1995 to collect harvest and age information of moose taken in Units 18 and 21E. Two-hundred thirty-three hunters went through the check station. Of the 80 moose reported harvested, 44 were sampled for antler measurements and for aging by extracting an incisor tooth.

Additional harvest statistics were gathered from harvest ticket reports turned in by hunters. In Unit 18, 300 hunters returned harvest reports, and 74 male moose were reported harvested. Harvest reports show only a few moose were taken during the winter hunt; lack of snow limited snowmachine access by hunters. Successful hunters needed an average of 8 days to harvest a moose. Seventy-one successful hunters used boats for transportation; only 1 used an aircraft. Snowmachines are also a common means of transportation. Sixty-six (90%) male moose were harvested along the Yukon River drainage, and 8 male moose (10%) were harvested along the Kuskokwim drainage and the Johnson River.

Increasing numbers of moose are being harvested downstream of Mountain Village. Very few moose existed in this area before 1988. The first harvest was 10 bulls during the 1994-95 season and during the fall 1995-96 season, the harvest increased to 18 bulls. Clearly there is a small harvestable surplus of moose in this area.

A scoping meeting ("mini-symposium") was held in Aniak during the winter to identify and resolve the upriver/downriver moose hunting allocation issues existing between residents of Unit 19 and hunters from Unit 18 (who hunt in Unit 19). We are hopeful that a cooperative management plan will come forth from this initial meeting.

Progress Meeting Project Objectives: During the past 10 years, estimated recruitment rates obtained from aerial survey data have ranged from 12% to 25% for the Yukon River drainage. Steady increases in moose numbers along the lower Yukon drainage have been documented since 1985. However, fall composition counts, except during 1994, have not been regularly completed because of poor snow conditions. The fall composition (November 1994) along the lower Yukon River was 37 bulls:100 cows and 66 calves:100 cows in a sample of 321 moose. During February 1995, the short yearling count in the same area was 32% in a sample of 98 moose. The Yukon census (completed during February 1992) yielded an estimate of 994 moose $\pm$ 13% at the 80% confidence level. The population size of the delta portion of the Yukon River is estimated at 65 moose based on the 17 March 1994 census. Overall, we estimate the Yukon drainage moose population at 1100 moose.

The first Kuskokwim drainage census was completed in 1993. The census results show the lower Kuskokwim moose population along the main river is very low in density and is estimated at 200 moose. The riparian corridor of the main Kuskokwim River between Kalskag and Kwethluk only yielded an estimate of 217 moose $\pm$ 28% at the 80% confidence level. The tributaries of the Kuskokwim River have an estimated moose population of 200 moose based on surveys conducted in 1989 and 1990 along the Tuluksak, the Kisaralik, the Kwethluk, and the Eek drainages. We estimate the minimum population size for all of Unit 18 is 1600 moose.

We drafted a moose management plan for the lower Yukon River in cooperation with the lower Yukon villages, the FWS, and the Association of Village Council Presidents (AVCP). The plan established the 3000 moose population goal and a 5-25 September bull moose season within the delta portion of the lower Yukon River. The delta of the Yukon River has been closed to hunting since the fall of 1989.

Improved harvest reporting and compliance with regulations is being achieved through hunter contacts at the check station, radio and newspaper announcements, law enforcement activities, and community meetings. Harvest ticket receipts and returns have been consistent for the last 7 years.

The 1993-94 harvest was the highest *reported* harvest on record for Unit 18. The 1994-95 and the 1995-96 harvest were above the 15-year average of 65 moose. The fall 1995 harvest was above average, and if there is a large winter harvest, we may have a record harvest for the reporting period.

Project Location: Unit 22 (25,230 mi^2)
Seward Peninsula and eastern Norton Sound.

Project Objectives and Activities:
The overall population management objective is to maintain a minimum population level of 5,000-7,000 moose throughout the Unit. In Unit 22A, the objective is to increase population size from the current estimate of 400-600 moose to at least 800-1,000 moose. In Units 22B and 22D, the objective is to maintain the population at 1,500-2,500 and 2,500-3,000 moose, respectively, with a minimum bull:cow ratio of 30:100. In Unit 22C, the objective is to maintain the existing population of 350 with a minimum bull:cow ratio of 20:100. In Unit 22E, the objective is to maintain the existing population of 250-350 moose. These objectives will be accomplished through the following management activities:

1. Estimate abundance, sex and age composition, and recruitment to yearling age and determine trends in population size and composition.
   a. Conduct aerial surveys throughout the Unit during late fall and early spring to provide an index of population status and trends, sex and age composition, and yearling recruitment.
   b. Conduct moose censuses in each of the 5 Units (on a yearly rotational basis) to estimate abundance.
2. Monitor human and natural mortality factors affecting the population.
   a. Evaluate hunting mortality by analyzing all harvest data.
   b. Improve harvest reporting through public contacts and improved communication.
   c. Evaluate mortality factors affecting moose populations in Unit 22 through the use of radiotelemetry.
3. Develop updated moose management objectives, with special emphasis on areas adjacent to the Nome road system.

Work Accomplished During the Project Segment Period: The known harvest from Unit 22 was 185 moose (169 males and 13 females). A breakdown of the harvest by Unit is as follows: 22A - 24; 22B - 52; 22C - 17; 22D - 76; and 22E - 15. Of the 469 individuals who reported hunting in Unit 22, 425 (91%) were residents of Alaska, and 370 (79%) were residents of Unit 22. Hunter success rate was 39%.

Incisorform teeth from 60 hunter-killed moose were collected and analyzed to determine age and the cause of the unusually high incidence of tooth breakage among Seward Peninsula moose.

We completed a moose census of all riparian and willowed habitat in Unit 22E during March 1996. the census resulted in a population size of 196 moose (164 adults and 32 calves) and a recruitment rate of 16%.

During 1995, we began a moose telemetry study in western Unit 22B to investigate why short yearling recruitment is so low in the Fish and Niukluk River drainages. Specific objectives of the study are to determine calving success during June and the timing of calf mortality during the remainder of the year. We radiocollared 27 cows in the Niukluk and Fish River drainage during early April 1995. During early April 1996, we radiocollared an additional 10 cows in the upper Niukluk River and Boston Creek drainage. Preliminary results of the study are as follows:

During April and early May 1995, 2 adult cows died, 1 from probable bear predation and 1 from unknown causes. The first newborn offspring of a radiocollared cow was observed on 30 May 1995. Between 30 May and 16 June 1995, we observed 11 of 25 radiocollared cows were accompanied by newborn calves (6 cows with a single calf and 5 cows with twin calves). By the end of July 1995, only 3 of 11 cows (with calves) were accompanied by a calf. Additional mortalities did not occur until the period December 1995 through February 1996 when 3 adults and 1 calf died. Although the causes of death are not known with certainty, we believe they were attributable to hunting or wolf predation.

We made several trips to villages explaining the need for regulations and harvest reporting as well as assisting local license vendors in their duties. We devoted considerable time to answering questions from the public, writing articles, mailings information and regulatory materials.

Progress Meeting Project Objectives: The unreported harvest of moose in Unit 22 is considerable. We believe much of this harvest is attributable to hunters who do not purchase licenses or pick up harvest tickets rather than by those who hunt outside of current season dates. Efforts to inform the public of the importance of wildlife conservation and the need for regulations are having an effect in some communities because the number of individuals purchasing license and/or picking up harvest tickets has increased. However, additional contact with local residents needs to occur if we are to achieve more complete compliance with current moose regulations.

Since 1987, we have achieved the objective of completing a census 1 subunit in Unit 22 each year. However, because of poor weather and conflicts with competing projects, we were often unable to complete fall and spring aerial surveys planned for Unit 22 during the reporting period. We are

continuing our efforts to develop updated management objectives in consultation and cooperation with the public and other agencies.

Project Location: Unit 23 (43,000 mi^2)
Kotzebue Sound and Western Brooks Range

Project Objectives:

The population management objective of Unit 23 is to maintain the moose density at or above 1 moose/mi^2, and the bull:cow ratio at a minimum of 40:100.

1. Conduct modified Gasaway censuses in established census areas to monitor population composition and recruitment.
2. Monitor harvest.
3. Identify a census area in the Upper Kobuk River drainage and conduct a quantitative census.
4. Collect data on moose movement patterns, distribution, and evaluate sources and rates of mortality in the Noatak and Selawik River Drainage.

Work Accomplished During the Project Segment Period:

Population Monitoring. The western portion of the middle Noatak census area (858 mi^2) was censused in November 1995 using a simple random sample design. Moose density was 1.33 moose/mi^2 with 21 calves:100 cows and 34 bulls:100 cows. At the 80% confidence level the population estimate was 1140 moose $\pm$ 23%.

National Park Service (NPS) staff delineated a census area in the middle Kobuk River drainage (892 mi^2), which included the Salmon River. We assisted with a modified Gasaway census in this area in November 1995. Lack of aircraft resulted in selecting and sampling census units prior to stratification. The overall moose density was 0.87 moose/mi^2 with 56 calves:100 cows and 78 bulls: 100 cows. At the 80% confidence level, the population estimate was 780 moose $\pm$ 32%.

The department and NPS staff censused the upper Kobuk River drainage (1438 mi^2) in November 1995. We used linear regression to estimate the density of moose. The population estimate was 815 moose $\pm$ 22% at the 80% confidence level.

Harvest Monitoring. In Unit 23 295 hunters harvested 151 moose during the 1995-96 season. Most hunters (161) who reported harvest were nonlocal residents (residing outside of Unit 23). We monitored the harvest using the statewide harvest reporting system.

Radiotelemetry Studies. The department and federal agency staff completed the fifth year of a cooperative moose telemetry project in the middle Noatak River drainage and the third year of a similar study in the Tagagawik River drainage. In both studies we relocated radiocollared moose throughout the year with more intensive monitoring during calving and fall hunting season. Total mortality for radiocollared moose in the Noatak study was 22 %, almost double compared with

previous years. In the Tagagawik study, total mortality in 1995 was 12%. In the Tagagawik River drainage we collared an additional 16 moose in April 1996. This increased the number of radiocollared moose to 52 animals.

Progress Meeting Project Objectives: Data from the radiotelemetry projects and census results indicate population objectives are being met in most of Unit 23. Telemetry projects are providing valuable information on causes and extent of hunting and natural mortality. We are improving population data by moving away from trend count areas and by using statistically rigorous censuses on a rotational basis throughout the unit with modified census techniques in the intervening years.

Project Location: Unit 26A (53,000 mi^2)
Western North Slope

Project Objectives and Activities:

1. Monitor the moose population in Unit 26A.
   a. Conduct late winter trend counts annually to monitor population trends and short yearling recruitment. A unitwide census will take place every 4 years.
   b. Conduct fall surveys to monitor sex and age composition trends and summer calf survival.

2. Study the factors causing the population to decline.
   a. Examine and collect samples from dead moose to test for pregnancy status, disease, mineral deficiencies, and contaminants.
   b. Use radiotelemetry to examine mortality rates and causes of mortality in adults and calves.
   c. Continue monitoring predator populations.
   d. Continue the moose browse study.

3. Minimize hunting mortality.

Work Accomplished During the Project Segment Period: Fall sex and age composition surveys were attempted in the Colville, Anaktuvuk, and Chandler river drainages during November 1995. We did not consider the survey to be successful because incomplete snow cover compromised survey conditions and an adequate number of moose had not yet moved into the river bottoms. Only 34 moose were observed in the trend count area where 293 moose were seen in 1994. We saw 14 bulls, 20 cows, and no calves.

All drainages in Unit 26A containing moose habitat were surveyed to conduct a census and short yearling recruitment count during April 1995. A total of 757 moose (746 adults and 11 calves) were counted, yielding a short yearling recruitment rate of 1%. This represents a 51% decline since the 1991 census when 1535 moose were counted.

A survey to determine population trend and short yearling recruitment was conducted during April 1996 in trend count areas on the Colville, Anaktuvuk, and Chandler River drainages. A total

of 152 moose (151 adults and 1 calf) were counted, yielding a short yearling recruitment rate of less than 1%. In 1991 we counted 647 moose and in 1995 we counted 307 moose in this trend area.

During summer and fall of 1995, approximately 40 dead moose were reported along the Chandler and Anaktuvuk rivers. We examined several carcasses and found they did not appear to have been killed by predators. Samples from the carcasses and hunter-killed moose were analyzed for signs of mineral deficiencies, disease, and contaminants. We found several of the moose were deficient in copper.

In a cooperative study with the North Slope Borough, we captured and radiocollared 30 female and 5 male moose from 22-25 April 1995 to determine causes for the declining calf survival and moose population. Each moose was given a physical examination; we collected blood, fecal, and hair samples to test for pregnancy status, disease, mineral deficiency, and contaminants. Blood samples indicated that 23 of 28 females were pregnant. In addition 6 of 33 animals sampled tested positive for exposure to brucellosis, a bacterial disease. Further studies are needed to determine how this disease has affected the population.

Surveys to locate radiocollared moose were flown daily during the calving period, and we attempted to fly at approximately 2-week intervals during the postcalving period. As of 13 June, 1 adult died from bear predation, 19 cows produced 19 calves (13 cows with single calf, 3 cows with twin calves, and 3 cows lost their calves). One calf appeared to have died from bear predation, and the cause of death for the others is unknown.

A moose browse specialist spent 3 days observing and sampling the quality of the willows in the area. The samples will be analyzed for the food content of the willow browsed by moose.

Harvest data were compiled from harvest reports submitted by hunters. Because of the declining moose population, restrictive regulations were established and only 12 bull moose were harvested in 1995. The chronology of the harvest was as follows: Aug. (4), 1-7 Sep. (1), 8-14 Sep. (7), 15-21 Sep. (1), 22-28 Sep. (0), and Oct. (1). The harvest was distributed throughout the Colville River drainage: 4 animals were taken from the Anaktuvuk River, 2 from the lower Colville, 2 from the Chandler, 2 from the upper Colville, and 2 from the Killik River. Antler sizes and percentage of animals having these sizes are as follows: <25" (0%), 25-29.99" (7%), 30-34.99" (7%), 35-39.99" (7%), 40-44.99" (0%), 45-49.99" (7%), 50-54.99" (29%), 55-59.99" (21%), 60-64.99" (7%), >65" (8%), unknown (7%) .

Twenty nine percent of the hunters were residents of Unit 26, 29% were nonlocal Alaska residents, and 43% were nonresidents. The average hunt lasted 9.1 days, and the hunter success rate was 33%.

Progress Meeting Project Objectives: More restrictive regulations reduced the number of moose harvested to only 12 bulls. However, the moose population continued to decline. We will continue to monitor the population and investigate the causes of the population decline. In addition to annual surveys to determine population size, we will continue the telemetry study,

browse study, and predator surveys. We will capture moose during the spring of 1996 and examine, sample, and radiocollar them. The emphasis of the sampling will be to learn more about the effect of brucellosis on the population. The emphasis of the telemetry study will be to determine the causes of calf mortality.

There will be very little hunting mortality because the Board of Game closed nearly the entire North Slope to moose hunting. Only a section of the lower Colville River will be open for bull moose during August when airplanes are not permitted for hunting.

Segment Period Project Costs:

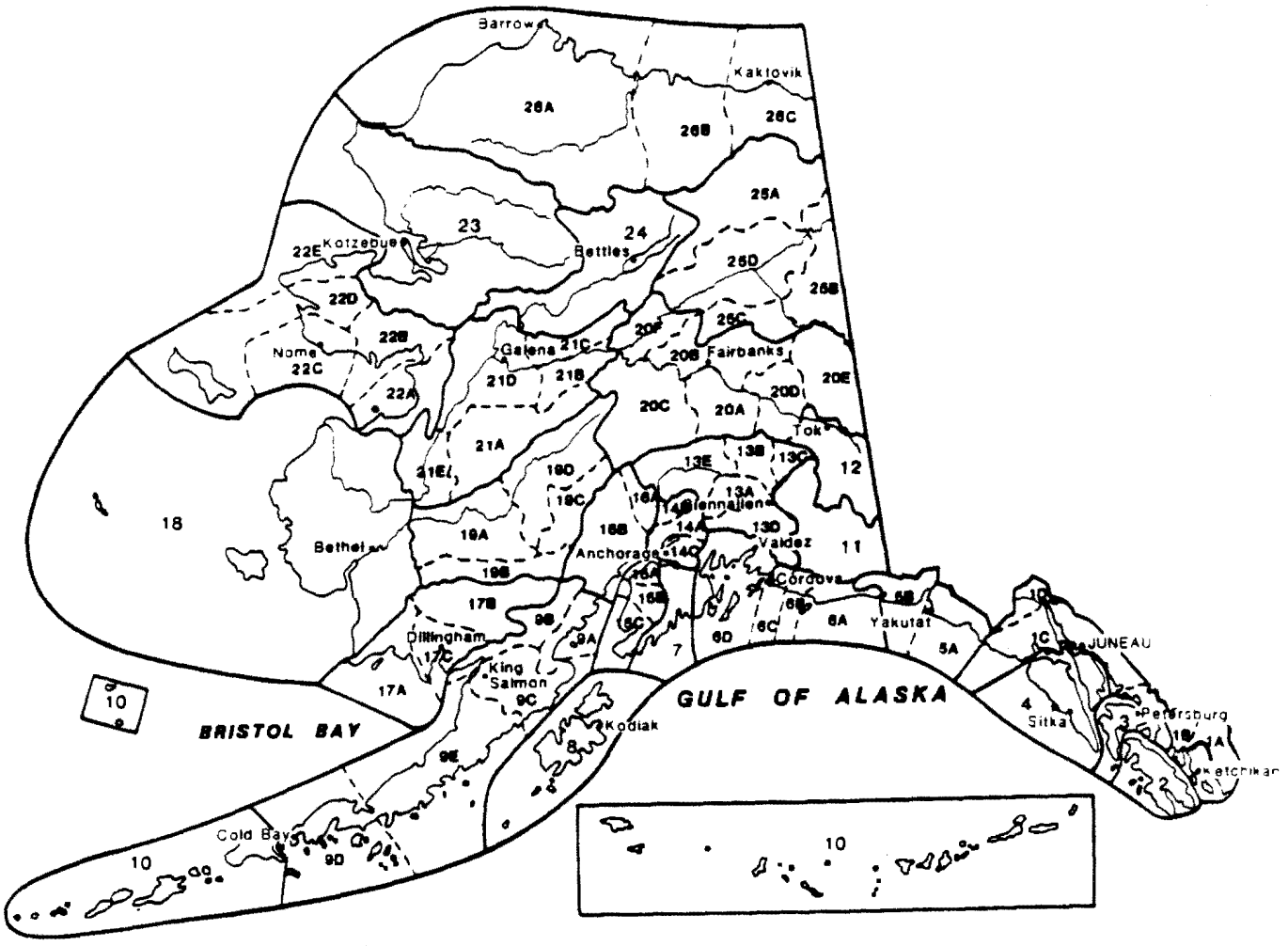
	Personnel	Operating	Total
Planned	96.3	188.0	284.3
Actual	59.0	109.3	168.3
Difference	37.3	78.7	116.0

Explanation: Poor weather conditions prevented our conducting some surveys.

Submitted by:

Peter Bente
Survey-Inventory Coordinator

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manufacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program allots funds back to states through a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum 5% of revenues collected each year. The Alaska Department of Fish and Game uses federal aid funds to help restore, conserve, and manage wild birds and mammals to benefit the public. These funds are also used to educate hunters to develop the skills, knowledge, and attitudes for responsible hunting. Seventy-five percent of the funds for this report are from Federal Aid.

PAT COSTELLO