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Division of Wildlife Conservation



Federal Aid in Wildlife Restoration  
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Survey-Inventory Activities  
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# MOOSE

Mary U. Hicks, Editor



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Grant W-27-1  
Study 1.0  
September 1998

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**DEPARTMENT OF FISH AND GAME**  
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**DIVISION OF WILDLIFE CONSERVATION**  
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**Project Title:** Southeast Moose Population Management

**Project Location:** Unit 1A (5,000 mi<sup>2</sup>)  
Ketchikan area including mainland areas draining into Behm and Portland Canals

**Project Objectives and Activities:**

1. Measurable management objectives for Subunit 1A include the following:

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

2. Complete winter sex and age composition surveys and monitor harvests.

**Work Accomplished During the Project Segment Period:** For the fifth consecutive season, we monitored the moose harvest using registration permits issued out of the Ketchikan office. We did not fly any aerial surveys during this report period.

**Progress Meeting Project Objectives:** Hunters harvested 4 moose from 1A during this report period. We issued 59 registration permits, down 4 from last season. Thirty-two hunters killed 4 bulls along the Unuk River. The 12% hunter success rate was commensurate with last season's 11% success rate. The number of hunters afield was substantially higher than our objective, numbers of moose killed was only slightly above our objective, and the hunter success rate almost met our objective. Antler widths for the 4 bulls were 26, 27, 34, and 36 inches, for an average of 31 inches. This was nearly identical to last season's average of 30 inches. Hunters voluntarily submitted teeth from their killed moose; we received tooth collections from 2 harvested 2-year-old bulls.

**Project Location:** Unit 1B (3,000 mi<sup>2</sup>)  
Southeast mainland from Cape Fanshaw to Lemesurier Point  
Unit 3 (3,000 mi<sup>2</sup>)  
All islands west of Unit 1B, north of Unit 2, south of the centerline of Frederick Sound, and east of the centerline of Chatham Strait

**Project Objectives and Activities:**

▪ Management objectives for Stikine River moose include the following:

Posthunt moose numbers 300  
Annual hunter kill 30  
Number of hunters 250

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Hunter days of effort	1750
Hunter success	12%

- 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%

- Management objectives for Unit 3 moose include the following:

Posthunt moose numbers	300
Annual hunter kill	30
Number of hunters	350
Hunter days of effort	1750
Hunter success	9%

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

**Work Accomplished During the Project Segment Period:** Unit 1B, Unit 3, and that portion of Unit 1C south of Point Hobart were included on a single registration permit. We issued 852 registration permits, 484 of these to Petersburg residents and 234 to residents of Wrangell.

We collected 56 incisors from harvested moose to determine age. Thirty-three (59%) of the harvested moose were long yearlings, 12 (21%) were between 2–4 years of age, and the remaining 11 (20%) were between 5–11 years of age. We measured and photographed antlers from harvested moose.

We completed the first phase of the moose habitat improvement project at Thomas Bay, the clearing and reopening of approximately 10 miles of preexisting logging roads. Preparations are underway to implement phase two of the project that will involve habitat manipulation. Habitat enhancement efforts will concentrate on pre-commercial thinning of select second growth stands to improve browse plant production. Four units of second growth totaling 380 acres were selected and delineated. The thinning contract has been finalized, a call for bids was announced, and a contract will be awarded to the lowest qualified bidder.

**Progress Meeting Project Objectives:** Hunters harvested the following number of moose from Units 1B and 3 during this report period:

<u>Unit 1B</u>	<u>Unit 3</u>
18 (Thomas Bay)	22
17 (Stikine)	

Most project objectives were not met. A total of 669 permittees hunted 4107 days with a success rate of 9%. In Unit 1B hunters harvested 18 moose in the Thomas Bay area and 17 in the Stikine River area. Twenty-two moose were harvested in Unit 3. Of the 57 moose harvested, 2 were illegal.

**Project Location:** Unit 1C (7,600 mi<sup>2</sup>)

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:**

- 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%

- Management objectives for Berners Bay moose include the following:

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

- 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 489 registration and 15 drawing permits for the three Unit 1C hunts, an increase of 93 registration permits and a decrease of 2 drawing permits. A total of 348 hunters participated in these hunts. Permit results for hunters reporting the location of their hunt are shown on the following page.

Management Area	Hunters	Success	Days Hunted
Berners Bay (bulls)	8	100%	21
(cows)	7	100%	21
Chilkat Range	126	10%	468
Gustavus	104	30%	405
Taku River	105	8%	406
Entire Subunit	350		

We conducted an aerial survey in Berners Bay on January 8, 1998. We counted 60 moose during the survey, 11 of which were calves. Due to the date of the survey, we were unable to differentiate bulls from cows. Due to lack of snow cover, no other surveys were flown within the unit.

We required Unit 1C hunters to submit lower jaws of their killed moose for age determination by Matson's Laboratory (Milltown, Montana, USA). Hunters were informed of the age of moose taken the previous year.

**Progress Meeting Project Objectives:** Hunters harvested the following number of moose from Unit 1C during this report period:

Unit 1C

15 (Berners Bay)

44 (Chilkat Range)

8(Taku)

Management objectives were met for the Berners Bay moose population and hunt. All 15 permittees harvested moose, surpassing the objective of 80% success. In addition the desired effort in hunter days was exceeded. The posthunt population size is probably near the target of 90, given that we counted 60 moose during the survey and saw an abundance of moose tracks immediately adjacent to thick stands of timber that probably hid additional moose from our view.

All of the easily measurable Chilkat Range herd management objectives were not met. The kill of 44 moose (31 at Gustavus) exceeded the goal of 10, and 230 hunters hunted (104 at Gustavus), much above the goal of 65. A total of 873 hunter days were expended (405 at Gustavus) compared to the objective of 195, and hunter success was 27%, compared to the objective of 15% (30% for Gustavus area hunters and 10% for the remainder of the Chilkat hunters). The record high take in the Gustavus area for the fourth year in a row was the main contributor to the success rate for the Chilkat Range. Because no aerial surveys were conducted, the posthunt size of the population is unknown. Due to the high moose harvest at Gustavus, we may soon need to consider that hunt as separate with a discrete set of management objectives.

Management objectives for Taku River moose were only partially met. The number of hunters climbed to 105, which was above our target of 100. Hunter success dropped from 16% in the previous 2 years to 8% in 1997. At the same time, the number of hunting days increased from 360 in 1996 to 406. Since we conducted no aerial surveys, the posthunt size of the population is unknown.

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

**Project Objectives and Activities:**

- Management objectives for Unit 1D moose include the following:

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

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

**Work Accomplished During the Project Segment Period:** The 1997 Chilkat Valley moose hunt was the fifth hunt since the Board of Game established a spike-fork/50 inch requirement for this Tier II hunt. We offered and issued 200 permits. Staff monitored the hunt, measured antlers, and collected incisors for aging. An aerial survey of moose winter habitats in the entire Chilkat drainage was conducted on 8 January, 1998. During the survey we counted 215 moose with 18% calves. We were unable to obtain sex composition of the herd due to the late timing of the survey. Unit 1D hunters were required to submit lower jaws of moose killed. Ages were determined by Matson's Laboratory (Milltown, MT). Hunters were informed of the age of moose taken the previous year.

**Progress Meeting Project Objectives:** Hunters harvested 15 moose from Unit 1D during this report period. The 1997 Tier II moose hunt in Unit 1D resulted in the harvest of 15 legal moose, with 10% hunters successful. Both the number of moose harvested and the percent success were below the management objectives of 30 and 12%, respectively. Since hunt conditions only allowed for 200 hunters, the management objective for hunter participation was not met either. Hunters spent a total of 941 days hunting, above the hunt objective of 500 for the second time since the hunt was reopened as an antler-restriction hunt. It should be noted management objectives contained in our strategic moose management plan predate the move to a Tier II hunt and should be revised to reflect inherent restrictions in this hunt. Based on the early winter aerial survey, the posthunt size is estimated at 400 animals.

**Project Location:** Unit 5 (5,800 mi<sup>2</sup>)  
Cape Fairweather to Icy Bay, eastern gulf coast

**Project Objectives and Activities:**

- Management objectives for Yakutat Forelands moose include the following:

Posthunt moose numbers	850
Annual hunter kill	70

Posthunt bull:cow ratio	20:100
Number of hunters	250
Hunter days of effort	1025
Hunter success	28%

- 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%

- Management objectives for Malaspina Forelands moose include the following:

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

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

**Work Accomplished During the Project Segment Period:** We issued 238 registration permits for Unit 5 moose hunts (190 for Unit 5A and 48 for Unit 5B). An additional 77 federal subsistence permits were issued for Unit 5A. Division of Wildlife Conservation staff and enforcement officials from the U.S. Forest Service monitored the hunts. Harvest and hunter data were analyzed from registration permit reports. Moose incisors were collected for age determination.

Due to poor snow conditions, we did not conduct aerial surveys of the Yakutat Forelands, Nunatak Bench, or Malaspina Forelands.

Unit 5 hunters were required to submit lower jaws of moose killed. Ages were determined by Matson's Laboratory (Milltown, Montana, USA). Hunters were informed of the age of moose taken the previous year.

**Progress Meeting Project Objectives:** Hunters harvested the following number of moose from Unit 5 during this report period:

Unit 5

61 (Yakutat Forelands)

2 (Nunatak Bench)

13 (Malaspina Forelands)

We estimate the posthunt Yakutat Forelands moose population between 600 and 1000 animals. Hunters killed 61 moose, 40 under the state season and 21 during the federal subsistence hunt. An additional 2 moose were taken under federal ceremonial permits. The number of hunters (142 state hunters plus 63 permitted under the federal subsistence season) was below objectives.



Hunter effort (527 days during the state hunt) was lower than our objective of 1025 days. Hunter success (28%) for state hunters met our objective of 28%, while the success for federal subsistence hunters was 33%.

Management objectives in the Nunatak Bench area of Unit 5A were not met. While a hunt was held for the third time in recent years, only 2 moose were harvested. Nine permits were issued, with 2 hunters using 3 days to harvest 2 bull moose.

On the Malaspina Forelands the moose harvest totaled 13, with 29 hunters spending a total of 114 days in the field. Hunter success was 44%, down from 52% the previous year. No surveys were conducted in this area, so it is not possible to determine the posthunt population size.

**Segment Period Project Costs:**

	<u>Personnel</u>	<u>Operating</u>	<u>Total</u>
Planned	23.0	28.8	51.8
Actual	36.0	30.0	66.0
Difference	-13.0	-1.2	-14.2

*Explanation:* Difference is due to a) time PFT and PS staff worked on Thomas Bay moose browse enhancement project and b) aerial surveys not done in much of central and northern Region I.

**Submitted by:**

Bruce Dinneford  
Management Coordinator

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

**Project Location:** Unit 6 (10,150 mi<sup>2</sup>)  
Prince William Sound and north Gulf Coast

**Project Objectives:**

Unit 6A (East): Maintain a posthunting population of 300–350 moose and a minimum bull:cow ratio of 30:100.

Unit 6A (West): Maintain a posthunting population of 300–350 moose and a minimum bull:cow ratio of 15:100.

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

Unit 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:** Total 1997–98 reported harvest in Unit 6 was 55 moose. In Unit 6A (East) 46 hunters took 13 males, which is a success rate of 28%. In Unit 6A (West) 33 hunters took 18 males, a success rate of 54%. Unit 6B had no open hunting season. In 6C 18 males and 5 females were taken by 23 hunters who had a success rate of 100%. No moose were reported harvested in Unit 6D.

**Progress Meeting Project Objectives:** We achieved our population objectives in 6B and established a permit hunt. No data are available for the other units because climate conditions prevented surveys.

**Project Location:** Unit 7 (3,520 mi<sup>2</sup>)  
Kenai Peninsula

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

**Work Accomplished During the Project Segment Period:** No surveys were completed during this reporting period. The winter of 1997–98 was considered normal with light snow pack in lower elevations. However, Unit 7 experienced several heavy snow storms in early spring. Overall winter mortality was higher than average including 28 deaths by motor vehicle and 18 by train. There were no reported cases of starvation. The moose population seems stable between 1000 and 1500 animals.

Preliminary harvest statistics indicated that 362 hunters reported hunting in Unit 7 during the 20 August–20 September season and harvested 69 bull moose for a 19% success rate. Twenty-four (35%) hunters reported taking spike/fork bulls (less than 35") compared to 44 (64%) hunters who

harvested large bulls, or 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.

Residents of the Kenai Peninsula took 65% of the moose; 33% of these residents were from Unit 7. Nonresidents took only 4 moose (6%). Successful hunters averaged 4.2 days afield while unsuccessful hunters averaged 5.5 days.

**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, management changes in Unit 7 should also be instated in 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<sup>2</sup>)  
Alaska Peninsula and Unimak Island

**Project Objectives:**

- To maintain existing moose densities in areas with moderate- (0.5–1.5 moose/mi<sup>2</sup>) or high- (1.5–2.0 moose/mi<sup>2</sup>) densities.
- To increase low-density populations (where habitat conditions are not limited) to 0.5 moose/mi<sup>2</sup> 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:** Fall composition surveys were conducted in the 3 trend areas in Unit 9C and 1 in Unit 9B. A total of 512 moose were classified in Unit 9C and ratios were 44 bulls:100 cows and 14 calves:100 cows.

Preliminary harvests were 5, 71, 49, and 100 moose for Units 9A, 9B, 9C and 9E, respectively.

**Progress Meeting Project Objectives:** Efforts to monitor moose density and composition in Unit 9C indicate density objectives were being met. Estimates of bull:cow ratios in all areas counted in recent years met or exceeded desired ratios.

**Project Location:** Unit 11 (12,800 mi<sup>2</sup>)  
Wrangell Mountains

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

**Work Accomplished During the Project Segment Period:** We conducted fall sex and age composition counts in 1 count area (CA-11) in Unit 11 during 1997. We counted 111 moose at a rate of 29 moose per hour. The bull:cow ratio was 128 bulls:100 cows. Calves composed 4% of the moose counted. The observed density was 0.4 moose per  $\text{mi}^2$ .

Preliminary harvest figures indicate hunters killed 34 moose in Unit 11 during the 1997-98 season. Of these, nonresidents took 3 (9%) moose; overall hunter success was 30%. The average hunt lasted 8.0 days, a 22% decline (2.3 days) from time spent in the field during the 1996-97 season. The mean antler size in the harvest was 45.3 inches. Harvest chronology figures show the last week of the season accounted for 62% ( $n = 21$ ) of the harvest. In 1997 4-wheelers were the most frequently used transportation for moose hunters in Unit 11; highway vehicles were the next common transportation mode.

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 1997 indicated moose numbers remain low with an observed density of only 0.4 moose/ $\text{mi}^2$ . A more intensive Gasaway census conducted in 1993 by NPS personnel resulted in a slightly higher density estimate of 0.58 moose/ $\text{mi}^2$ . Differences in density estimates between years are attributed to survey methods rather than changes in moose numbers from 1993 to 1997. The bull:cow ratio increased 39%, rising from 92 to 128:100, mostly due to a decline in the number of cows observed; the number of bulls has been relatively stable for 4 years. The calf:cow ratio dropped 57% from 21:100 in 1996 to 9:100 in 1997. The reason for the decline in calves is unknown; calf numbers were higher in previous years. The moose-per-hour figure was virtually the same in 1997 as the previous year but remains well below the 40 moose-per-hour figure of the mid to late 1980s. Count data for the past 5 years fluctuate between years with no evident trend. We conclude the population has been relatively stable. However, we are concerned about the low calf crop in 1997.

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 17 days with season dates of 20 August-20 September. 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 keep the total harvest low. Harvest chronology figures for 1993 through 1997 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, and 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 27.7"

during the winter of 1997–98, 18% above the 1964–1997 average of 25.6 inches. Snow depths in the southern portions were much deeper with 22 inches in McCarthy, lasting through winter.

**Project Location:** Unit 13 (23,400 mi<sup>2</sup>)  
Nelchina Basin

**Project Objectives:** To increase the moose population to an estimated 20,000–25,000 animals with yearly sex and age ratios of 25–30 calves:100 cows, 25–30 total 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 9 count areas located throughout the unit. We counted 6206 moose at a rate of 56 moose per hour. The overall bull:cow ratio was 18 bulls:100 cows with 12 adult bulls:100 cows. Calves composed 14% of the herd.

Hunting season dates and bag limits remained unchanged from last year for the general state harvest ticket hunt, extending from 20 August–20 September 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, a Tier II state subsistence hunt was also held. The season length for this hunt was extended 4 days in 1997 with the season date 1–19 August; we issued 150 permits.

We use snow depths recorded at permanent sites throughout the unit to categorize the severity of winter. Historically, the average depth of readings for February, March and April are used for a winter severity index. To determine snow depths, we fly over the sites on or near the first day of the month and record the snow level on permanent markers. Winters in which the average snow depth is  $\geq 30$  are considered severe, when at or near the historic (1964–present) average (25.5), they are considered moderate, and when well below the historic average, winters are considered mild. Based on snow depths the winter of 1997–98 was mild to moderate in Unit 13. The unit severity index rating was 22.8, or 11% below the historic (1964–97) unit average of 25.5. Index ratings ranged from equal to the historic average in 13D to 20% below the historic average in 13C. Weather conditions have been favorable for calf overwinter survival during the last 3 winters, following 7 consecutive winters that were classified severe ( $\geq 30$ ), according to the department's winter severity index.

Preliminary harvest figures show hunters killed 937 moose in Unit 13 moose hunts during the 1997–98 season, a 9% decline compared to 1996 ( $n = 1027$ ). A breakdown of the moose harvest shows that 862 bulls and 7 cows were taken during the general state season, 25 bulls in the state Tier II hunt, while 43 bulls were taken under a federally regulated fall subsistence hunt held on federal land in Unit 13 for unit residents.

We discussed effects of land-use proposals 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. Composition data indicated this decline occurred in all sex and age classes. Fall composition count data show moose numbers increased slightly in 1997 for Unit 13 but are still well below numbers observed in the late 1980s. The bull:cow ratio has been relatively stable since 1994 and is well below both the 25–30 bulls:100 cows observed during the 1980s and the current management objective for bulls. The percent calves in the herd and calves:100 cows was down in 1997 and has been low in 3 of the last 4 years. Continued low calf recruitment will become a problem as a lack of young age classes among cows will mean a higher percentage of the cow base is in older age classes and more susceptible to overwinter mortality during a severe winter. Continued low calf recruitment will decrease availability of bulls for harvest.

The 1997–98 bull harvest in the general state harvest ticket hunt declined by 9% compared with last year's harvest of 951. In this hunt there were 5510 reported hunters for a success rate of 16%. Hunting pressure declined slightly (2%) from last year's but still remains quite high compared to that of the late 1980s. Hunter success has been 16% for 3 of the last 4 seasons and is the lowest ever observed. It appears the spike-fork 50-inch regulation has been unsuccessful in limiting the bull harvest to maintain management objectives for the bull:cow ratio while providing a liberal season length. High harvests coupled with low calf survival have caused a decline in the bull:cow ratio during this 5-year period under the spike-fork 50" regulation. Until calf survival results in increased bull recruitment, harvests should be reduced. To accomplish this I recommend: 1) shortening the season by 15 days with dates 1–15 September; 2) reducing the bag limit by eliminating fork-horn yearlings and making only spikes and 50-inch or 3 brow tine bulls legal; 3) Restricting participation on the road system by allowing hunters to hunt in only 1 roadside unit per year.

The 1997 fire season was uneventful in Unit 13 as no major fires occurred in the unit. The last large fire was in 1991 when 5500 acres burned in Unit 13D. Wildfire is the only feasible means of enhancing moose habitat in most of Unit 13.

**Project Location:** Unit 14A (2,560 mi<sup>2</sup>)  
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:** We attempted to complete fall surveys between 6–12 December but curtailed the survey when observations indicated early antler casting. We classified 774 moose, 161 of which were calves and 56 were bulls. We observed a fall composition of 30 calves and 14 bulls:100 cows or 21% calves. An early snowmelt prevented a spring composition survey. Despite the lack of survey results, winter conditions were mild and survival of calves was estimated as high.

We monitored hunter harvest which totaled 742 moose. A total of 3761 people reported hunting "spike-fork/50-inch" bulls in the 10–17 August, 20 August–20 September, and 20 November–15 December general seasons; 468 (12%) hunters were successful. Forty-four percent of the moose were spike- or fork-antlered bulls taken in the November–December general season. Of the 63 people hunting on any-bull drawing permits, 23 (37%) were successful. Of the 410 individuals hunting on drawing permits for antlerless moose, 292 hunters (71%) were successful. In the combined late season drawing permit hunts, the success rate was 77%.

We also monitored moose mortality unrelated to hunting. Between May 1997 and April 1998, trains killed a minimum of 16 moose, and between 1 September 1997 and 30 June 1998, automobiles killed a minimum of 171. The number of moose killed illegally is estimated to be between 30 and 55. Four moose were reported killed in defense of life or property (DLP).

**Progress Meeting Project Objectives:** Based on previous subpopulation estimates and recent mild winters, we assume the subpopulation size is commensurate with our objectives. Despite observations of a 14 bulls:100 cows ratio, we believe the true bull:cow ratio approached 20:100. Despite 841 moose killed by hunters during fall 1996 and 742 killed in 1997, only 461 were killed during fall 1995, which brought the average to 681 moose. The human-use objective, a 3-year average annual harvest, was short of the 750 moose objective. However, if we add salvaged road- and rail-killed moose, human use would exceed 800 moose.

**Project Location:** Unit 14B (2,150 mi<sup>2</sup>)  
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 infrequent snowfall and higher survey priorities in other areas.

We monitored harvest of moose during the general early and late hunts and the any-bull drawing hunts that totaled 74 bull moose. Examination of harvest reports indicates 471 hunters harvested 49 bulls (10% success) during the general season. Twelve of these were spike- or fork-antlered bulls taken during the late season. Of the 112 people hunting with any-bull drawing permits, 25 (22%) were successful. The 46% success rate was considerably higher for permittees hunting during the early November season.

Automobiles and trains each killed 14 moose, for a combined kill of 28. Unreported/illegal harvest probably reached 10–20 moose.

**Progress Meeting Project Objectives:** Our last survey was conducted during fall 1994 and at that time the moose subpopulation was near the objective level (although the confidence interval was large). The winters of 1995–96, 1996–97 and 1997–98 were very mild, so we assume the subpopulation has reached the objective. A stratified random census is overdue in this subunit to evaluate objectives and management strategies.

The human-use objective was not met. Although we expect harvest 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.

**Project Location:** Unit 14C (1,910 mi<sup>2</sup>)  
Anchorage area and the Placer and Portage river drainages

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

**Work Accomplished During the Project Segment Period:** Herd population size and composition for Unit 14C were determined by aerial surveys flown in late November and early December 1997. We observed 1083 moose. However, several drainages were not counted due to a limited budget or low priority due to no open hunting season. The ratios of bulls and calves per 100 cows were 44 and 30, respectively. Several late counts may have tallied many antlerless bulls as cows; therefore, actual ratios of bulls and calves per 100 cows are higher. The population, currently estimated at 2150 moose, is increasing.

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.

During 1997–98 hunters harvested 97 moose. Cows (23) composed 24% of the total harvest. All cows were killed during special permit hunts. Hunters took 74 bulls, of which 22 came from the general season and 52 from special permit hunts. Of bulls taken during the general season hunt, 6 were spike-forks, 9 were over 50 inches, and 4 had at least 3 brow tines (mean length = 39.7 inches, range 23–62 inches). Overall, hunters ( $n = 465$ ) were 21% successful. Hunters with drawing permits and general-season harvest tickets ( $n = 337$ ) were 29% successful, while those with Eklutna archery registration permits ( $n = 128$ ) had only 1% success. A large proportion of harvested moose (55%) were taken on either Fort Richardson or Elmendorf Air Force Base with an additional 20% taken in the Portage area hunts. Bowhunters took 57% and muzzleloaders none of the total harvest in primitive-weapon hunts. Seasons ran continuously in various parts of the unit from 20 August through 15 January, excluding only 16 November to 14 December. Vehicles killed 137 moose in the unit between 1 June 1997 and 31 May 1998. Six moose were shot in defense of life or property, and 1 moose was shot for a meat-care video during the same period. Trains killed an additional 10 moose in Unit 14C between 1 May 1997 and 30 April 1998.

**Progress Meeting Project Objectives:** Aerial surveys conducted during 1997 found an overall ratio of 44 bulls:100 cows, above the objective of 25 bulls:100 cows. The population appears to have rebounded from the high mortality caused by deep snow during the winter of 1994–95.



**Project Location:** Unit 15A (1,310 mi<sup>2</sup>)  
Northern Kenai Peninsula

**Project Objectives:** To maintain the 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 1997–98 was classified as normal for Kenai Peninsula with snow accumulation up to 24 inches. However, favorable survey conditions did not develop in most count areas until late winter, prohibiting a complete fall survey in Unit 15A. The Skilak Loop Wildlife Management Area (SLWMA) area, comprised of 2 count areas, was counted in 1997 and 175 moose were classified. Ratios for the Skilak Loop area were 34 calves:100 cows; 37 bulls:100 cows, and calves composed 20% of the observed moose. Seven of 13 count areas in Unit 15A were flown during the 1996 fall sex and age composition surveys, resulting in the following totals and ratios: 1467 moose classified; 39 calves:100 cows; 26 bulls:100 cows; and calves composed 24% of observed moose.

A preliminary total of 1331 hunters reported hunting Unit 15A during the August 10 to 17 archery and August 20 to September 20 general 1997 season, harvesting 191 moose. The harvest comprised 108 (61%) spike/fork antlered bulls, 68 (39%) bulls with an antler spread of 50 inches or greater, or possessing at least 3 brow tines on 1 antler ( $n = 176$ ), and 15 unspecified or illegal bulls. Thirty-six (19%) of these moose were killed during the early archery season.

The department received 598 applications for 20 permits to hunt spike/fork bulls in Skilak Loop. The season was September 21–30 for spike/fork bulls. Thirteen of the hunters that won a bull permit hunted and only 1 spike/fork bull was harvested.

Subsistence hunters harvested no moose during the August 10–19 season.

**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. Fall composition surveys were not completed over a large enough area in 1997 to determine subpopulation trends. Surveys completed in 1996 indicated the bull to cow ratio averaged 26:100, compared with 13:100 before the Selective Harvest Program.

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 and predation are the primary factors controlling moose density. On May 11, 1996 wildfire burned 5200 acres in the Hidden Lake area of Skilak Loop Special Management Area. 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. No natural or prescribed burns occurred during this reporting period.

The winter of 1997–98 was mild compared to previous winters in Unit 15A. Snow came late with accumulations of 24 inches or less over large portions of the unit. Mortality due to starvation was documented in 2 cases in 1997–98, compared to a recent high of 178 in 1994–95. Last winter highway vehicles killed 143 moose, primarily calves and adult cows. The moose

population in Unit 15A should have increased moderately due to normal winter conditions in 1997-98. The fall population is projected to be 3000 animals.

No change in the general season or bag limit is recommended for fall 1998. The selective harvest program has again gained support during the 1997 season and should protect midsized bulls that survived the winter.

An antlerless moose season should be reestablished and the current bull season closed in Skilak Loop to satisfy the requirements of the interagency cooperative management agreement.

**Project Location:** Unit 15B (1120 mi<sup>2</sup>)  
Central Kenai Peninsula

**Project Objectives:** To maintain the 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 mild weather in fall of 1997, no count areas were surveyed. The most recent sex and age composition surveys were conducted in 15B East in 1996. A total of 224 moose was classified in 15B West, resulting in ratios of 39 calves and 33 bulls per 100 cows. Calves composed 23 percent of the observed total.

Preliminary harvest reports indicate 337 hunters reported hunting in 15B West during the 20 August to 20 September 1997 season, resulting in the harvest of 67 bulls. Hunter success rate was 20%.

The bag limit for 15B West was 1 bull with a spike/fork or 50-inch antlers. The 1997 harvest comprised 38 (65%) spike/fork antlered bulls and 20 (35%) bulls with an antler spread of 50 inches or greater or possessing at least 3 brow tines on 1 antler. Nine successful hunters did not report the antler spread of the bull they harvested.

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 or at least 3 brow tines on 1 antler. From 1609 applications, staff issued 100 permits, resulting in the harvest of 24 bulls. The average antler spread was 53 inches and ranged from 39.5 to 67.0 inches. Successful hunters averaged 4 days hunting; on average hunters took 6 illegal and 6 legal bulls. The number of bulls observed by successful hunters ranged from 1 to 40.

Subsistence hunters reported taking 2 bulls during the August 10 to 19 season.

**Progress Meeting Project Objectives:** The Selective Harvest Program initiated in 1987 was designed, in part, to increase the bull to cow ratio. Since no areas were surveyed during 1997, an assessment of the unit's moose density 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 indicate moose are becoming more difficult to find and trophy-sized bulls are less common, compared to 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 of 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, 1995–96, and 1997–98 were mild or normal, allowing for normal calf and older bull survival.

In addition to reported harvest, highway vehicles killed 68 moose in 15B West. No moose were documented as winter mortality.

No change is recommended for Unit 15B for the 1998 season. We should continue the Selective Harvest (15B West) and Permit Drawing (15B East) programs, designed to protect the male segment of the population from overharvest after a severe winter.

**Project Location:** Unit 15C (2,440 mi<sup>2</sup>)  
Southern Kenai Peninsula

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

**Work Accomplished During the Project Segment Period:** The Homer count area (15C-CA26) was counted between snow storms in early December. We observed 394 moose, including 64 calves: 100 cows and 8.3 bulls: 100 cows. This was the highest calf cow ratio ever reported for this unit.

We attempted 1 partial survey of the Caribou hills in Unit 15C (CA21). We counted 483 moose in the alpine portion of this area. We canceled the rest of the survey because of poor weather and moose moving from the survey area. Bull:100 cow and calf:100 cow ratios were 51:100 and 31:100, respectively. There were 19 yearling bulls:100 cows, representing good overwinter survival during 1996–97.

The winter of 1997–98 was considered moderate with normal snow pack throughout most of the winter; however, early snowfall caused moose to migrate from postrut areas to their wintering areas earlier than usual. Heavy snow in late February and most of March further stressed animals. During winter, motor vehicles killed 84 moose. In the Homer area 51 moose died of starvation, and 5 moose were shot in defense of life or property. Additional winter mortality was reported for the Ninilchik and Seldovia areas. Survey results indicate the moose population (2500 animals) is stable to slightly increasing.

Preliminary harvest statistics indicated approximately 1396 people hunted in Unit 15C during the 20 August–20 September season and took 351 moose. This represented the highest bull harvest since 1969. The overall hunter success rate was 25%. We classified 225 (64%) moose in the

spike/fork category and 111 (32%) in the 50+ category. In addition, 15 moose had either illegal or unknown antler sizes. These statistics may change in the final harvest reports.

Two drawing permit hunts for antlerless moose were established for an area around the city of Homer in 1995. A total of 40 permittees were chosen from 735 applicants for these 2 hunts in 1997. Residents of the Kenai Peninsula composed 75% and 90% of the permittees for DM549 and DM550, respectively. Department personnel were not required to assist hunters this year; however, staff continued to monitor the hunt. Thirty four hunters reported hunting and 20 (59%) were successful.

**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 maintaining the current spike/fork-50 inch restriction to the bag limit. Any management changes to the general season in Unit 15C should match those of Unit 7 and the remainder of Unit 15 to avoid any shifts in hunting pressure.

The survey of the Homer area (15C-CA26) indicated the moose population declined slightly. The management objective of reducing this local subpopulation is slowly being met. We recommend continuation of the antlerless permit hunts until we achieve a postseason estimated population of 365 moose. During the spring 1997 Board of Game meeting, the BOG changed the season dates for DM549 and DM550 to 1 November through 15 November and 16 November through 30 November, respectively.

Increased logging activities in Unit 15C to combat spruce bark beetles (*Dendroctonus rufipennis*) may provide increased visibility and access to moose hunters. Approximately 25,000 acres were scheduled for timber sale in 1997-98, including large parcels near the communities of Port Graham and Nanwalek. Habitat quality may be affected when overstory is removed. We need to continue monitoring effects of logging on moose on the Kenai Peninsula.

**Project Location:** Unit 16A (1,850 mi<sup>2</sup>)  
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 20-25 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:** We conducted a "Becker" composition survey during 19-24 November and observed 1234 moose. These observations produced an estimated  $3636 \pm 614$  moose in the subpopulation. We also calculated a composition of 33 bulls and 35 calves:100 cows.

Total harvest was 197 bulls. Examination of harvest reports indicates 767 hunters harvested 141 bulls (18% success) during the 58-day (August 20–September 20 and 20 November–15 December) general seasons. Hunters reported taking 33 moose during the November 20–December 15 spike-fork hunt. Of the 172 individuals hunting with any-bull drawing permits, 56 (33%) were successful.

During the report period an additional 6 moose were reported killed in collisions with autos. This figure is a minimum number.

**Progress Meeting Project Objectives:** The subpopulation seems well above the desired objective for the bull:cow ratio. Harvest is well below the objective, primarily due to difficult access in many parts of the subunit and the spike-fork/50-inch selective harvest strategy.

**Project Location:** Unit 16B (10,400 mi<sup>2</sup>)  
West side of Cook Inlet

**Project Objectives:** To achieve a fall population of 3500–4000 moose by 1995 with a posthunt sex ratio of 20–25 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:** We conducted a “Becker” composition survey during 19–24 November and observed 1234 moose. These observations produced an estimated  $3636 \pm 614$  moose in the subpopulation. We also calculated a composition of 33 bulls and 35 calves: 100 cows.

Total harvest was 197 bulls. Examination of harvest reports indicates 767 hunters harvested 141 bulls (18% success) during the 58-day (August 20–September 20 and 20 November–15 December) general seasons. Thirty-three moose were reported taken during the November 20–December 15 spike-fork hunt. Of the 172 individuals hunting with any bull drawing permits, 56 (33%) were successful.

During the report period an additional 6 moose were reported killed in collisions with autos. This figure is a minimum number.

**Progress Meeting Project Objectives:** The subpopulation has reached the management objective with a bull:cow ratio well above the objective. 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.

**Project Location:** Unit 17 (18,780 mi<sup>2</sup>)  
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<sup>2</sup> on habitat considered good moose range in Unit 17B.
- To maintain a minimum density of 0.5 moose/mi<sup>2</sup> in areas considered moose habitat in Unit 17C.

**Work Accomplished During the Project Segment Period:** A cursory survey in the upper and middle Togiak drainages (17A) was flown on December 1, 1997. We observed 83 moose in 3.8 hours of flight time. We conducted another survey in 17A in January 1998 in which we observed 436 moose.

A survey in the Mosquito, Stuyahok, and Mulchatna drainages of the Nushagak River (17B) was flown on January 23, 1998. We observed 782 moose in 3.0 hours of survey time. A minimum estimate of calves in the moose observed was 19.4%.

A survey in the upper Nushagak River area (Big Bend to Koliganek; 17A) was flown on February 5, 1998. We observed 882 moose in 2.4 hours of survey time. A minimum estimate of calves in the moose observed was 24.9%.

A survey in the lower Nushagak River area (Mulchatna River to Iowithla River; 17C) was flown on February 20, 1998. We observed 480 moose in 2.7 hours of survey time. A minimum estimate of calves in the moose observed was 22.3%.

We monitored fall harvest by personal interviews and analysis of harvest ticket returns. Data from harvest tickets returned by June 1998 indicated 452 hunters killed 157 bulls during the 1997–98 general season. No moose were harvested in 17A, 126 were harvested in 17B, and 27 in 17C. Four were harvested in unspecified areas of Unit 17. Hunter success was 27% (14/52) for local residents, 30% (39/129) for other Alaska residents, and 38% (100/261) for nonresidents. Four of the 10 hunters who did not report residency were successful. Aircraft provided the most common mode of transportation (66%). Of the moose harvested, 81% had antlers 50" or larger.

Harvest data from registration hunt RM583 indicated 420 of 530 permittees hunted and harvested 148 bulls during the August 20 through September 15, 1997 season. Thirty-nine moose were harvested in 17B, and 84 were taken in 17C. Twenty-five bulls were harvested in unspecified areas of Unit 17. Hunter success among responding permittees who reported hunting was 36% for local residents (121/338) and 33% for other Alaska residents (27/81). Nonresidents were not eligible to participate in this hunt. Boats were the most common means of transportation (80%). Eighty-three (56%) moose were killed in August, and 65 (44%) were taken in September. Forty-six (31%) of the moose harvested had antlers 50" or larger.

Harvest data from registration hunt RM585 indicated that 65 of 99 permittees hunted and harvested 34 bulls during the December 1–31, 1997 season. Two moose were reported harvested in 17B and 21 in 17C. Eleven moose were harvested in unspecified areas of Unit 17. Hunter success among responding permittees who reported hunting was 55% for local residents (28/51) and 46% for other Alaska residents (6/13). Nonresidents were not eligible to participate in this hunt. Snowmachines were the most common means of transportation.

Harvest data from registration hunt RM573 indicated that 39 of 44 permittees hunted and harvested 15 bulls during the August 20 through September 15, 1997 hunt in 17A. All hunters obtaining registration permits for this hunt were Unit 17 residents. Boats were the most common means of transportation (97%).

The reported harvest of moose for Unit 17 for all hunts combined was 354 bulls. Unit 17 residents took 178 bulls (59%), other Alaska residents took 72 (20%), nonresidents took 100 (28%), and 4 bulls were taken by hunters who didn't specify residency.

**Progress Meeting Project Objectives:** The winter of 1997-98 saw record snowfall in the Bristol Bay region. Though many areas had extreme snow depths, overall survival appeared high, with few reports of winter-killed moose. Moose populations were stable to increasing in most portions of the unit, in spite of increasing harvests by hunters and predators.

Continued work with local advisory committees and staff from the Togiak National Wildlife Refuge on moose management guidelines changed our management objective for 17A. It is now our intent to manage the area to establish and maintain a population of 600-1000 moose. Based on the January 1998 survey in the Togiak drainage, the number of moose in Unit 17A is at least 400 to 500. During the March 1997 meeting of the Board of Game, a registration moose hunt was authorized for 17A, and permits were issued in Togiak. The August 20 through September 15, 1998 season was the first legal moose hunting in 17A in 17 years.

Efforts continue to develop moose survey and population estimation protocols that will work in 17B and 17C, despite variable weather conditions and unpredictable moose movements.

**Segment Period Project Costs:**

	<u>Personnel</u>	<u>Operating</u>	<u>Total</u>
Planned	236.0	76.9	312.9
Actual	236.0	76.9	312.9
Difference	0.0	0.0	0.0

**Submitted by:**

Michael G. McDonald

Assistant Management Coordinator

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

**Project Location:** Unit 12 (9,980 mi<sup>2</sup>)  
Upper Tanana and White River drainages

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

1. Conduct fall sex and age composition counts in selected trend count areas.
2. Conduct a population estimation survey in northwestern Unit 12 every 3 years.
3. Monitor hunting pressure and review harvest report data.
4. Periodically conduct browse surveys to evaluate winter range condition.

**Work Accomplished During the Project Segment Period:** Between 28 and 30 October 1997, moose numbers and density in northwestern Unit 12 were estimated to be  $1401 \pm 21\%$  (90% CI), with a density of 1.1 moose/mi<sup>2</sup>. We used standard Gasaway techniques, with the exception of stratification of most of the area based on count data collected during previous surveys. During the early 1990s, bull numbers declined due to harvest and poor yearling recruitment within the more accessible areas in the Alaska Range and Tok River drainage. Calf recruitment to 5-months was in the high 20s to low 30s since 1993, but yearling bull recruitment was low (5–9:100 cows). Since few bulls were recruited annually, harvest had a greater additive effect on the bull population. Bull:cow ratios were 20–25:100.

We also conducted 4 standard contour counts (sex and age composition) in southcentral Unit 12 along the north face of the Nutzotin Mt. between the Nabesna River and the Yukon border. The combined calf, yearling bull, and bull:100 cow ratios were 31:100, 22:100, and 87:100, respectively. Calf survival was 36:100 in 1996. The 1997 yearling bull:100 cow ratio exceeded the 5-year average of 11:100 but was comparable to ratios found between 1987 and 1991 (21:100).

We conducted a traditional knowledge workshop in Northway on 29 and 30 October in cooperation with Northway Village, White River First Nation, and Yukon Department of Renewable Resources. About 10 elders from each village attended and described historic moose distribution, movement patterns, harvest areas, and practices. The areas were mapped and oral history recorded and given to the village councils. The information will be used to draft future management direction and to possibly design moose surveys. We used the information in drafting a proposal to lengthen the spike-fork bull season. The Board of Game adopted the proposal in March 1998.

Based on data collected during annual moose contour surveys and 4 area-specific censuses (1989, 1990, 1994, and 1997), the moose population in Unit 12 increased slowly from 1982 until 1989 and then remained relatively stable until 1993. Since 1993 calf and adult survival have



improved and the population has grown slowly. Bull numbers declined in the more accessible areas of the unit but stabilized during the past 2 years. Population objectives were met throughout the unit.

The 1997–1998 preliminary moose harvest was 120 bulls with a 25% hunter success rate. Harvest and success rates were 123 and 25%, respectively, in 1996. These were the highest reported harvests in over 12 years and exceeded the 10 year average by 28 bulls. During the past 8 years, hunter success rate in Unit 12 ranged between 15% and 27% and averaged 23%. About 500 hunters reported hunting moose in Unit 12 in 1997. Hunter participation has increased since 1992 due to increased participation and better reporting by local residents. The area's human population grew slightly due to recent logging and road construction projects, and many of the newcomers participated in area hunts. The greatest harvest occurred along the Tok and Tanana Rivers. In addition, the number of moose harvested for funeral and memorial potlatches increased during the past 5 years. Reporting was poor, but I estimated 15–40 moose, primarily cows, were taken each year.

Browse transects were not completed during this report period due to conflicts with other field activities. We completed a 250 acre browse crushing project within the Tok River drainage, and in cooperation with state forestry developed a logging plan for the Tok River valley. The plan included forest regeneration techniques designed to maximize growth of quality moose browse species following a 1000-acre logging operation. This program will be implemented in winter 1998.

**Progress Meeting Project Objectives:** Objectives for bull:cow ratios were met over the entire unit. However, along the north side of the Alaska Range and in the upper Tok River, the bull population declined to near the population minimum due to harvest. If the trend continues, harvest or access restrictions will be necessary. The bull:cow ratio in the remote areas of Unit 12 exceeded 70:100. Moose numbers near communities were low due to poaching and high harvests of cow moose for potlatches. Poaching declined the past 4 years due to efforts of the local Fish and Wildlife Protection officer. In the remainder of the unit, predation on 5–12-month-old calves was the primary factor limiting the population. Due to land ownership patterns and the loss of same-day-airborne wolf hunting, wolf and grizzly bear populations are expected to remain at current levels and continue to limit the unit's moose population at low density (0.2–1.0 moose/mi<sup>2</sup>).

During 1998–1999, techniques to enhance moose habitat following logging will be implemented. This project will last for 2–3 years and will affect 1000 acres within the Tok River drainage.

**Project Location:** Units 19, 21A and 21E (59,756 mi<sup>2</sup>)  
Kuskokwim River drainages, Middle Yukon River, and Nowitna River

**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 unit 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:** During July and August 1997 moose surveys were flown in Unit 19D east. The objective was to estimate calf survival throughout the summer. Sample sizes, on a per day basis, were small (<45 total moose). However, percent calf and percent twin calves observed indicated the population was doing better. Fall surveys were conducted in 7 trend areas including: Wilson's slough, Candle ridge, Katlitna Burn, Farewell, Holitna, Windy-Ping, and the North Fork of the Innoko River. Calf:cow and bull:cow ratios indicated healthy populations. A Gasaway survey was conducted during March 1998 in parts of the Holitna and Hohlitna Rivers. We surveyed 1733 mi<sup>2</sup> and estimated 2180 ( $\pm$  14%) moose. Preliminary harvest ticket data indicated harvests in Units 19, 21E, and 21A were 502, 182 and 105, respectively.

One major wildland fire burned in the area in June 1998. It consumed 21,800 acres and was located between the Slow and North Forks of the Kuskokwim River. DNR worked to protect cabins but did not otherwise suppress the fire. Large areas of black spruce were burned, which should enhance moose browse in the area.

**Progress Meeting Project Objectives:** We met our objective of developing population estimates. We must continue our efforts to survey areas not surveyed in the last decade. We also met our objective of yearly assessment of trend areas in the heavily hunted portions of the unit. Based on preliminary data, we are meeting our harvest objectives for Units 19 and 21E. However, we did not meet our harvest objective of 150 moose in Unit 21A. When all harvest records are counted, this objective may also be achieved. We met our objective of encouraging agencies to let wildland fires burn whenever possible to promote regeneration of moose browse.

**Project Location:** Unit 20A (6,796 mi<sup>2</sup>)  
Tanana Flats, Central Alaska Range

**Project Objectives and Activities:**

1. Manage for a November adult population (i.e., excluding calves) of 10,000–12,000 adult moose.

- 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.
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.
    - Monitor composition of the moose population in those areas in November.
  3. Allow appropriate harvests of cow moose when the population is above the population objective of 10,000 adult moose.

**Work Accomplished During the Project Segment Period:** We estimated twinning rates by conducting aerial surveys on the Tanana Flats during May 1996 and 1997. We estimated the peak of calving by monitoring parturition dates of radiocollared cow moose and conducted twinning surveys accordingly. We conducted 2-3 surveys, spaced 2 days apart, each spring.

We estimated population size and composition during late October and early November in 1996 and 1997. The 1997 survey consisted of a reduced effort monitoring plan that will be attempted every year. This method should provide adequate composition information and a low-precision estimate of population size.

Using hunter reports, we estimated the number, timing, spatial distribution, hunter effort, transportation mode, and antler characteristics of moose taken during general and drawing permit hunts. We issued 300 antlerless permits.

**Progress Meeting Project Objectives:** We completed all surveys scheduled for 1996 and 1997. We implemented an antlerless hunt consistent with management objectives. We are continuing to meet our objectives for bull:cow ratios. 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-inch or 4 brow tines to spike-fork or 50-inch or 3 brow tines. The Board also approved a November drawing permit hunt for muzzleloading rifles in the Wood River Controlled Use Area.

We recommend no changes in objectives for 1999. However, we expect to surpass our objective of maintaining 10,000-12,000 adult moose. The limited hunt for cow moose (300 permits) probably will not stabilize the population.

**Project Location:** Unit 20B (9,114 mi<sup>2</sup>)  
Drainages into the north bank of the central Tanana River

#### **Project Objectives and Activities:**

1. Manage for a population of 10,000 adult moose, with 4000 in Unit 20B West, and 6000 distributed over Units 20B Central and East.

- Complete population and/or composition surveys in Unit 20B in November.
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 archery hunts with drawing permit hunts for antlerless moose when appropriate.
    - c. Limit the moose hunting opportunity in Minto Flats to Tier II hunters and allow for general hunts when possible.
  4. Minimize human–moose conflicts near Fairbanks, while accommodating moose viewing.

**Work Accomplished During the Project Segment Period:** We estimated twinning rates on the Minto Flats Management Area (MFMA) during May 1996 and 1997. We estimated the peak of calving by monitoring parturition dates of radiocollared cow moose in Unit 20A, and then we conducted twinning surveys in Unit 20B accordingly. We conducted 1 survey each spring.

We estimated population size and composition in the MFMA during late October and early November in 1996 and 1997. The 1997 survey was a reduced effort monitoring plan that will be attempted every year. This method should provide adequate composition information and a low-precision estimate of population size.

Using hunter reports, we estimated the number, timing, spatial distribution, hunter effort, transportation mode, and antler characteristics of moose taken during general and drawing permit hunts.

**Progress Meeting Project Objectives:** Because of the lack of recent moose population surveys in 20B East and West, we cannot adequately evaluate our population objectives, other than for the MFMA. However, the trend observed in harvests and survey results from the MFMA indicate we are making progress. Results from November 1994 surveys in central Unit 20B should be supplemented with additional surveys.

We exceeded our harvest objectives for 300–400 bulls in 8 of the last 9 years. However, we do not plan to reevaluate harvest objectives until we have better information on composition and population objectives.

We 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. We also increased the number of antlerless permits distributed in the MFMA.

**Project Location:** Units 20C, 20F and 25C (23,318 mi<sup>2</sup>)  
Drainages into the south bank of the Tanana River west of the Nenana river, the west bank of the Nenana River, and the south bank of the Yukon River

**Project Objectives and Activities:**

1. Estimate hunting mortality and document nonhunting mortality when possible.
2. Estimate moose densities in Units 20C, 20F, and 25C by 2000.
  - a. Cooperate with BLM to superstratify approximately 1000 mi<sup>2</sup> in central Unit 25C in November 1997.
3. Promote moose habitat enhancement by allowing natural fires to alter vegetation.
4. Establish moose population objectives for Units 20C, 20F, and 25C by 2000.
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:** Using harvest reports, we estimated the number, timing, spatial distribution, hunter effort, transportation mode, and antler characteristics of moose taken by hunters. We estimated moose population size and composition in Unit 25C by conducting extensive aerial surveys in cooperation with BLM in November 1998. We discussed population and harvest objectives with local advisory committees and the Board of Game.

**Progress Meeting Project Objectives:** We met our objectives for monitoring harvest and for providing sustained yields. We also made progress determining population size and harvest objectives. We worked beyond our objectives for estimating moose in Unit 25C by obtaining more detailed information.

**Project Location:** Unit 20D (5,633 mi<sup>2</sup>)  
Central Tanana Valley near Delta Junction

**Project Objectives and Activities:** Increase the fall moose population to 8,000–10,000 moose, with a sustainable harvest of 240–500 moose by the year 2002.

**Work Accomplished During the Project Segment Period:** We conducted a population survey in northeastern Unit 20D during November 1997. We estimated 883 moose ( $\pm 31.6\%$ ) were present, with 32 bulls:100 cows, 18 calves:100 cows, 6 yearling bulls:100 cows, and a mean density of 0.6 moose/mi<sup>2</sup>. A public meeting was held to review hunting regulations and regulation proposals before the March 1997 meeting of the Board of Game.

Preliminary 1997 harvest was analyzed for the unit. Reported total harvest was 210 moose during the 1997–1998 hunting season. During the general hunting season, 683 hunters killed 202 moose. Drawing permit hunt DM790 in the Delta Management Area resulted in 8 moose killed by 8 hunters. No moose were killed during subsistence hunt TM787.

**Progress Meeting Project Objectives:** We conducted a population estimation survey in northeastern Unit 20D to contribute to an overall unit population estimate and determine compliance with herd size goals. Herd density and composition ratios were also calculated from survey data. Harvest data was analyzed. The moose population was below the population and harvest objective. The Unit 20D Wolf Control Implementation Plan, intended to improve ungulate calf survival and help achieve moose population size objectives, was not implemented during this reporting period. No regulatory changes are recommended at this time.

**Project Location:** Unit 20E (10,681 mi<sup>2</sup>)  
Charley, Fortymile, and Ladue River drainages

**Project Objectives and Activities:** Maintain a posthunting bull:cow ratio of at least 40 bulls:100 cows in all areas.

1. Conduct periodic population estimate surveys in portions of Unit 20E.
2. Conduct browse transect surveys to ensure habitat is capable of sustaining increasing moose densities.
3. Conduct annual composition and trend count surveys within traditional count areas.

**Work Accomplished During the Project Segment Period:** During November 1997 we completed 6 contour surveys in eastern and central Unit 20E. The combined calf, yearling bull, and bull:100 cow ratios were 26:100, 14:100, and 61:100, respectively. Calf and yearling bull:100 cow ratios were 27 and 6–10:100, respectively, in 1996. No population estimation surveys were conducted in Unit 20E in 1997. By extrapolating population estimation survey data, the 1997 Unit 20E population estimate was 5700–6000 moose (0.57–0.6 moose/mi<sup>2</sup>). We will survey the Mosquito Flats Study Area in 1998. We will also try a new technique developed by our staff biometrician that will allow us to estimate population size for a much larger area of Unit 20E and 12. We will survey the Mosquito Flats, the Ladue River, and the Tok River study areas.

We did not conduct browse surveys in Unit 20E this year due to conflicts with other fieldwork. We got approval for a prescribed burn to enhance up to 40,000 acres of moose habitat in the east-central portion of the unit. The fire is scheduled for summer 1998.

Preliminary harvest data indicated 462 hunters harvested 142 bull moose (31% success). The average annual hunter participation rate and harvest during the previous 5 years was 448 hunters and 124 bull moose, respectively. The average success rate was 28%. The number of hunters and moose harvested increased over the past 5 years. Higher harvest probably occurred because 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 brought hunters into the area, and 3) Hunters found several little known moose concentration areas and hunted these areas intensely. The effect of increased harvest was a decline in bull:cow ratios in the most popular area.

Most of the new hunters in the area are from southcentral Alaska, and they now represent 31–36% of the moose hunters in Unit 20E. Historically, most nonlocal resident hunters were from either Southeast or Interior Alaska. Along with the geographic change in hunter composition, transportation mode to access the area has also changed. More hunters used 4-wheelers during the past 3 years than during the previous 3 years.

**Progress Meeting Project Objectives:** Survey results since 1992 indicated the moose population in northern, central, and western Unit 20E was relatively stable at low-density (0.2–0.6 moose/mi<sup>2</sup>). The population density in the eastern portion of the unit ranged between 0.8 and 1.3 moose/mi<sup>2</sup> and, based on calf recruitment the past 2 years, it was beginning to stabilize. Overall, the moose population in Unit 20E remained at low-density (0.5–0.6 moose/mi<sup>2</sup>). Past and ongoing research demonstrated that wolf and bear predation was the primary limiting factor, with hunting and habitat quality having little effect. The combination of wolf and bear predation took about 28% of the postcalving moose population annually. 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. In an attempt to reduce effects of predation on the area's moose population, grizzly bear hunting regulations were liberalized in 1981. Bear numbers were reduced an estimated 38% in a portion of the unit. Calf survival increased during this period, but the effects of lower grizzly numbers on the increase in relation to environmental conditions, wolf numbers, and habitat are not known. In the western portion of the unit, nonlethal wolf control was implemented in fall 1997 to benefit the Fortymile caribou herd. Within the treatment area, wolf numbers will be reduced 60–80%. We will monitor the moose population in the treatment and control areas to determine effects of the program and to learn more about effects of compensatory wolf predation on moose calf survival in an area where harvest has reduced the grizzly bear population.

The bull:cow ratio in Unit 20E was above the management objective. In areas that receive the most hunting pressure, the bull:cow ratio declined and in one of the most popular hunting areas was near the population minimum.

**Project Location:** Unit 21B (4,871 mi<sup>2</sup>)  
Lower Nowitna River and Yukon River between the Molozitna and Tozitna rivers

**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.

- Conduct annual trend area surveys.
- 2. Maintain an average annual harvest of 40 moose from the desired population of 1000–1600 moose.
  - Monitor harvest with harvest reports and checkstations.

*Remainder of the Nowitna Drainage*

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

*Remainder of Unit 21B*

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

**Work Accomplished During the Project Segment Period:** No fall moose composition surveys were flown in Unit 21B. Moose harvest data were not available for most of Unit 21B. Data from a registration permit hunt in the Nowitna River drainage indicated 100 hunters took 35 bull moose. ADF&G staff operated a moose hunter checkstation at the mouth of the Nowitna, where stopping to register for the permit hunt was mandatory.

**Progress Meeting Project Objectives:** The moose population within the Nowitna drainage was at the low end of the population objectives. The drainage provided an annual harvest of about 40 bulls. The major sources of calf mortality were unknown.

**Project Location:** Unit 21C (3,761 mi<sup>2</sup>)  
 Dulbi River above Cottonwood Creek and Melozitna River above Grayling Creek

**Project Objectives and Activities:**

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.
  - 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:** No moose surveys were conducted during this reporting period. Preliminary analysis of moose harvest reports indicated 52 hunters took 40 moose. In 1996, 27 hunters took 12 moose.

**Progress Meeting Project Objectives:** Population objectives were probably achieved.

**Project Location:** Unit 21D (12,113 mi<sup>2</sup>)  
Yukon River from Blackburn to Ruby and Koyukuk River drainage below Dulbi Slough

**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.
  - 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.
  - Monitor harvest with harvest reports and check stations.
4. Develop guidelines for maximum winter browse use within the Three-day Slough area.
  - 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.
  - 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.
  - Conduct annual trend area surveys.

7. Develop a population level and density estimate by 1996 for the remainder of the unit, including the Yuki and Nulato rivers.
  - 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 checkstation at Ella's cabin.

**Work Accomplished During the Project Segment Period:** Within the Three-day Slough trend count area, the observed density of moose was 8.7 per square mile. The bull:cow ratio was 20:100, the lowest ratio since 1981. The calf:cow ratio was 24:100, and the yearling percent in the herd was 12.8%. In the Kaiyuh Slough trend count area, the observed density of moose was 2.3 moose per square mile, the bull:cow ratio was 35:100, the calf:cow ratio was 39:100, and the yearling percent in the herd was 16.4%.

Moose harvest statistics for all of Unit 21D were not available at report preparation time. However, 524 hunters that moved through a mandatory checkstation on the lower Koyukuk River reported taking 306 moose in a registration permit hunt. Harvest has been slowly increasing within the unit with most of the harvest coming from the Koyukuk River.

**Progress Meeting Project Objectives:** The moose population was at or above the population management objective in most of Unit 21D; however, the bull:cow ratio in the Three Day Slough trend count area was below management objectives for the third year in a row. We did no population estimates for the Gisasa, Melozitna, Yuki, and Nulato rivers.

**Project Location:** Unit 24 (26,055 mi<sup>2</sup>)  
Koyukuk River drainage above the Dulbi River

#### **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.

- Conduct annual trend area surveys.
5. Determine harvest.
- Monitor harvest with harvest reports and checkstations.

**Work Accomplished During the Project Segment Period:** Within the Batza Slough trend count area, the observed density was 1.6 moose per square mile. The bull:cow ratio was 51:100, the calf:cow ratio was 21:100, and the yearling percent in the herd was 1%. Within the Matthews Slough trend count area, the observed density was 0.4 moose per square mile. The bull:cow ratio was 60:100, and the yearling percent in the herd was 4%.

Moose harvest statistics for Unit 24 were not available at report preparation time. ADF&G staff operated a mandatory moose hunter checkstation on the Koyukuk River.

**Progress Meeting Project Objectives:** In southern and northern Unit 24, the moose population was at or above the management objective. Predation and illegal harvest have kept the population low, but recent fires and caribou that were available as alternate prey helped the moose population recover in the central part of the unit.

**Project Location:** Units 25A, 25B, and 25D (48,000 mi<sup>2</sup>)  
Upper Yukon River Valley

### **Project Objectives and Activities:**

#### *Unit 25*

1. Continue efforts to communicate with and educate local residents about moose management.
2. In cooperation with U.S. Fish and Wildlife Service (FWS), monitor moose population status as funding permits.

#### *Unit 25A*

1. Evaluate possible effects of increasing moose hunting on major drainages along the Brooks Range.
2. Educate local residents regarding the importance of not taking cow moose.
3. Cooperate with FWS 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 FWS, 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 November 1997. This resulted in an estimate of 625 moose in 1530 mi<sup>2</sup>. Calf survival was unusually low, probably resulting from a flood in the Black River area in June 1997. In addition, FWS initiated a 3-year study of calf mortality in Unit 25D west in March 1998. ADF&G contributed 2 days of aerial monitoring to detect calf mortalities during late May. We discussed the status of the Unit 25D moose population and potential benefits of local involvement in developing a moose management plan with the Yukon Flats Advisory Committee and local community governments. There are local concerns about the future of the moose population, and some positive interest in taking steps to maintain or enhance moose numbers. Weather and logistic limitations 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 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, except that surveys in Unit 25A were not completed due to weather and funding did not allow surveys in Unit 25B.

**Project Location:** Units 26B and 26C (25,800 mi<sup>2</sup>)  
North Slope of the Brooks Range and Arctic Coastal Plain east of the  
Itkillik River

#### **Project Objectives and Activities:**

1. Conduct trend count surveys with the U.S. Fish and Wildlife Service (FWS) 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 1996. These surveys showed the decline in moose numbers have continued. Only 97 moose were counted, compared to 145 in 1996. However, a composition survey in April 1998 showed that overwinter calf survival improved.

Radiotelemetry studies were conducted in the southern portions of Units 26B and 26C beginning in March 1995 when moose were radiocollared by FWS on winter range in the Kongakut and Firth drainages. This study is continuing and has yielded interesting results regarding migration patterns.

Harvest data are being compiled and analyzed. Because 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 meeting objectives. We monitored population status and habitat conditions. However, objectives relating to hunter success cannot be met in view of the dramatic decline in moose numbers during the last few years and the 1996 season closure.

**Segment Period Project Costs:**

	<u>Personnel</u>	<u>Operating</u>	<u>Total</u>
Planned	182.6	83.1	265.7
Actual	79.0	61.9	140.9
Difference	103.6	21.2	124.8

*Explanation:* During the last 7 months of this report period, Region III staff initiated a new time accounting procedure. In December 1997, staff began recording time spent on specific federal aid projects. Previously, staff had recorded only total time that was then prorated to either federal aid or nonfederal aid time, according to a fixed percentage that varied among staff positions. Therefore, the "Actual" expenditures for "Personnel" in this report are estimates derived from 7 months of specific project time, extrapolated to 12 months. The new procedure unavoidably resulted in what appear to be substantial discrepancies between "Planned" and "Actual" personnel expenditures for most of the FY98 federal aid projects. However, most "discrepancies" are not real, and the explanation and justification are presented in the explanation section of each project report. This is a transitional circumstance and, unlike this year, the FY99 performance reports will reflect accounting for 12 months of actual project time.

*Personnel:* The gross underestimate of personnel expenditures is the result of the seasonality of moose survey and inventory work. Most of this work occurs during the first 5 months of the fiscal year, the period preceding the implementation of the new time accounting procedures. Relatively little moose work occurred between December and June, the period upon which the extrapolation was based.

*Operating:* The operating allocation was actually 67.6, a budgetary decision made after the Work Plan was submitted. The underexpenditure of funds reflects our not surveying Unit 26B in spring because of poor weather.

**Submitted by:**

Roy A. Nowlin  
Regional Management Assistant

David D. James  
Management Coordinator

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

**Project Location:** Unit 18 (42,000 mi<sup>2</sup>)  
Yukon-Kuskokwim Delta

**Project Objectives:**

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:100 cows.
  - a. Conduct fall sex and age composition surveys and winter recruitment surveys of the Yukon 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, addressing the population goal of 3000 moose 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:** A moose population census was completed in January 1998 in the Paimiut count area in the eastern third of the Yukon River drainage in Unit 18. The population was estimated at 2024.1 moose  $\pm$  13% at 95% CI. This is higher than the last estimate but is still about 1000 moose short of the population objective for this area.

An unsystematic survey flight was made over the western third of the Yukon River in March in response to a request from the Lower Yukon Advisory Committee. Fifty-four moose were observed in nearly 4 hrs of flying. This measure has little statistical merit, however, since only 65 moose were found during the previous census in almost 39 hours of flying. There are probably more moose in this area now than there were in 1994.

We operated 2 moose checkstations during this period. The Yukon River station at Paimiut checked 67 moose and 244 visitors. The Kuskokwim River station near Kalskag had 39 moose and 13 caribou checked by department staff. The number of hunters visiting the checkstation is not available.

An emergency order was used to open a 10-day moose season from December 27, 1997 through January 5, 1998. These dates were determined after contacting the various villages and establishing a preference.

A total of 127 moose were reported harvested in 1997–1998. No moose were reported taken during the late season opened by emergency order.

**Progress Meeting Project Objectives:** We are achieving improved harvest reporting and compliance with regulations through radio and newspaper announcements, law enforcement activities, community meetings, and hunter contacts at the Paimiut checkstation on the Yukon River, the newly initiated checkstation on the Kuskokwim River south of Lower Kalskag.

Surveys reveal that although the moose population is below its potential, it is beginning to grow in the Yukon River drainage. There is no indication the moose population on the Kuskokwim River is growing.

**Project Location:** Unit 22 (25,230 mi<sup>2</sup>)  
Seward Peninsula and eastern Norton Sound

**Project Objectives:** The overall population management objective is to maintain a minimum population of 5700–7300 moose in Unit 22. In Unit 22A the objective is to increase population size from the current estimate of 600–800 moose to a minimum of 1000 moose. In Units 22B and 22D, the objective is to stabilize the population at 1500–2500 and 2500–3000 moose, respectively, with a minimum bull:cow ratio of 30:100. In Unit 22C, the objective is to maintain the existing population of 480 animals 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:**

*Harvest monitoring.* The reported harvest from Unit 22 was 203 moose (197 males and 6 females). The reported harvest by subunit was 22A – 22; 22B – 72; 22C – 27; 22D – 65; 22E – 16; and unknown – 1. Of the 423 individuals who reported hunting in Unit 22, 339 (80%) were residents of Alaska, 280 (66%) were residents of Unit 22, 37 (9%) were nonresidents and 47 (11%) were of unknown residency. Hunter success rate was 48%.

*Age determination.* We collected incisorform teeth from 61 hunter-killed moose to age and examine the condition of teeth. Seward Peninsula moose have an unusually high incidence of tooth breakage.

*Population monitoring.* Poor flying weather occurred much of the reporting period. The winter of 1997–1998 was mild with little snowfall until April. Observations by staff and the public indicate yearling recruitment was high this spring, and we observed an abundance of calves, including twin calves, in early June.

*Radiotelemetry studies.* Work continued on the moose telemetry study initiated in 1995 in the western part of Unit 22B to investigate low recruitment rates 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 the remainder of the year. Twenty-six of 36 cows radiocollared in the Niukluk and Fish River drainages during early April of 1995 and 1996 were alive and being monitored as of June 1998. Preliminary results of this research study are discussed in the 1998 Moose Management Report.

*Public interactions.* Staff attended Regional Advisory Committee meetings, Federal Advisory Council meetings and public meetings in various Unit 22 villages to discuss wildlife issues and regulations with the public. Public comments indicate general satisfaction with the status of moose and current moose regulations in Unit 22. Considerable time was devoted to answering questions from the public, writing articles, mailing information and regulatory materials, and assisting license vendors.

The antlerless moose season remained closed in Unit 22B west of the Fish River and in the Kougarok, Kuzitrin, and Pilgrim River drainages in Unit 22D to facilitate population recovery. The antlerless moose season is open 1–31 December in the remainder of Unit 22B and 22D.



**Progress Meeting Project Objectives:** The unreported harvest of moose in Unit 22 is considerable. Much of this harvest is attributable to hunters who do not purchase licenses or pick up harvest tickets rather than to those who ignore seasons and bag limits. 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 using licenses and/or harvest tickets has increased. However, additional contact with local residents needs to occur if we are to achieve better compliance with current moose regulations. An alternate means of big game harvest assessment utilizing village surveys is in the planning stage. Surveys are scheduled to begin in 2 Unit 22 villages during the next reporting period.

For the first time since 1987, we failed to complete an annual census in Unit 22 because of the lack of snow. Recruitment and composition surveys planned for spring and fall in Unit 22 were also canceled during this reporting period. Subjective observations by staff and the public indicate moose numbers are stable or increasing throughout the unit, following 3 mild winters with relatively light snowfall. Efforts are continuing to develop updated management objectives in consultation with the public and other agencies.

**Project Location:** Unit 23 (43,000 mi<sup>2</sup>)  
Kotzebue Sound and Western Brooks Range

**Project Objectives:** The population management objectives of Unit 23 are to maintain the moose density at or above 1 moose/mi<sup>2</sup> and the bull:cow ratio at a minimum of 40:100.

1. Census moose in established census areas to monitor population composition and density.
2. Monitor harvest.
3. Collect recruitment information in the Noatak River drainage.
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.* We conducted a census to assess recruitment of calves into the Noatak moose population; department staff surveyed 643.5 mi<sup>2</sup> of a 1628 mi<sup>2</sup> study area. The calf:adult moose ratio was  $0.12 \pm 22.6\%$  at the 80% confidence level ( $P$  0.09–0.15). We conducted the census in early May and observed 454 moose. Pilot and observer teams censused 50 units (33 high- and 17 low-density units). Stratification was based on the past distribution of moose rather than a stratification flight. Our objective was to obtain a calf:adult ratio, rather than a population estimate.

*Harvest monitoring.* In Unit 23, 319 hunters harvested 142 moose during the 1997–1998 season. One hundred and seventy-two nonlocal state residents and 135 nonresidents reported hunting moose. We monitored the harvest using the statewide harvest reporting system.

*Radiotelemetry studies.* The department and federal agency staff completed the 7<sup>th</sup> year of a cooperative moose telemetry project in the middle Noatak River drainage and the 5<sup>th</sup> year of a similar study in the Tagagawik River drainage. In both studies, we relocated radiocollared moose throughout the year. The objective of relocating moose was to determine seasonal mortality rates and track seasonal movements. We tracked moose before and after the fall hunting season.

#### *Moose Mortality*

Noatak. Total mortality for radiocollared moose in the Noatak study from April 1997 to April 1998 was 16%. As of April 1998 there were 65 surviving moose, 22 bulls and 43 cows. In April 1998 NPS collared additional cows as part of another study.

Selawik. In the Tagagawik moose study, total mortality in 1997 (Apr 1997–Apr 1998) was 8%. Fifty -six moose (20 bulls and 36 cows) had radiocollars at the beginning of the 1998–1999 study year. FWS radiocollared additional moose as part of another study.

**Progress Meeting Project Objectives:** Data from the radiotelemetry projects and census results indicate population objectives are being met in some areas of Unit 23. Moose densities in the Noatak (1993) and upper Kobuk (1995) are below our objective of 1 moose per mi<sup>2</sup>, based on our last complete census in these areas. Bull:cow ratios are below 0.40 in the Squirrel (0.37) and above 0.40 in the Noatak (0.43) and Upper Kobuk (0.62). 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 using statistically rigorous censuses on a rotational basis throughout the unit. We plan to use a modified census technique in the intervening years.

**Project Location:** Unit 26A (53,000 mi<sup>2</sup>)  
Western North Slope

#### **Project Objectives:**

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 that caused the population to decline.
  - a. Examine and collect samples from captured and dead moose to test for pregnancy status, disease, mineral deficiencies, and contaminants.
  - b. Conduct radiotelemetry surveys to examine calf production and survival, distribution, and mortality rates.
  - 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 conducted in trend count areas in the Colville, Anaktuvuk, and Chandler river drainages 6 and 7 November 1997. During these surveys, we observed 102 moose; 25 bulls (60 bulls:100 cows), 55 cows, and 22 calves (22% calves). The estimated antler sizes of the bulls were:

Inches	<30	30-39	39-40	40-49	50-59	60+
Percent	4%	16%	8%	48%	17%	24%

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 represented a 51% decline since the 1991 census when we counted 1535 moose.

During 31 Mar-2 Apr 1998 we conducted population and short yearling recruitment counts in trend count areas on the Colville, Anaktuvuk, and Chandler River drainages. A total of 216 moose (161 adults and 55 calves) were counted, yielding a short yearling recruitment rate of 26%. Eight pairs of twins were seen during the survey. This is similar to the 1987 survey when 23% short yearlings were counted. Both counts indicate a great improvement in short yearling survival, as there were 3%, 2%, and <1% short yearlings counted in 1994, 1995, and 1996, respectively, and no twins were seen during those years.

We used Hughes 500 helicopter and tranquilizer darts to capture moose and attach radio collars to 15 moose on 10-14 April 1997. Ten of those tested positive for pregnancy, 3 tested not pregnant, and 2 may have been pregnant. Two tested positive for exposure to brucella. In addition, 8 moose, which had been examined in 1996, were recaptured in 1997. Five of these had tested positive to exposure to brucella in 1996, and they all had high titers again in 1997, indicating the disease was still active. Of the 8 recaptured, 7 were pregnant. No moose were captured during spring 1998.

We conducted radiotelemetry surveys during spring calving season, fall, and late winter during 1997-1998. On 3-6 June 1997 we located 44 collared moose and found 29 calves (66 calves per 100 cows), including 4 sets of twins. Our fall survey, flown from 30 Sep-1 Oct was incomplete due to weather, but we located 35 collared cows and counted 19 calves (54 calves:100 cows). During 31 Mar-2 Apr we located 43 collared cows with 23 calves (53 calves:100 cows). From 10-15 June 1998 we located 43 collared cows with 24 calves (56 calves:100 cows), including 5 sets of twins. There was no mortality among the radiocollared adult moose.

Dr. Knut Kielland, from the Institute of Arctic Biology, analyzed willow samples from the Colville River. He measured the diameter at point of browsing, current annual growth, crude protein, and the digestibility of the feltleaf willow twigs. He determined the digestibility of sapwood is twice as high as it is for feltleaf willow in other areas of the state. He concluded that browse is currently of fairly high quality and the nutrient return of browsing on feltleaf willow is relatively high. He also said that, considering daily intake rates, the Colville moose are operating on the margin of dietary sufficiency. This is similar to the nutritional scenario of most moose in the state. There was plenty of unused forage in 1997. Unfortunately, we have little information on the amount of forage available during the time of the population decline.

Because of the declining moose population, restrictive regulations have been established, and only 1 moose was reported harvested.

**Progress Meeting Project Objectives:** Spring population and radiotelemetry surveys indicate high calf survival and low adult mortality, resulting in a second year of population increase. This comes after 4 years of population decline. We will attempt to do a census of Unit 26A in 1999.

Our fall composition count indicated that oversummer calf survival in 1986 and 1987 was much better than during the previous 4 years. We observed some young bulls in 1997 whereas in 1996 nearly all bulls observed were over 3 years of age. It will still be necessary to restrict bull harvest until bulls born during the last 2 years of high calf survival mature.

We learned from samples taken from captured moose that moose had a fairly high pregnancy rate. They also had a high incidence of exposure to the diseases brucellosis and leptospirosis. By analyzing samples from moose found dead, taken by hunters, and captured, we learned most of the moose were marginally deficient in copper. Five moose that had high titers for brucella in 1996 were recaptured in 1997 and we found that brucellosis was still active in all of them.

It is unclear how much of a role disease played in the population decline. The moose with positive titers for brucellosis had similar survival rates, calf production, and calf survival as the rest of the population in 1986 and 1987. However, in the 1998 calving survey 7 of 8 cows that had positive titers for brucella did not have calves. The one exception had twins. Calving surveys indicated that calf production was fairly good in 1998. Further surveys will be needed to determine calf survival.

We conducted wolf surveys 15 and 16 April in an area surrounding the Colville River. Survey conditions were not good in the southern part of the survey area, so we concentrated on the northern 5000 km<sup>2</sup>. We found much lower wolf density (1.56 wolves/1000 km<sup>2</sup>) in this area than in 1992 and 1994 when we found 4.2 and 4.1 wolves per 1000 km<sup>2</sup>, respectively. The decrease in wolf density probably contributes to the reduced moose mortality in recent years.

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:**

	<u>Personnel</u>	<u>Operating</u>	<u>Total</u>
Planned	35.2	50	85.2
Actual	35.2	35	70.2
Difference	0.0	15	15.0

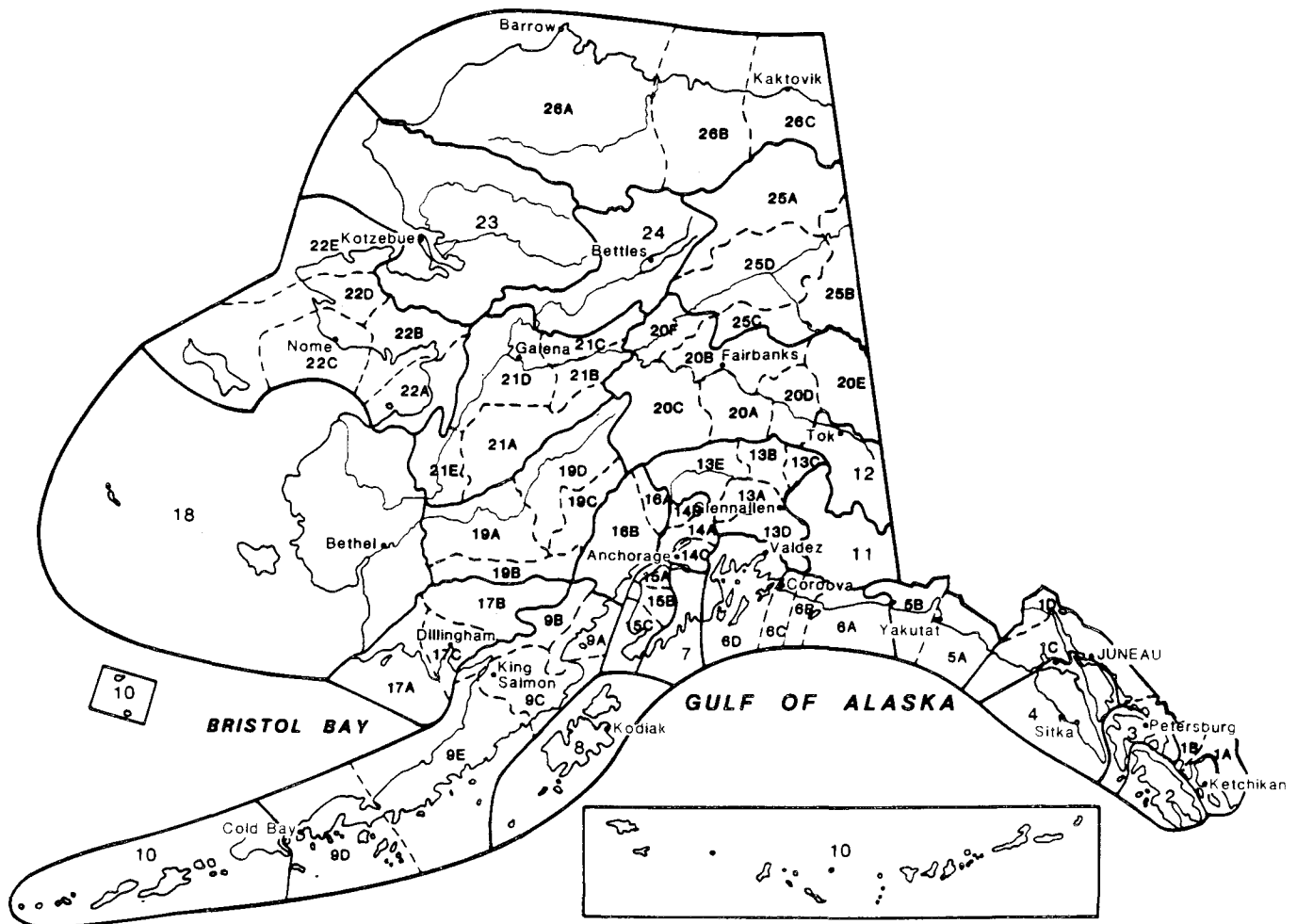
Poor weather in Unit 22 and Unit 23 prevented scheduled moose censuses.

**Submitted by:**

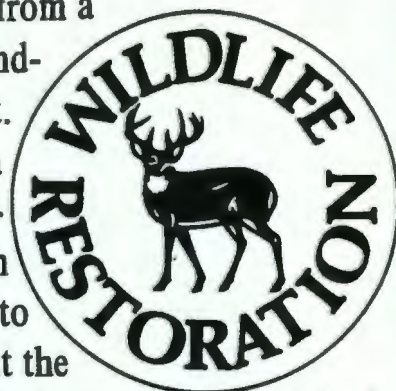
Peter Bente

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.



Joel Sartore