Alaska Department of Fish and Game
Division of Wildlife Conservation

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Federal Aid in Wildlife Restoration
Annual Performance Report of
Survey - Inventory Activities
1 July 1994 - 30 June 1995

MOOSE

Mary V. Hicks, Editor

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STATE OF ALASKA
Tony Knowles, Governor

DEPARTMENT OF FISH AND GAME
Frank Rue, Commissioner

DIVISION OF WILDLIFE CONSERVATION
Wayne L. Regelin, Director

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Project Title: **Southeast Moose Population Management**

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

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

Project Objectives and Activities:

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

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

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

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

Progress Meeting Project Objectives: We issued 81 registration permits to hunters in Subunit 1A. Six bulls were killed by 47 hunters, a success rate of nearly 13%. Five of the moose were killed on the Unuk River drainage and one was killed on the Cleveland Peninsula. Numbers of hunters (47), number of hunter days (216), and moose killed exceeded objectives, but the success rate was below our objective. Antler spread averaged 35 inches.

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

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

Project Objectives and Activities:

1. Measurable management objectives for Stikine River moose include the following:

Posthunt moose numbers	450
Annual hunter kill	40
Number of hunters	300
Hunter days of effort	2,100
Hunter success	13%

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2. Measurable management objectives for Thomas Bay moose include the following:

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

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

We plan to establish project objectives for Unit 3 during the coming regulatory year.

Work Accomplished During the Project Segment Period: The Stikine River hunt was closed by emergency order. Two Stikine surveys were flown; 34 adults and 0 calves were seen in early March, and 30 adults and 1 calf were seen in early April. Discussions with hunters indicate a much higher percentage of calves seen during the fall hunting season.

In Subunit 1B north of LeConte Bay and Glacier and Unit 3, we collected incisors for aging and measured antlers. We did not survey these areas.

Progress Meeting Project Objectives: Due to the closure of the Stikine hunt, none of the project objectives was met. Three moose were harvested in the Federal subsistence hunt.

In the Thomas Bay hunt, 128 hunters harvested 11 legal moose (9% hunter success rate) and spent 793 days in the field. Hunter days of effort was the only project objective met.

In Unit 3, 389 hunters killed 19 legal moose in 1537 days of effort.

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

Project Objectives and Activities:

1. Measurable management objectives for Taku River moose include the following:

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

2. Measurable management objectives for Berners Bay moose include the following:

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

3. Measurable 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 347 registration and 15 drawing permits for the 3 hunts in Subunit 1C, a decrease of 6 registration permits. A total of 241 hunters participated in these hunts. Permit results for hunters reporting the location of their hunts are shown in the following table:

Management Area		Hunters	Success	Days Hunted
Chilkat Range		140	19%	566
Taku River		87	18%	318
Berners Bay	(bulls)	8	100%	26
	(cows)	6	86%	12

An aerial survey was conducted in the Berners Bay area on November 16, 1994. We counted 75 moose in 2.0 hours. Bull:cow and calf:cow ratios were 38:100 and 29:100, respectively. The percentage of calves in the herd was estimated at 17%.

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

Progress Meeting Project Objectives: Management objectives for the Berners Bay herd were met. With 75 moose observed during the winter survey, an increase of 7 over the previous season, the posthunt population exceeded the objective of 90. Fourteen of 15 permittees took moose; our objective of 80% success was surpassed.

Most Chilkat Range herd management objectives were achieved. The kill of 27 moose exceeded the goal of 10; 140 hunters hunted, surpassing the goal of 65; 566 hunter days were expended, compared to the objective of 195; and the success rate objective was surpassed. A high take in the Gustavus area (20 moose) for the third year in a row contributed to the success rate for the Chilkat Range. No aerial surveys were flown, so the posthunt population size is unknown.

Management objectives for the Taku River moose population were not met. Although the number of hunters increased compared with the previous season, hunter success remained the same and the number of hunter days declined. Adverse weather and river conditions probably affected hunter effort. Since no aerial surveys were conducted, the posthunt population size is unknown.

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

Project Objectives and Activities:

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

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

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

Work Accomplished During the Project Segment Period: In 1994 the Chilkat valley moose hunt was held for the second time since the Board of Game established a spike-fork/50 inch requirement for this Tier II hunt. Two hundred permits were offered and all were issued. Staff monitored the hunt, measured antlers, and collected incisors for aging. We also gathered tissue samples for genetic studies being conducted in Soldotna.

An aerial survey was flown on November 14, 1994. We counted 149 moose in 4.3 hours. Bull:cow and calf:cow ratios were estimated at 53:100 and 35:100, respectively. Calves composed 18% of the animals observed.

Progress Meeting Project Objectives: The second moose season following a 3-year closure resulted in the harvest of 17 legal moose. Hunt conditions only allowed 200 hunters. Twelve percent of those hunting were successful. The success rate met the management objective. Most other objectives, including the harvest level, were not met. The winter survey indicated a posthunt population of about 300 moose, well below the management objective. Hunter effort (304 hunter days) was also below the management objective. The posthunt bull:cow ratio was higher than the objective.

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

Project Objectives and Activities:

1 Measurable 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	1,025
Hunter success	28%

2 Measurable management objectives for Nunatak Bench moose include the following:

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

3 Measurable 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%

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

Work Accomplished During the Project Segment Period: We issued 312 registration permits for Unit 5 moose hunts (269 for Subunit 5A and 43 for Subunit 5B). Hunts were monitored by Division of Wildlife Conservation staff, Fish and Wildlife Protection staff, and enforcement officials from the US Forest Service. Harvest and hunter data were analyzed from registration permit reports. We collected and examined teeth for age determination.

Aerial surveys of the Yakutat Forelands and Nunatak Bench were flown from December 2-7, 1994. We counted 25 moose in 0.3 hours in the Nunatak Bench area, with bull:cow and calf:cow ratios of 16:100 and 22:100, respectively. Calves composed 16% of the herd. Two different types of aircraft (a PA-18 Supercub and a Cessna 185) were used to survey the Yakutat Forelands. We counted 377 moose. Bull:cow and calf:cow ratios from the Supercub flights were estimated at 20:100 and 32:100, respectively. Calves composed 21% of the animals counted during Supercub flights.

Progress Meeting Project Objectives: In the Yakutat Forelands herd, we estimate the post-hunt moose population at about 750 animals, below the management objective of 850. The posthunt bull:cow ratio matched the objective. However, hunter kill (60) and the number of hunters (208) were below objectives. Hunter effort (849 days) was slightly lower than our objective of 1025 days, and hunter success (27%) was near the objective of 28%.

In the Nunatak Bench area in Subunit 5A, no hunt was held, so objectives there were not met. Surveys have indicated a hunt is now possible, and the Board of Game has reestablished a 5 moose hunt for fall, 1995.

In Subunit 5B, the Malaspina Forelands, the population was previously estimated at the desired 250 animals. Hunter effort (135 hunter days), success rate (27%), and harvest (7) are all below management objectives. The lack of surveys precludes determining herd status and if the desired bull to cow ratio was attained in either subunit.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	32.5	28.8	61.3
Actual	32.5	25.3	57.8
Difference	0.0	3.5	3.5

We did not aerial survey Unit 1C.

Submitted by:

Bruce Dinneford
Management Coordinator

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

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

Project Objectives: Maintain observed moose densities of between 0.8 and 2.0 moose/mi^2 and bull:cow ratios of 30:100.

Work Accomplished During the Project Segment Period: We completed censuses in Subunits 6B and 6C. Estimates for Subunit 6B are as listed: moose-296, bulls-48, cows-218, calves-30, 22 bulls:100 cows, 14 calves:100 cows. Estimates for Subunit 6C were moose-281, bulls-53, cows-190, calves-39, 28 bulls:100 cows, 21 calves:100 cows.

Total reported harvest in Unit 6 was 145 moose (105 males and 40 females). In Subunit 6A, 52 males and 13 females were taken by 121 hunters, a success rate of 54%. In Subunit 6B, 125 hunters harvested 32 males and 12 females under drawing and registration permit hunts, a success rate of 35%. In Subunit 6C, 35 hunters took 20 males and 15 females under drawing permit hunts, a success rate of 100%. In Subunit 6D, 1 male was taken by 20 hunters, a success rate of 5%.

We monitored the registration hunt for bull moose in Subunit 6B by field checks of hunters. An emergency order closed the hunt on 1 September. A harvest of 20 antlered moose was allowable, and 32 were reported killed. The 12 animals taken in excess of the allowable harvest were killed during the 12 hour period between issuance of the closure and its effective date.

Progress Meeting Project Objectives: We completed censuses in Subunits 6B and 6C. In Subunit 6B, the population was slightly lower than the goal of 300 moose. Reduced harvest of cows during the coming year should correct the problem. The objective for bull:cow ratio was achieved. In Subunit 6C, we established the objective to increase the population this year. We will achieve it by reducing the cow harvest to a maximum of 5 annually. Numbers should increase slowly.

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

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

Work Accomplished During the Project Segment Period: Excellent weather conditions allowed us to survey preferred composition count areas. We surveyed 453 moose in 4 survey areas. Bull:cow ratios ranged from 20 bulls:100 cows to 52 bulls:100 cows with a mean of 34

bulls:100 cows. Fall calf:cow ratios averaged 31:100 cows. The moose population seems stable between 1000 and 1500 animals.

Preliminary harvest statistics indicated approximately 422 hunters reported hunting in Unit 7 during the 20 August-20 September season and harvested 56 bull moose. Twenty-five (45%) hunters reported taking spike/fork bulls (less than 35") compared to 30 (54%) hunters who harvested large bulls (greater than 39"), defined as a 50 inch antler spread or having 3 brow tines on at least 1 antler. One additional moose was reported but not classified.

The winter of 1994-95 was considered severe with deep and persistent snow. Winter mortality included 35 by motor vehicle, 18 by train, and an unknown number by starvation.

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

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

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

Project Objectives:

- To maintain existing moose densities in areas with moderate (0.5-1.5 moose/mi^2) or high- (1.5-2.0 moose/mi^2) densities.

- To increase low-density populations (where habitat conditions are not limited) to 0.5 moose/mi^2 by 1995.

- To maintain sex ratios of at least 25 bulls:100 cows in medium to high-density populations and at least 40 bulls:100 cows in low-density areas.

Work Accomplished During the Project Segment Period: We surveyed 10 trend areas in 1994. Poor snow conditions prevented further survey work. In Subunit 9B 150 moose were counted in 2 trend areas, and the overall sex ratio was 34 bulls:100 cows and 25 calves:100 cows. In Subunit 9C we surveyed all 4 trend areas and saw 638 moose. Overall ratios were 54 bulls:100 cows and 23 calves:100 cows. We surveyed 4 trend areas in Subunit 9E and counted 365 moose. Ratios were 40 bulls:100 cows and 21 calves:100 cows.

Preliminary 1994 harvests by subunit were 4, 79, 59, and 74 for 9A, 9B, 9C and 9E, respectively.

Progress Meeting Project Objectives: Efforts to monitor moose density and composition were hampered in 1994 by poor snow conditions. In the areas we counted moose, bull:cow ratios met desired ratios.

Project Location: Unit 11 (12,800 mi^2)
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: Fall sex and age composition counts were conducted in 1 count area (CA-11) in Unit 11 during 1994. We counted 114 moose at a rate of 24 moose per hour. The bull:cow ratio was 91 bulls:100 cows. Calves composed 11% of counted moose. The observed density was 0.4 moose per mi^2.

Preliminary harvest figures indicate hunters killed 35 moose in Unit 11 during the 1994-1995 season. Of these, nonresidents took 5 (14%) moose. Hunter success was 33%. The average hunt lasted 5.2 days. Harvest chronology figures show 51% (n=18) of the take occurred during the last week of the moose season. The most important means of transportation was aircraft. The mean antler size in the harvest was 49.4 inches.

Staff discussed proposals on land use patterns, access, and development with 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 1994 indicated moose numbers are low with an observed density of only 0.4 moose/mi^2. A more intensive Gasaway census in 1993 by NPS personnel resulted in a slightly higher density estimate of 0.58 moose/mi^2. Differences in density estimated between years were attributed to survey methods rather than changes in moose numbers from 1993 to 1994. The bull:cow ratio was higher than observed in most years, but the actual number of bulls counted declined. The increase in the bull:cow ratio was attributed to a decline in the number of cows observed. The calf:cow ratio of 25:100 was higher than observed in recent years during fall trend counts, but again the number of calves actually counted was not appreciably higher than observed in previous years. The moose:hour figure continued to decline. Overall moose numbers could be considered stable or declining slightly, based on the 1994 composition count.

The bag limit and season dates for the state hunt in Unit 11 were changed in 1993. The definition of a legal bull changed from any bull to one with 50+ inch spread or 3 brow tines,

and the season was lengthened by 15 days with season dates of 20 Aug.-20 Sept.. Although the harvest increased initially by 30% under the new regulations, the kill still remains very low and does not exceed harvest levels observed during the late 1980s. Although the season was lengthened, the conservative bag limit may well keep harvest low. Harvest chronology figures for 1993 and 1994 indicate the best time to hunt moose was during 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 sustainable, and human harvests have minimal effects on moose numbers in the unit. Wolf predation continues to be relatively high on moose. 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 28 inches the winter of 1994-95, 8% above the 1964-1994 average of 25.6 inches, but was the lowest in 6 years. Because of the lower snow pack, overwinter mortality may have been lower this year.

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

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

Work Accomplished During the Project Segment Period: We conducted fall sex and age moose counts in 10 count areas located throughout the unit. We counted 4854 moose at a rate of 55 moose per hour. The overall bull:cow ratio was 18 bulls:100 cows with 14 adult bulls:100 cows. Calves composed 12% of the herd.

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

Hunting season dates and bag limits remained unchanged from last year, extending from 20 August-20 September for a bull having 50+ inch antler spread or 3 brow tines on one side. Three drawing permit hunts with 75 total permits issued were held in portions of Subunit 13A.

Snow depths were recorded throughout the Basin to determine a winter severity index for moose. Snow depths varied throughout the unit, with some subunits such as 13D and portions of 13A and 13B having another severe winter.

Preliminary harvest figures show hunters killed 875 bull moose and 39 cows in Unit 13 during the 1994-1995 season. An analysis of the moose harvest shows 849 bulls were taken

during the state-regulated fall season, compared with 26 bulls taken under a federally regulated fall subsistence hunt held on federal land in Unit 13 for unit residents.

Staff reviewed potential effects on moose habitat by land use proposals. Staff attended DNR meetings on forest practices and uses for Unit 13 and submitted comments on habitat improvement for moose.

Staff reviewed the Copper River Fire Management Plan.

Progress Meeting Project Objectives: Moose numbers declined by an estimated 25-30% in Unit 13 between 1988 and 1991. This decline followed a 9-year period (1978-87) when moose numbers increased at an estimated 5% per year. Analysis of composition data indicated this decline occurred in all sex and age classes. Fall composition count data show moose numbers declined again in 1994 after stabilizing somewhat in 1992 and 1993. Moose-per-hour and bull and calf:cow ratios declined during 1994. Calf production or survival was the lowest in 4 years. Much of the decline observed in the bull:cow ratio was due to poor recruitment of yearling bulls. Although calf production in 1993 was good, based on fall composition count data, survival of bull calves overwinter was low, as they were not recruited into the population as yearlings. The decline observed in the number of adult bulls counted was very small. The current bull:cow ratio is below the management objective for Unit 13. Spring twinning rate surveys suggest good initial calf production with the percent of twins ranging from 39% in 13E to 28% in 13B and 13C. These percentages are within the expected range for moose.

Snow depths varied throughout much of Unit 13. The winter of 1994-95, however, was classified as a severe winter, based on the snow severity index of 30.6. This is the 7th winter with a winter severity index exceeding 30. The 32 year average severity index is 25.6. A severity index exceeding 30 indicates a severe winter and overwinter mortality of moose, especially calves.

The current bull harvest declined by 26% from the previous year's take. The 1995 harvest was especially high because a large portion of Subunit 13A had been closed to hunting for 3 years and accounted for 40% of unit take. There were 5237 reported hunters in Unit 13 for a unitwide success rate of 16%. Hunting pressure was among the heaviest ever reported in the unit, while hunter success was the lowest ever observed. Initial indications were that the spike-fork 50-inch regulation may successfully limit harvest of large bulls to prevent declines in the bull:cow ratio and still allow unlimited hunting. The reason for the decline in the bull:cow ratio was low calf survival. Until recruitment increases, the hunting season should be shortened to reduce harvest until recruitment can keep pace with natural and hunting mortality rates on bulls. Drawing permit hunts for cows should be eliminated until the current population decline reverses itself.

The 1994 fire season was uneventful due to normal Copper River Basin weather patterns, with no major fires in the unit. The last large fire was in 1991 when 5500 acres burned in Subunit 13D. Wildfire is the only feasible means of enhancing moose habitat in most of Unit 13.

Project Location: Unit 14 (6,600 mi^2)
Subunit 14A
Upper Cook Inlet

Project Objectives: To maintain the moose population with a posthunting sex ratio of no less than 20 bulls:100 cows. To achieve and maintain a human use objective of 600-700 moose annually by the year 1995.

Work Accomplished During the Project Segment Period: During 30 October-7 November, we counted moose from aircraft in 24 of 119 survey sample units. We observed 1589 moose and estimated a population of 5500-6500 moose. We also estimated ratios of 22-25 bulls:100 cows: and 34-37 calves:100 cows. Calves were 22-25% of the estimated population. During 3-4 April, we counted 518 moose in the Knik and Matanuska River valleys and observed 14.5% short yearlings. Overwinter calf survival indicated a severe winter comparable with 1989-90 but slightly less harsh. Fall calf survival to short yearling was estimated at 40-50%.

A total of 2337 hunters reported hunting "spike/fork/50 inch" (S/F/50) bulls in the 20 August-20 September season; 282 hunters (12%) were successful. The second year of antler restrictions produced a harvest of 66% yearling bulls. Of the 500 individuals holding antlerless permits, 453 (96%) hunted and 250 (55%) of those who hunted were successful.

During 1 July 1993 to 30 April 1994, trains killed 40 moose, and during 1 September 1993 to 30 June 1994, automobiles killed 260 moose. The number of moose killed illegally was 40-50, while 19 were reported killed in defense of life and property.

Progress Meeting Project Objectives: The fall survey indicated the Subunit 14A post-hunting moose population exceeded 5500 moose, and the bull:cow ratio exceeded the minimum objective level of 20:100. The S/F/50 regulation will probably cause the bull:cow ratio to reach 30:100 if additional opportunity for harvest is not provided. During spring 1995 the Board of Game approved department proposals to 1) issue a limited number of drawing permits for any bull, and 2) establish a Nov. 20 - Dec. 15 general season for spike or forked bulls. Additional hunting opportunity for spike-forked bulls during the November-December hunt and 90 permits issued to take any bull for fall 1995 should stabilize the increase while providing greater human use. Issuing 270 antlerless moose permits for fall 1995 should produce a stable population near 5500-6000 moose.

Human use objectives, established before antler restrictions, will not likely be met by hunters until 1997. However, if road, railroad, illegal, and DLP moose kills are added to hunter-killed, moose from 14A consumed by humans during 1994/95 approached 850.

Project Location: Subunit 14B
Western Talkeetna Mountains

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

Work Accomplished During the Project Segment Period: We conducted aerial surveys during 28 October-5 November 1994. The population was estimated at 2337 $\pm$527 (80% CI) moose, with 17% calves, and a sex ratio of 31 bulls:100 cows.

Examination of harvest reports indicates 301 hunters harvested 34 bulls (11% success) during the 32-day (August 20-September 20) season. Only bulls with S/F/50 antlers were legal. In addition, at least 56 moose were killed by trains, 34 were killed by automobiles, and 12 were reported killed in defense of life and property.

Progress Meeting Project Objectives: The fall moose population in Subunit 14B seemed similar in size to that recorded just before the severe winter of 1989-1990 and near the objective level (although the confidence interval is large). During fall 1994 the bull:cow ratio (31:100) was well above the objective, but the harvest was below human-use objectives. During spring 1995 the Board of Game approved department proposals to 1) issue a limited number of drawing permits for any bull and 2) establish a Nov. 20-Dec. 15 general season for spike or forked bulls. This should encourage additional harvest and reduce the bull:cow ratio. The winter of 1994-95 was relatively severe, with early deep snows causing some calf starvation by January. A stratified random census should be conducted in the next 2 years to determine population size, to evaluate effectiveness of "Becker" trend surveys conducted since the census of 1987, and to evaluate effects of additional harvest.

Project Location: Subunit 14C
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 Subunit 14C were determined by aerial surveys flown during November. We observed 815 moose. Several drainages were not counted due to our limited budget and low priority (closed season). The ratios of bulls and calves per 100 cows were 31 and 30, respectively. The current subunit population is estimated at 1900 moose.

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

Over the past decade Subunit 14C has supported a large harvest of cow moose. During the past reporting period, the number of cows harvested declined. In 1994-95 cows composed 20% of the total harvest, or 33 animals. Despite recent cow harvests the population remains high because of excellent calf survival over many years, possibly related to the low number of predators throughout much of wintering range. All cows were killed during special permit hunts. Hunters also took 128 bulls, of which 69 came from the general season and 59 during special permit hunts. Hunters averaged 4.8 days afield and were 24% successful. Nearly 39% of all moose were taken on either Fort Richardson or Elmendorf Air Force Base with an additional 14% taken from the Portage area hunts. Bowhunters took 35% of the total harvest in archery-only hunts. Seasons ran continuously in various parts of the subunit from 20 August through 15 January, excluding only 16 November to 14 December. A record 220 moose were killed by vehicles in the subunit between 1 June 1994 and 31 May 1995, as a result of near record snowfalls in early winter.

Bull:cow ratios in portions of the subunit with a bag limit of any bull were declining in recent years due, in part, to increased hunting pressure by those unwilling to hunt in adjacent areas with a spike-fork/50-inch bag limit. During this reporting period a spike-fork/50-inch bag limit was implemented in Subunit 14C so that it conforms with other game management units in southcentral Alaska.

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

Project Location: Unit 15 (4,900 mi^2)
Subunit 15A
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: Seven of 13 count areas in Subunit 15A were flown during the 1994 fall sex and age composition surveys, resulting in the following totals and ratios: 1199 moose classified; 32 calves:100 cows; 24 bulls:100 cows; and calves composed 20% of observed moose.

A preliminary total of 1426 hunters reported hunting 15A during the 20 Aug.-20 Sept. general 1994 season, harvesting 237 moose. The harvest comprised 155 (65%) spike/fork antlered bulls, 66 (28%) bulls with an antler spread of 50 inches or greater, or possessing at least 3 brow tines on one antler, and 16 (7%) unspecified or illegal bulls.

The department received 1426 applications for 30 permits to hunt antlerless moose in Skilak Loop Special Management Area (SLSMA). The season was September 21-30. Twenty six of the 30 permits winners hunted and 13 harvested an antlerless moose.

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

Additionally, the department would like to maintain the population at its current size. Loss of habitat through human development or deterioration from natural plant succession is the primary factor controlling moose density in 15A. Attempts to enhance areas through prescribed burning by the US Fish and Wildlife Service and the department have been largely unsuccessful due to restrictions necessary to safely burn on the Kenai Peninsula.

The winter of 1994/95 was severe compared to the 2 previous winters in Subunit 15A. Snow came early with accumulations of 3 to 4 feet over large portions of the western part of the Subunit. Mortality due to starvation was common with a minimum of 178 documented. Calves composed 85% of the mortality for known age animals (n = 132). Last winter 142 moose were reported killed on the road system. The moose population in Subunit 15A should have declined moderately due to the severe winter conditions in 1994/95. The fall population is projected to be 2500 to 3000 animals.

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

Project Location: Subunit 15B
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: Sex and age composition surveys were conducted only in 15B East in 1994. A total of 489 moose was classified resulting in the following ratios: 29 calves and 57 bulls:100 cows; calves composed 15% of the total observed.

Preliminary harvest reports indicate 323 hunters reported hunting in 15B West during the 20 August to 20 September 1994 season, resulting in the harvest of 56 bulls. Hunter success rate was 17%.

The bag limit for 15B West was 1 bull with a spike/fork or 50 inch antlers. The 1994 harvest comprised 44 (79%) spike/fork antlered bulls, 10 (18%) bulls with an antler spread of 50 inches or greater or possessing at least 3 brow tines on 1 antler, and 2 (4%) with an unreported antler spread or an illegal bull.

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. Staff issued 100 permits from 2543 applications, resulting in the harvest of 20 bulls. Mean age of harvest was 5 years with a range of 3 to 9. The average antler spread was 51.7 inches and ranged from 33.5 to 67.7 inches. Successful hunters averaged 4 days hunting and observed an average of 5 bulls. The number of bulls observed by successful hunters ranged from 1 to 18.

Progress Meeting Project Objectives: The Selective Harvest Program initiated in 1987 was designed, in part, to increase the bull:cow ratio. Because areas only in 15B East were surveyed during 1994, we did not assess the entire subunit's population status and trend. Due to selective harvest, the bull:cow ratio is suspected to be in excess of 15:100 in 15B West and was in excess of 50:100 in 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 wildfires. Because censuses have not been conducted recently, 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 and 1993-1994 were mild, allowing normal calf and older bull survival.

In addition to reported harvest, highway vehicles killed 41 moose in 15B West. Thirty five moose mortalities (81 percent calves) were also documented due to starvation.

No change is recommended for 15B for the 1995 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 following a severe winter.

Project Location: Subunit 15C
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: Excellent weather conditions allowed us to survey desired trend areas. We surveyed 1719 moose in 4 survey areas. Bull:cow ratios ranged from 10 bulls:100 cows to 30 bulls:100 cows with a mean of 19 bulls:100 cows. Fall calf:cow ratios averaged 41:100 cows. Survey results indicate the moose population is stable to slightly increasing around 2500 animals.

Preliminary harvest statistics indicated approximately 1417 people hunted in Subunit 15C during the 20 August-20 September season and took 307 moose. The hunter success rate was 22%. Two hundred fifteen (70%) moose were classified in the spike/fork category and 83 moose were classified in the 50+ category. Nine moose had either sublegal or unknown antler sizes.

The winter of 1994-95 was considered severe with deep and persistent snow. Winter mortality in Unit 15C included 74 by motor vehicle and 57 by starvation.

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

Increased logging activities in Unit 15C to combat spruce bark beetles (*Dendroctonus rufipennis*) may provide increased visibility and access to moose hunters. Habitat quality may also be affected when overstory is removed. We need to continue monitoring effects of logging on moose on the Kenai Peninsula.

Project Location: Unit 16 (12,300 mi^2)
Subunit 16A
West side Susitna River valley, Yentna-Kahiltna rivers to Chulitna-Tokositna rivers

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

Work Accomplished During the Project Segment Period: During November 1994 the population was estimated at 3300 (± 300, at the 80% confidence level) moose. There were 42 bulls:100 cows; 31 calves; calves composed 18% of the population.

Examination of harvest reports indicated 466 hunters harvested 66 bulls (14% success) during the 32-day (August 20-September 20) general S/F/50 bull season. We issued drawing permits for any bull during a Nov. 1-15 season. The subunit was divided into 2 hunt areas, north (40 permits) and south (60 permits) of the Petersville Road and Peters Creek. Hunters harvested 49 bulls in the November permit season.

During the report period an additional 4 moose were reported killed in collisions with autos, and 2 moose were reported killed in defense of life and property. These figures represent minimum numbers.

Progress Meeting Project Objectives: The population was at or slightly below the objective, and the bull:cow ratio was well above the desired level. Surveys should be conducted fall 1995 to help determine population trends, the effects of the S/F/50 selective harvest strategy, and the number of drawing permits needed in the late season hunt. Harvest is well below the objective level, primarily due to difficult access in many parts of the subunit. To encourage additional harvest, the department proposed 1) issuing 100 any-bull drawing permits during the regular fall general season, and 2) adding a November 20-December 15 general season for spike or forked bulls. The Board of Game approved these proposals. To encourage harvest in river-accessible (and underused) areas, the 100 any-bull permit winners hunting during November 1-15 will be restricted to that portion of the subunit south of the Petersville road.

Project Location: Subunit 16B
West-side of Cook Inlet

Project Objectives: Maintain a population of 6500-7500 moose with a November sex ratio of not less than 20 bulls:100 cows, and on Kalgin Island to maintain a fall population of 30-40 moose with a minimum of 15 bulls:100 cows. Human use objectives are to maintain a minimum annual average harvest of 650 moose in subunit 16B and in addition no less than 5 moose from Kalgin Island.

Work Accomplished During the Project Segment Period: We conducted fall sex and age trend aerial surveys during November 11-25 north of the Beluga River and on November 18 on Kalgin Island. We flew 35 of 294 sample units North of Beluga River and observed and classified 805 moose. We estimated a bull:cow ratio of 33:100 and 11% calves in the estimated 5400 moose in this portion of the subunit. On Kalgin Island we classified 40 moose and estimated a population of 60 moose in a ratio of 35 bulls:100 cows and 65 calves:100 cows.

We also conducted an aerial survey of moose using a regression sampling method developed by VerHoef in Interior Alaska. The survey was conducted between Beluga River and Straight Creek during 29 November-2 December. We observed and classified 261 moose in 12 of 38 sample units. The method produced an area population estimate of 612 ± 51 (80% CI) moose with estimated ratios of 25 bulls:100 cows and 25 calves:100 cows.

The total subunit population estimate was 6200-7200 moose.

Harvest opportunity in most of the subunit occurred during 20 August-20 September and was limited to bulls with S/F/50 antlers. The exceptions were the general season on Kalgin Island, the midwinter Tier II hunts in northern 16B, and the Tier II fall and winter seasons between Beluga and McArthur rivers where any bull was legal. During the general season, 437 hunters took 127 bulls for a 29% success rate. The harvest comprised 13% yearlings. A total of 145 (74% of those reporting) Tier II permittees went afield and killed 96 bulls. In total, 221 moose were taken from the subunit, which includes 11 bulls taken from Kalgin Island and no moose killed in federal subsistence hunts.

Progress Meeting Project Objectives: Population estimates of the subunit place the moose population at or below the objective. Bull:cow ratios are above objective levels and will be exploited fall/winter 1995 to help meet human-use objectives not met for the subunit during 1994. Declining adult recruitment slows our reaching human-use objectives. However, human-use objectives were attained on Kalgin Island, but the population objective was exceeded. In response to the island's excessive population, the Board of Game authorized the issuance of antlerless permits for the fall season.

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

Project Objectives:

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

Work Accomplished During the Project Segment Period: We flew late winter aerial surveys along riparian areas of the upper Nushagak and Mulchatna rivers and their major tributaries in January and February 1995. There were 484 moose on the Nushagak (281 moose/hr) and 542 moose along the Mulchatna (140 moose/hr). These concentrations were comparable to those we saw in 1993 and considerable higher than in 1994.

In February 1995 I worked with staff from the Togiak National Wildlife Refuge to census the moose population in Subunits 17A and 17C (west). The 1395 mi^2 study area contained an estimated 458 moose (±11.95% at 90% CI). We also derived an estimate of 100.9 moose (± 21.11% at 90% CI) for the subunit 17A portion of the study area (1042 mi^2).

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

Data from harvest tickets returned by June 1995 indicated that 487 hunters killed 159 bulls during the 1994-95 general season. No moose were harvested in 17A, 131 in 17B, and 27 in 17C. Hunter success was 47% (21/45) for local residents, 25% (37/150) for other Alaska residents, and 35% (101/292) for nonresidents. Aircraft was the most common mode of transportation (74%). The average reported antler size was 55.2", and 72% of the moose harvested had antlers 50" or larger.

Harvest data from Registration Hunt 583 indicated 438 permittees harvested an additional 135 bulls during the 1994-95 season. No moose were reported harvested in 17A, 35 were harvested in 17B, and 66 in 17C. Hunters harvested 34 in unspecified areas. Hunter success was 46% for local residents (108/235) and 36% for other Alaska residents (27/75). Nonresidents were not eligible to participate in this hunt. Boats were the most common means of access (64%). Fifty (37%) moose were killed in August, 53 (39%) in September, and 24 (18%) in December. The average reported antler size was 43.8", and 17% of the moose harvested had antlers 50" or larger.

Progress Meeting Project Objectives: Moose in Unit 17 experienced another relatively mild winter in 1994-95. Survival seemed high, with few reports of winter-killed moose. Moose populations were stable to increasing throughout the unit, in spite of increasing harvests by hunters and predators.

Moose numbers in subunit 17A were near or slightly exceeded the minimum population level of 100 moose. During the census, most of these moose were either in remote drainages or immediately adjacent to high density areas in 17C. Subunit 17A could support much higher densities, but illegal harvest is limiting population growth, especially during winters with good travel conditions. The illegal harvest in 17A during 1994-95 was about 20 moose.

One moose was killed in defense of life/property at a homestead along the Wood River about 5 miles north of Dillingham on 26 January 1995. The homestead is next to a wintering area and a young bull moose came into the yard and began stomping 2 chained dogs. Moose were also regular visitors to the Dillingham/Aleknagik road system for the first time.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	181.2	110.6	291.8
Actual	181.2	108.0	289.2
Difference	0	2.6[a]	2.6

[a]Lack of adequate survey conditions prevented some moose surveys from being flown.

Submitted by:

Jeff Hughes
Survey-Inventory Coordinator

Project Title: **Region III Moose Population and Habitat Management**

Project Location: Unit 12

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

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

Work Accomplished During the Project Segment Period: During November 1994 we censused moose in northwestern Unit 12 and completed 4 standard contour surveys in southern Unit 12. The census area measured 1119.6 mi^2 and included most of the area burned during the 1990 Porcupine Creek and Tok wildfires. Our methods followed the standard Gasaway census techniques, except that we were able to stratify the area based on count data collected during previous censuses or standard contour surveys. By using the historic count data and foregoing a stratification plane, we were able to save about $4,000.00 without sacrificing the precision of the estimate.

We determined a population estimate of 1075 moose (±15.85%) and a density of 0.93 moose/mi^2. The calf, yearling bull, and bull:100 cows ratios were 39:100, 16:100, and 38:100, respectively. Calf and yearling bull survival exceeded the 5-year unit averages of 30:100 and 11:100, respectively. Unitwide, the bull:cow ratio was above the population objective minimum. However, along the north face of the Alaska Range and in the upper Tok River drainage, the bull:cow ratio has declined and is near the population minimum. These areas receive the greatest hunting pressure compared to the remainder of the unit

Preliminary reported moose harvest during FY95 was 89 bulls with a 19% success rate. During the past 7 years, the Unit 12 success rate for moose has ranged between 15% and 27% and has averaged 22%. The mean antler spread was 45.2 inches, slightly above the 5-year average of 44.5 inches. Of the successful hunters, 25% used highway vehicles, 21% used horses, 19% used 4-wheelers, 19% used boats, 9% used airplanes, and 7% used ORVs. During FY95 most of the harvest was in the Chisana (21), Tok (20), Tetlin (14), and Little Tok River (13) drainages.

ADF&G staff did not conduct formal browse surveys in Unit 12 during FY95 due to conflicts with other projects.

Progress Meeting Project Objectives: Both of the unit's bull:100 cows objectives were met. However, along the north side of the Alaska Range and in the upper Tok River, the bull population has declined due to harvest. If the trend continues, antler restrictions may be enacted. Beginning in FY96, a season for spike or fork antlered moose during late August will occur in Unit 12. Under this regulation, we expect a shift of harvest to this age class,

which historically has been underrepresented in the harvest, without causing a decline in the bull:cow ratio. Except in a few areas, harvest has had limited effects on the ability of the unit's moose population to increase or on its sex and age composition.

Project Location: Unit 19 and Subunits 21A and 21E

Project Objectives and Activities:

1. Develop statistically sound population estimates for select portions of the area as an ongoing objective.

2. Annually assess population status and trend in portions of the unit where harvest levels significantly affect moose populations.

3. Maintain unitwide reported harvests of at least 500 moose for Unit 19, 150 for Unit 21A, and 125 for Unit 21E.

4. Encourage the U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and Alaska Department of Natural Resources to reduce suppression efforts on wildfires that do not threaten human life, property, or "valuable" resources, in accordance with provisions of the Alaska Interagency Fire Plans, so that fire can fulfill its natural role of maintaining young, highly productive and diverse habitats.

Work Accomplished During the Project Segment Period: No population estimation surveys were conducted in the McGrath area during 1994-1995. However, ongoing population trend and composition surveys were completed in 9 areas. An additional winter trend count area was surveyed 5 times between 15 December and 17 March to count winter concentrations of moose and to assess mortality rates along the Kuskokwim River near McGrath. During September 1994 staff in a hunter check station on the upper Hoholitna River monitored hunter participation and harvest rates. Hunter harvest ticket returns were analyzed during summer 1995. Staff monitored calving rates and calf survival near McGrath during summer 1994 and 1995. We analyzed moose marrow fat from winter- and wolf-killed animals during winter 1994-95.

Progress Meeting Project Objectives: Based on a sample of 2388 moose observed on 9 trend count areas during October and November 1994, bull:100 cow ratios varied from 0:100 to 73.2:100, with a mean of 31.9:100. Calf:100 cow ratios varied from 0:100 to 62.6:100, with a mean of 39.4:100. Overall, moose observed per hour of survey time was 144.7.

During the period from 7 November through 17 March, we conducted 6 repeated surveys along the riparian corridor of the Kuskokwim River between McGrath and Selatna River. On 7 November 15.3% of the observed moose were calves. This number declined steadily throughout the winter period, ending at 0% calves by 17 March 1995. Early December snows

resulted in very severe winter conditions for the moose population. In addition to a virtually complete loss of the 1994 calf crop in the area, wolf predation on adults was extremely high. Six marrow samples were gathered from hunter-killed moose, 3 from winter-killed moose, and 21 from wolf-killed moose in the area. Hunter-killed moose had a mean marrow fat content of 74.8%, winter-killed moose had 10.6% marrow fat, and wolf-killed moose had a mean of 54.0% marrow fat.

During summers 1990 through 1993, cumulative calf percentages in the herd remained between 20 and 24%. However, based on a sample of 324 moose during summer 1994, the observed calves in the herd was 12.7%. This significant drop in calf survival throughout the summer is probably due to heavy predation rates. Preliminary data from summer 1995 indicate a similar decline in calf percentages through the summer period.

Final results of the 1994-95 moose harvests for the area have been calculated based on hunter harvest ticket returns. We met the objective of maintaining at least 500 moose in the reported harvest from Unit 19. Five hundred thirty-five moose were reported taken by 1030 hunters (success rate = 51.9%). In Unit 21A, 119 moose were reported taken. This is the second year in succession the reported harvest has been below the 125 targeted for the unit. In Unit 21E, 123 hunters were successful. Reporting rates are relatively high in Unit 21A (probably 80+%) while reporting rates remain low from local users in Unit 21E (I suspect less than 70% reporting rate).

Efforts are ongoing to modify the various fire management options within select areas to ensure wildfires are allowed to burn to maintain or increase available moose habitat.

Project Location: Subunit 20A

Project Objectives and Activities:

1. Manage for a November adult population (i.e., excluding calves) of 10,000 to 12,000 adult moose by 1995.
   a. Monitor twinning rates of parturient cows annually in late May.
   b. Census the moose population on the Tanana Flats and western foothills in November 1995.

2. Manage for at least 30 bulls:100 cows overall, and at least 20 bulls:100 cows in the Tanana Flats, western foothills, and eastern foothills census areas.
   a. Monitor composition of moose population in 3 trend areas in November 1994.
   b. Examine composition data from census in November 1995.

3. Maintain an annual harvest of ≤300 bulls ≥2 years old, and a total harvest of <400 bulls until the population objective is reached.
   a. Monitor harvest with harvest report cards and hunter check stations.

b. Assume adult bulls have antlers ≥30 inches and the reporting rate for successful hunters is about 85%.

4. Allow the harvest of cow moose when the population is above the population objective of 10,000 adult moose.

Work Accomplished During Project Segment Period: To obtain an unbiased estimate of composition, we surveyed a stratified random sample from most of Unit 20A using new techniques. We "dry-labbed" the stratification by assigning sample units west of the Little Delta River into a "high" or a "medium-low" stratum based on previous results of stratification from 1988, 1991, and 1993. We surveyed 28 randomly selected sample units (17 high, 11 low-medium). Approximately one-half of the selected sample units were in the foothills and one-half in the Tanana Flats. No sightability plots were surveyed to establish a sightability correction factor. To estimate the population east of the Little Delta River, we increased the 1988 population estimate for this area by the same rate of growth calculated for 1988 to 1994 from our surveys west of the Little Delta River. This estimate for observable moose in all of Unit 20A was multiplied by a very conservative SCF of 1.05 to estimate the total 1994 moose population.

Based on this technique, we estimate the November 1994 moose population in Unit 20A included 13,300 moose ± 2700 moose (90%CI), of which 10,020 were adults and 3,270 were calves. This was derived by adding an estimated 10,870 observable moose (24.6% calves) in the 3912 mi^2 west of the Little Delta River to 1790 moose (1988 estimate of 1290 increased by 6%/year) east of the Little Delta River, and multiplying the sum by an SCF of 1.05.

These results indicated the moose population was at the low end of our objective for 10,000-12,000 adults and had increased about 6% per year from 1988 to 1994. Because of the potential for this population to exceed our population objectives within a few years, we submitted a proposal to the Board of Game to establish a limited drawing hunt for cows to stabilize the population. Although the board passed this proposal in March 1995, the regulation was not implemented because the necessary advisory committee approval was absent.

We completed a 6.2 hour moose survey of 200 mi^2 in the northcentral Tanana Flats on 8 and 9 May 1995 to assess overwinter survival of calves. We observed 648 moose, including 437 cows, 114 short yearlings (11-month olds), and 67 bulls. The short-yearling:cows ratio of 33:100 was the highest we have documented since 1984. Twenty-two percent (144/648) of the moose classified were short yearlings. The strong 1994 cohort, born after the first relatively mild winter in 5 years, undoubtedly benefited from the relatively mild winter of 1994-95 and from the lower wolf population. However, the effects of wolf control on increased overwinter survival of moose calves are difficult to assess because our survey was in a portion of Unit 20A closed to wolf control and because immigration of moose from Unit 20B as well as 20A can increase the density of moose on the Tanana Flats 2- to 4-fold.

We surveyed moose for 3.3 hours in the northern Tanana Flats on 21 and 22 May 1995 to determine twinning rates of parturient cows. We observed 57 cows without calves and 50 cows with calves. Only 3 of the 50 cows with calves had twins (6%). This compares to 10-22% from 1986-91 (no survey in 1992), 0% in 1993, and 18% (9/51) in 1994. The surprisingly low twinning rate could indicate the population is near or exceeding carrying capacity; this low rate could also indicate poor sightability because of leaf-out or early calving (older calves further from cows).

According to the preliminary report from the 1994 harvest report cards, 947 moose hunters harvested 382 bull moose in Unit 20A (40% success rate). Of these bulls, 304 (80%) had antler spreads of 30 inches or larger, 58 (15%) had spreads less than 30 inches, and 20 (5%) had unknown antler spreads.

Progress Meeting Project Objectives: Data that we collected for composition information in November 1994 were used to calculate a best estimate for the entire moose population in Unit 20A. The estimate of 10,020 adults indicated the moose population was at the low end of our population objective and had increased about 6% per year since 1988. These data contrast sharply with results from our superstratification in November 1993; we estimated the population had declined 12% per year between 1991 and 1993 but did not estimate total population size from the superstrat. A census designed to estimate population size is planned for November 1995 to clarify this discrepancy.

Although we attempted to establish a cow hunt after meeting our objective of 10,000-12,000 adult moose, the necessary advisory committee support was lacking and the regulation was not implemented. We should resubmit this proposal to the board if November 1995 surveys indicate Unit 20A includes at least 10,000 adults.

We are meeting our objectives for bull:cow ratios. In November 1994, we observed 35 bulls:100 cows in the 28 sample units randomly selected from west of the Little Delta River. From 1991 to 1993, in the Central Tanana Flats the bull:cow ratio increased from 21:100 to 30:100, respectively. Even though the 1993 bull:cow ratio in the western foothills (29:100) was slightly lower than in 1991 (32:100), we still met our objective of at least 20:100 in each area. In March 1995, we submitted a proposal that the board passed to lengthen the bull hunting season throughout Unit 20A by 5 days because we had met our bull:cow ratio objectives for 4 years.

We probably exceeded our objectives for a total harvest of <400 bulls, with $\leq$300 bulls 2 years or older. In 1994, the preliminary reported harvest of 382 bulls included 304 bulls 2 years or older. If we assume that 17% of successful hunters did not report (Gasaway et al. 1983), we estimate that 460 bulls were harvested, including approximately 366 bulls 2 years and older.

Project Location: Subunit 20B

Project Objectives and Activities:

1. Manage for a population of 10,000 adult moose (i.e., excluding calves) by 1995, 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 1994.

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

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

4. Minimize human-moose conflicts in the Fairbanks vicinity, while accommodating moose for viewing.

Work Accomplished During the Project Segment Period: We completed surveys in 3 portions of Unit 20B in November 1994, one in Central 20B, one in the Minto Flats Management Area (MFMA), and one in the Fairbanks Management Area (FMA). In Central 20B, we completed 2 moose surveys using a new technique called the "regression estimator." After combining data from the 2 surveys, we estimate that 836 moose (±19%, 90%CI) inhabit a 642 mi^2 area (1.3 moose/mi^2) north and west of Fairbanks. Although productivity (47 calves:100 cows, 28% calves) was as good as in other portions of Units 20B and 20A (range 44-61:100), the bull:cow ratio was low (18:100) and below our objectives for at least 30:100. In addition, yearling recruitment was low (5 yearling bulls:100 cows). Until we receive more information on the yearling bull harvest from September 1994, we will not know if this reflects poor recruitment or high harvest of this age class.

In the MFMA, we spent 13 hours surveying 16 sample units (187 mi^2, 19% of MFMA) to assess composition. Sample units were randomly chosen from the 80 SU used in our 1989 census of the MFMA. Calf production and survival to fall was high (47 calves:100 cows), with our estimate being surprisingly precise (±8.47%, 90%CI). The bull:cow ratio was also high (47:100, ±35.99%), which was not surprising because harvest has been restricted to Tier II hunting, and harvests have only ranged from 36-47 bulls annually from 1991-92 through 1993-94. Yearling recruitment was 11 yearling bulls:100 cows (±42.25%).

In the FMA, we surveyed 78 mi^2 (approximately 50% of the FMA), using standard techniques and flying an intensive plot within most sample units. We observed 163 moose, including 13 bulls, 93 cows, and 57 calves. The resulting calf:cow ratio was very high (61:100) and the bull:cow ratio very low (14:100). Multiplying the observable moose by the calculated SCF of 1.23 results in an estimated population of 201 moose within the 78 mi^2, or 2.6 moose/mi^2. The entire FMA probably has about 250-300 moose.

In 1994-95 preliminary reports from harvest tickets indicate at least 461 bull moose were harvested in Unit 20B. This harvest included 369 bulls taken in the general season (1941 hunters), 43 bulls taken by 407 participants in registration hunt RM786 for bowhunters in the Fairbanks Management Area (FMA), and 49 bulls taken by 135 participants in Tier II hunt TM785 for the Minto Flats Management Area (MFMA). If we assume hunters had an 85% reporting rate, the estimated total harvest in Unit 20B was 542 bulls.

The FMA registration hunt continues to be popular with local bowhunters, even though success rates are low (11% in 1993 and 1994). The number of hunters registering for this hunt has steadily increased from 333 in 1991 to 597 in 1994. However, 32% (190/597) of the 1994 permittees did not hunt or report. The 1993 and 1994 harvests of 41 and 43 bulls, respectively, are nearly twice the average harvest reported for the previous 3 years (25). Eight bulls were taken during the November season, the highest reported. The proportion of yearlings (antlers ≤30 inches) in the harvest has declined from 79% in 1991 and 75% in 1992 to 63% (25/40) in 1993 and 65% (28/43) in 1994.

Interest in the MFMA Tier II hunt is also high, as reflected by the 597 applicants for the 1994-95 hunt. The number of permits issued for the Minto Management Area Tier II hunt increased to 200 in 1993-94 (although 5 were not valid) and 1994-95 from 150 the previous 3 years. The harvest of 49 bulls included 18 bulls taken during the winter season. The 36% success rate was similar to 1992-93 and 1993-94. Residents of Minto, Manley, and Nenana received 32% of the permits and Fairbanks vicinity residents received 61% of the permits. We are not aware of any additional bulls taken under federal subsistence permits.

Progress Meeting Project Objectives: Because of the lack of recent moose population estimation surveys in 20B east and west, we are unable to determine whether or not we are meeting our population objectives. Results from November 1994 surveys in central 20B should be supplemented with surveys in 1995 and 1996 in these areas.

We are not meeting our objectives in all areas for at least 30 bulls:100 cows overall and at least 20 bulls:100 cows in each count area. We estimated only 18 bulls:100 cows in central 20B and 14:100 in the FMA. However, we far exceeded our objectives in the MFMA where we counted 47:100.

We exceeded our harvest objectives for 300-400 bulls in 5 of the last 6 years. However, we do not know if we have met our population objective.

We have reduced some of the human-moose conflicts within the Fairbanks vicinity 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.

Project Location: Subunits 20C, 20F, and 25C

Project Objectives and Activities: The management objectives listed in the FY94 moose performance reports for this area are listed:

1. Estimate hunting mortality and document nonhunting mortality when possible.

2. Estimate moose densities in Units 20C, 20F, and 25C by 1996.
   a. Cooperate with BLM to superstratify approximately 1,000 mi^2 in central Unit 25C in November 1992.

3. Promote moose habitat enhancement by allowing natural fires to alter vegetation.

4. Establish definitive moose population objectives for Units 20C, 20F, and 25C by 1996.

5. Provide for a sustained yield harvest of these low-density populations until specific population management guidelines have been established.

Work Accomplished During the Project Segment Period: In Unit 20C, preliminary data indicate 373 hunters reported taking 150 bulls during 1994. From 1986 to 1992, the number of hunters ranged from 224-327, and harvest ranged from 56-142 bulls, indicating an increase in the number of hunters.

In Unit 20F, preliminary data indicate 104 hunters reported taking 29 moose during 1994. From 1986 to 1993, the number of hunters ranged from 64 to 129, and harvests ranged from 20 to 38 moose.

In Unit 25C, preliminary data indicate 155 hunters reported killing 54 moose in 1994. From 1986 to 1993, the number of hunters ranged from 97 to 186, and harvest ranged from 26 to 55 moose.

We were contacted by the village of Tanana regarding permit needs for the Nuchalawoyya Potlatch in April. I forwarded permits to Donna Folger, who administered issuing the permits. They reported harvesting the limit of 3 moose for the potlatch.

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

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

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

We have not collected any density or composition information in any of these units since 1989. We did make a reconnaissance flight through the northern edge of Unit 20C, along the Tozitna River across the Yukon River and up Hess Creek to look at overwintering conditions for moose. Snow depths were not extreme and moose were doing well. The staff from Denali National Park completed a Gasaway-type moose census in the preserve near Lake Minchumina. They estimated moose densities at 0.34 moose/mi^2, with 36 calves:100 cows and 25 bulls:100 cows over an area of 1,007 sq. mi^2. We will attempt at least some trend area counts in Units 20F or 25C, but survey plans have not yet been finalized for the fall 1995 surveys.

We did not meet our objective to cooperate with BLM to conduct a superstratification survey in Unit 25C. Weather and other variables have delayed this project for several years. Plans to coordinate a survey are being made between the two agencies, with a possible goal of a fall 1996 survey.

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

We are in the process of establishing definitive moose population objectives. To meet this objective, we must collect, at a minimum, moose composition data for each unit to give a baseline for our objectives. Information from recent surveys and upcoming fall 1995 surveys will help formulate those population objectives, at least for Unit 20C and one other unit.

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

We recommend the following changes to the project objectives and activities:

1. Change objective 2b to "Cooperate with BLM to superstratify approximately 1000 mi^2 in central Unit 25C in November 1996."

2. Change objective 4 to "Establish definitive moose population objectives for Units 20C, 20F, and 25C by 1997."

Project Location: Subunit 20D

Project Objectives and Activities:

1. Manage for a posthunt population of 4000-6000 moose, with 1200-2200 in northern Unit 20D, 2000-2500 in southwestern Unit 20D, and 1000-1500 in southeastern Unit 20D.

2. Manage for a posthunting ratio of 30 bulls:100 cows.

3. Manage for a ratio of no less than 30 calves:100 cows.

4. Increase the bull age structure in southwestern Unit 20D so that by 1993 at least 20% of the bulls observed after the hunting season have an antler spread of >50 inches.

Work Accomplished During the Project Segment Period: During fall 1994 project objectives were assessed with population trend count surveys in the Donnelly Trend Count Area (TCA) and Robertson River composition survey in southern Unit 20D and Central Creek TCA in northern Unit 20D. Reported harvest was analyzed for the unit.

Bull:cow ratios met the objective in the Central Creek TCA (35 bulls:100 cows) but continued to decline. Bull:cow ratios were below the objective in the Donnelly TCA (25 bulls:100 cows) and the Robertson River (29 bulls:100 cows).

Calf:cow ratios met the objective in the Donnelly TCA (37 calves:100 cows) and were below the objective in the Central Creek TCA (16 calves:100 cows) and the Robertson River survey (12 calves:100 cows).

The bull age structure in southwestern Unit 20D increased to 26% of all bulls being large, meeting the objective.

Reported total harvest declined to 125 moose during the 1994-95 hunting season; however, total number of hunters decreased to 566.

The Alaska Board of Game adopted regulations that designated Unit 20D as an area for intensive management of predators and prey. We adopted a moose population goal of 8000-10,000 moose with a harvest goal of 240-500 moose for Unit 20D.

Progress Meeting Project Objectives: It was not possible to determine progress toward population size objectives because no population estimation surveys were conducted in Unit 20D. We monitored herd density and composition ratios. Bull:cow ratios met the objective in the Central Creek TCA and were slightly below the objective in the Donnelly TCA and the Robertson River. Antler restrictions will remain in effect in southwestern Unit 20D to compensate for low bull:cow ratios. Calf:cow ratios were met in the Donnelly TCA and were

below the objective in the Central Creek TCA and the Robertson River. Intensive management of predators was implemented in Unit 20D, partially in response to low calf survival. We monitored hunting season harvest.

Project Location: Subunit 20E

Project Objectives and Activities:

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

Work Accomplished During the Project Segment Period: No censuses or browse transect surveys were conducted in Unit 20E during FY95. The next census will be conducted in the Mosquito Flats study area during fall 1995. Due to conflicts with other projects during FY95, we did not conduct the browse surveys. Browse surveys will be conducted in portions of Unit 20E during FY96.

During FY95, preliminary harvest data indicate 478 hunters harvested 95 bull moose (20% success). The average annual hunter participation rate and harvest during the past 5 years has been 384 hunters and 86 bull moose, respectively. The average success rate has been 22%. The number of hunters and moose harvested increased the past 4 years. Probable causes of the higher harvest are 1) the Fortymile caribou season is open concurrently with the moose season, attracting hunters for both species, 2) regulations restricting harvest to bulls with spike/fork or antlers >50 inches throughout southcentral Alaska caused a displacement of hunters into the area, and 3) several little known moose concentration areas were found and hunted intensely during this hunting season. Of the successful hunters, 31% used 4-wheelers, 24% used airplanes, 16% used boats, 15% used highway vehicles, and 13% used ORVs. Mean antler width was 48.6 inches, exceeding the 5-year average of 46.9 inches.

During October and November 1994, fall moose composition and trend count surveys were flown in 4 traditional count areas in Unit 20E. ADF&G staff classified 553 moose in 11.5 survey hours. The overall bull:cow ratio was 74:100, exceeding the minimum management objective of 40:100. The unitwide bull:cow ratio has remained consistent over the past 4 years, ranging from 63 to 65:100. The bull:cow ratio was higher this year because most of the sampling occurred in inaccessible areas which receive little hunting pressure. The more accessible and most hunted areas will be sampled during the FY96 census. The overall calf:cow ratio was 23:100 but varied widely among count areas (18:100 to 36:100). Calf survival to 5 months has declined from the 5-year average of 27:100 to 19:100 in the eastern portion of the unit. This area supports the greatest density of moose (0.9 moose/mi^2) in Unit 20E. The causes for the decline in calf recruitment are not known.

Progress Meeting Project Objectives: Based on survey results since 1992, the moose population in central and western Unit 20E has remained stable or slightly declined and is currently at low-density (0.2-0.6 moose/mi^2). The population density in the eastern portion of the unit ranges between 0.8 and 1.0 moose/mi^2, but based on calf recruitment the past 2 years the population has probably stabilized. Overall, the moose population in Unit 20E remains at low-density (0.4-0.5 moose/mi^2). Past and ongoing research has shown that wolf and bear predation is the primary limiting factor on the moose population, and hunting and habitat quality have had little effect. Under current predator levels, the moose population in Unit 20E will remain at low-density. Managing for a significant growth of Unit 20E's moose population is not a long-term management goal; however, it is desired by the majority of local residents. If in the future the political and social attitudes become more accepting of active predator management or if different management tools become available, management objectives and activities should be developed to increase the area's moose population.

The bull:cow ratio in Unit 20E exceeds the management objective. However, bull:cow ratios have declined in the most popular hunting areas. To protect against an excessive decline in bull numbers in a portion of Unit 20E, the Alaska Board of Game established the Ladue River Controlled Use Area in the eastern portion of the unit at the spring 1994 meeting. Based on results collected during FY95, the bull population will have adequate protection under this regulation because it gives us the flexibility to periodically change hunter distribution.

Project Location: Subunits 21B, 21C, 21D, and Unit 24

Project Objectives and Activities:

Unit 21B:

The Floodplain Areas of the Yukon and Novi 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 check stations.

Remainder of the Novi 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 check stations.

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 check stations.

Unit 21C:

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. By 1997 develop a population level and density estimate for the Melozitna River drainage by conducting a moose stratification survey.

Unit 21D:

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. Determine forage dynamics of moose by defining the choice of browse species during winter; measuring the nutritive quality of winter browse, estimating browse consumption as a proportion of current annual growth, and assaying moose body condition by urinary chemistry or ultrasound.

9. Determine the number and residency of hunters using the Koyukuk River to access the Three-day Slough area by operating a moose hunter check station at Ella's cabin.

Unit 24:

1. Manage a moose population at the current level of 3,000-4,000 in the area south of Hughes, including the Koyukuk Controlled Use Area.

2. Increase the moose population to 5,000-6,000 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 3,000-3,500.

4. Maintain the population in the Gates of the Arctic National Park at 1,300-1,500.
   - Conduct annual trend area surveys.

5. Determine harvest.
   - Monitor harvest with harvest reports and check stations.

Work Accomplished During the Project Segment Period: Fall moose composition surveys were flown in cooperation with USFWS during November 1994. In Unit 21B, 389 moose were classified in 205.3 mi^2 along the Novi River for a density of 1.9 moose per square mile. The bull:cow ratio at 18:100 was lower than in previous years, the calf:cow ratio was down to 24:100, and the yearling percent in the herd was low at 8%. In Unit 21D within the Three-day Slough trend count area, the observed density of moose was 12.2 moose per square mile. Productivity in the area was good with average calf recruitment. The bull:cow ratio was 36:100, the calf:cow ratio was 28:100, and the yearling percent in the herd was

11%. In the Kaiyuh Slough count area, the bull:cow ratio was 41:100, the calf:cow ratio 33:100, and the yearling percent in the herd was 14%.

In May 1995 we conducted a moose calf twinning survey to determine the percentage of cows producing twins. The twinning rate was 33%. Numbers lower than 20% usually indicate environmental stress either from hard winters or poor forage conditions.

In Unit 21B, 83 hunters reported taking 55 bull moose. USFWS staff operated a moose hunter check station at the mouth of the Nowitna. Fifty-four moose were taken by 134 hunters within the drainage, which includes part of Unit 21A. Sixteen hunters were unit residents, 104 were Alaska residents and 13 were nonresidents. The number of hunters using the Nowitna has remained stable.

Twenty-six moose were taken by 32 hunters in Unit 21C. Nine hunters were nonresidents, 22 were Alaska residents, and 1 hunter's residency was unknown.

In Unit 21D preliminary harvest data from Anchorage show 306 hunters taking 249 moose of which 237 were bulls and 12 were females. Harvest has been slowly increasing within the unit with most of the harvest coming from the Koyukuk River. A moose hunter check station was operated on the Koyukuk River and 356 hunters were checked through. Hunters took 202 moose; residency and harvest are as follows: 106 unit residents took 34 moose, 194 Alaska residents took 127 moose, and 56 nonresidents took 41 moose.

Reported harvest in Unit 24 was 128 moose by 193 hunters. The number of hunters using the Dalton Highway for access has stabilized at about 100; they took 42 moose.

Progress Meeting Project Objectives: In Unit 21B moose populations within the Nowitna drainage have reversed their decline but are still 10-40% below population objectives. Depressed bull:cow ratios are hindering recovery. The Novi drainage continues to maintain an annual harvest of 40 bulls. The sources of calf mortality are unknown.

The moose population is at or above the population management objective level in Units 21C and 21D. A study is underway to investigate the foraging dynamics of moose in the Three-day Slough area. Population estimates were not done for the Gisasa, Melozitna, Yuki, and Nulato Rivers.

In southern and northern Unit 24, the moose population is at or above the objective level. In central Unit 24, a population estimation survey was conducted with USFWS and the number of moose was estimated at 1759 ± 22%. This was an increase of 600 moose over the 1989 census. Predation and out of season harvest have kept the population low, but recent fires and alternate prey (caribou) are helping the moose population.

Project Location: Subunits 25A, 25B, and 25D

Project Objectives and Activities:

Unit 25 Overall:

1. Continue efforts to communicate with and educate local residents about moose management.

2. In cooperation with USFWS, monitor moose population status as funding permits.

Unit 25A:

1. Evaluate possible effects of increasing hunting moose on major drainages along the Brooks Range.

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

3. Cooperate with USFWS in periodically determining population status.

Unit 25B:

1. Plan for and conduct biannual trend counts in selected areas for comparison with previous trend counts.

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

Unit 25D:

1. In cooperation with USFWS, plan for 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 moose trend surveys in Units 25D east during October 1994 and in 25D west during November 1994. Weather precluded composition surveys in Unit 25A. FWS staff initiated a cooperative study of moose population identity in Unit 25A. We radiocollared 57 moose in March 1995 and will monitor them to determine seasonal movements and habitat use.

Harvest data for all units are being analyzed; final figures will be available July 1995.

Progress Meeting Project Objectives: Overall management objectives for these units were met. There is progress in Unit 25A meeting objectives 1 and 2. Weather precluded

composition surveys and progress on objective 3. No surveys were accomplished in Unit 25B, but educational moose management videos were distributed to address objective 2. Composition surveys and distribution of educational videos on moose management represented progress with both objectives in Unit 25D. In addition, we are discussing the possibility of developing a cooperative moose management plan for Unit 25D with FWS and local communities. A long-term plan to monitor moose population trends in Unit 25D West was developed in cooperation with FWS.

Project Location: Subunits 26B and 26C

Project Objectives and Activities:

1. Continue to work with USFWS to monitor moose population status through trend counts.

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 1994. These surveys showed a significant decline in moose numbers and extremely poor calf survival. A browse condition and availability evaluation was conducted in Unit 26B during April 1995 to determine if poor habitat is a factor in the decline.

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

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

Progress Meeting Project Objectives: Substantial progress was made toward meeting objectives. Population status and habitat conditions were monitored. Objectives relating to posthunting sex ratios and hunter success continue to be met.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	106.3	102.5	208.8
Actual	97.8	59.5	157.3
Difference	8.5	43.0	51.5

Efforts to conduct a census in the Holitna-Hoholitna Controlled Use Area were unsuccessful. Weather and conflicting priorities prevented surveys planned for Unit 24.

Submitted by:

Kenton P. Taylor
Management Coordinator

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

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

Project Objectives and Activities:

1. Increase the moose population in Unit 18 by 10% a year to maintain a population goal for the Yukon River population of 3000-5000 moose. A population goal for the Kuskokwim River population has not been set. The bull:cow ratio for both populations will be maintained at a minimum of 30 bulls per 100 cows.

    a. Conduct fall sex and age composition surveys and winter recruitment surveys of the Yukon River population annually.
    b. Conduct fall and/or midwinter surveys of the major drainages of the Kuskokwim and the main Kuskokwim River 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.
    e. Improve harvest reporting and compliance with hunting regulations.

2. Develop a moose management plan in cooperation with local communities along the Yukon River.

Work Accomplished During the Project Segment Period: An aerial survey of the moose population on the Yukon River delta was completed during 16-17 March 1994. Sixty-five moose were counted in the delta portion of the Yukon River downstream of Mountain Village. We conducted midwinter surveys along the Yukon River between Ohagamiut and Paimiut and along the Kuskokwim River between Kalskag and Tuluksak during March 1994. Observing animals was difficult due to lack of snow and exposed vegetation, and moose were not aggregated in willowed riparian areas, making comparisons to previous years difficult. Moose numbers have not changed markedly, at least along the Yukon portion of the survey area. Surveys were also conducted along the Kanektok and the Arolik rivers during March 1994, and no moose were seen.

The Department and the U.S. Fish and Wildlife Service (FWS) continued to monitor the moose collared during March 1991, and we observed 9 short yearlings per 10 collared cows in the Kuskokwim River drainage during mid April 1994. The 4 remaining radiocollared female moose along the lower Yukon were regularly relocated until April 1994. No short yearlings were observed with these cows. Six of the original 10 moose collared on the Yukon were poached by hunters, or died of unknown causes.

We set up a hunter check station on the Yukon River during September 1993 to collect harvest and age information of moose taken in Units 18 and 21E. Three-hundred five hunters went through the check station. Of the 111 moose reported harvested, 60 were sampled for antler measurements and for aging by extracting an incisor tooth.

Additional harvest statistics were gathered from harvest ticket reports turned in by hunters. In Unit 18, 234 hunters returned harvest reports, and 95 male moose were reported harvested. This is the highest reported harvest for Unit 18. Successful hunters needed an average of 6 days to harvest a moose. Ninety hunters used boats for transportation, 4 used snowmachines, and 1 used an aircraft. Seventy-four (78%) male moose were harvested along the Yukon River drainage, and 21 male moose (22%) were taken along the Kuskokwim drainage and Johnson River.

Progress Meeting Project Objectives: During the past 8 years, estimated recruitment rates from aerial survey data ranged from 12 to 25% for the Yukon River drainage. Steady increases in moose numbers along the lower Yukon drainage have been documented since 1985. However, fall composition counts have not been regularly completed because of poor snow conditions. We did not complete a census of the Kuskokwim drainage until 1993. The results of this census show the lower Kuskokwim moose population along the main river is very low-density, estimated at 200 moose. The riparian corridor of the main Kuskokwim River between Kalskag and Kwethluk only yielded an estimate of 217 moose ± 28% at the 80% confidence level. The Yukon census completed during February 1992 yielded an estimate of 994 moose ± 13% at the 80% confidence level. The population size of the delta portion of the Yukon River is estimated at 65 moose based on the 17 March 1994 census. The tributaries of the Kuskokwim River have an estimated moose population of 200 moose based on surveys in 1989 and 1990 along the Tuluksak, the Kisaralik, the Kwethluk, and the Eek drainages. We estimated that minimum population size for all of Unit 18 is 1500 moose.

We drafted a moose management plan for the lower Yukon River in cooperation with the lower Yukon villages, the FWS, and the Association of Village Council Presidents (AVCP). The plan established the 3000 moose population goal and a 5-25 September bull moose season within the delta portion of the lower Yukon River. The delta of the Yukon River has been closed to hunting since the fall of 1989. Improved harvest reporting and compliance with regulations is being achieved through hunter contacts at the check station, radio and newspaper announcements, law enforcement activities, and community meetings. Harvest ticket receipts and returns increased dramatically over the last 5 years.

Project Location: Unit 22 (25,230 mi^2)
Seward Peninsula and that portion of the Nulato Hills draining west into Norton Sound.

Project Objectives and Activities: The overall population management objective is to maintain a minimum population level of 5000-7000 moose throughout the Unit. In Subunit

22A the objective is to increase population size from the current estimate of 400-600 moose to at least 800-1000 moose. In Subunits 22B and 22D the objective is to maintain the population at 1500-2500 and 2500-3000 moose, respectively, with a minimum bull:cow ratio of 30:100. In Subunit 22C the objective is to maintain the population of 350 with a minimum bull:cow ratio of 20:100. In Subunit 22E the objective is to maintain the existing population of 250-350 moose.

These objectives will be attained 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 subunits 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.
3. Develop a moose management plan, with special emphasis on areas adjacent to the road system.

Work Accomplished During the Project Segment Period: Harvest from Unit 22 was 210 moose (200 males and 10 females). A breakdown of the harvest by subunit is as follows: 22A-17; 22B-56; 22C-29; 22D-88; and 22E-20. Of the 482 individuals who reported hunting in Unit 22, 89% were residents of Alaska. Hunter success rate was 44%.

We collected and analyzed incisorform teeth from 66 hunter-killed moose to determine age and the cause of the unusually high incidence of tooth breakage among Seward Peninsula moose.

We completed fall composition surveys during October 1994 in the American Creek drainage in Subunit 22B, the Snake River drainage in Subunit 22C, and the Henry and Washington Creek drainages in Subunit 22D:

Count Area	Bulls:100 cows	Calves:100 cows	*n*
American Creek	28	28	45
Snake River	14	32	54
Henry Creek	35	17	91
Washington Creek	49	34	64

We completed a moose census in Subunit 22C during March 1995. The estimated population size was 479 moose (range 424-534 at the 90% confidence level).

Spring recruitment surveys were completed in trend count areas located in the Niukluk and Fish River drainage in Subunit 22B, and the American, Kuzitrin, and Kougarok drainages of Subunit 22D during March and April 1995:

Count Area	Total Adults	No. Calves	Percent Calves
Niukluk/Fish River	546	29	5
American River	299	51	17
Kougarak/Kuzitrin River	714	116	16

During early April 1995, we radiocollared 27 cows in the Niukluk and Fish River drainage. The purpose of the study was to determine calving success and the timing of calf mortality. Initial results of the study will be reported in the next progress report.

We sent a detailed questionnaire to local residents regarding moose management to all households in the communities of Teller, Nome, Council and Solomon during August 1994. Analysis of the returned questionnaires is in progress at this time.

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

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 by those who hunt outside of current season dates. Efforts to inform the public of the importance of wildlife conservation and need for regulations are having an effect in some communities; the number of individuals purchasing license and/or picking up harvest tickets has increased. However, we need additional contact with local residents if we are to achieve complete compliance with current moose regulations.

Moose management discussions took place throughout the year. Although the actual groundwork for development of a moose management plan was not initiated, a moose questionnaire was sent to Unit residents along the road systems, asking their opinions regarding regulatory changes should they become necessary.

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

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

1. Conduct modified Gasaway censuses in established census areas to monitor population composition and recruitment.

2. Identify a census area in the Upper Kobuk River drainage and conduct a quantitative census.

3. 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: The middle Noatak River Drainage from approximately the village of Noatak to and including the Kelly River Drainage (857 mi^2) was censused in November 1994. This was approximately half of the area censused in 1993. The overall density of moose was 1.06 moose/mi^2 with 16 calves/100 cows and 41 bulls/100 cows. At the 90% confidence level the population estimate was 1000 moose $\pm$ 15.5%.

A census area in the upper Kobuk River drainage was delineated. Snow conditions and weather prevented a census from being conducted. The fourth year of a cooperative moose telemetry project in the middle Noatak River drainage was completed as well as the second year of a similar study in the Tagagawik River. Collared moose were relocated throughout the year with more intensive monitoring around calving, hunting seasons, and recollaring in the spring. Fifty-nine additional moose were radiocollared in April 1995 to bring the sample size in the Noatak up to 100. There was one possible capture mortality. Total mortality for collared moose in the third year of the study (Apr 1994-Apr 1995) was 20% compared to 24% the first year and 27% the second. Calves per 100 cows was determined from census data and equaled 20/100 (radiocollared sample was 28/100). On the Tagagawik River in the Selawik River drainage, no additional moose were captured; movements were monitored. FWS is responsible for reporting requirements on this study.

Progress Meeting Project Objectives: Data from the Noatak moose telemetry project in combination with census data indicate population objectives are being met in the Noatak. 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 to conducting Gasaway censuses on rotational basis throughout the unit with modified census techniques in the intervening years.

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

Project Objectives and Activities:

1. Maintain the Subunit 26A moose population at approximately the current level, with a minimum population of 1200 moose and a minimum bull:cow ratio of 30:100. (This objective will change to one of rebuilding the population).
   a. Conduct late winter trend counts annually to monitor population trends and short yearling recruitment. A unitwide census will take place every 7 years.(In the future this census will be conducted every 4 years).
   b. Conduct fall surveys to monitor sex and age composition trends and summer calf survival.
2. Manage for a hunter success rate of not less than 50%.
3. Manage the harvest for spatial and temporal separation of recreational and subsistence hunters.
   a. Monitor harvest through field contacts.
   b. Monitor harvest through hunter harvest reports.

Work Accomplished During the Project Segment Period: Fall sex and age composition surveys were completed in the Colville, Anaktuvuk, and Chandler River drainages during November 1994. Of the 293 moose observed, 74 were bulls (34.7 bulls per 100 cows), 213 were cows, and 6 were calves (3% calves). The estimated antler size classification for bulls was as follows:

Inches	<30	30-39	40-49	50-59	60+
Percent	9	12	25	38	17

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

We conducted additional investigations to determine why the moose population has been declining and calf survival has been low. In the spring of 1994 we conducted a wolf census and found that wolf population density has remained high in the area. During April 1995 we collected moose pellets from 28 female moose; these are being analyzed to determine whether or not the animals were pregnant. A moose browse specialist spent 3 days observing willow quality in the area and analyzing food content and browse quality. In late May and early June, surveys were flown during calving season to determine the calving rate for 1995 and determine sources of calf mortality. Calving was late; only one calf was observed before 29 May. Only 4 out of 25 observed cows (16 calves/100 cows) had calves by 9 June. Some calf predation by bears and/or wolves had occurred, but we observed no direct predation.

We compiled harvest data from harvest reports submitted by hunters. Hunters reported killing 36 bulls and 4 cows during the fall 1994 hunting season. Fewer moose were harvested than in past years because of heavy flooding during early September. The chronology of the harvest was as follows: Aug. (1); 1-7 Sep. (20); 8-14 Sep. (8); 15-21 Sep. (7); 22-28 Sep. (2); Oct. (1) and Nov. (1). The harvest was distributed throughout the Colville River drainage, and the largest number of animals were taken from the Anaktuvuk River (35%), the Colville from the mouth of the Killik River to the Anaktuvuk River (25%), and the Chandler River (25%). Antler sizes and percentage of animals having those sizes were as follows: <25" (2.5%); 25-29.99" (0%); 30-34.99" (2.5%); 35-39.99" (5.0%); 40-44.99" (7.5%); 45-49.99" (2.5%); 50-54.99" (42.5%); 55-59.99" (20.0%); 60-64.99" (7.5%); >65" (0%).

Twenty percent of hunters were residents of Unit 26, 18% were nonlocal Alaska residents, and 62% were nonresidents. The average hunt lasted 6.1 days, and the hunter success rate was 75%.

Progress Meeting Project Objectives: The number of moose counted in Subunit 26A has declined by 51% since 1991. The calf survival rate has been very low for 2 years and it may be low again this year. We are considerably below our population objective of 1200 animals, and the population is continuing to decline. We have changed the objective of maintaining the population to one of rebuilding the population.

Several changes were made in the regulations to reduce hunting pressure. The cow season was reduced to August, which is when airplanes cannot be used to hunt. In addition, the bull season was shortened and hunters were restricted to harvesting only bulls with antlers of 50" or greater after 1 September.

We will continue to investigate causes of the population decline. In addition to annual S&I surveys, pregnancy testing, and browse studies, we are planning a radiotelemetry study in 1996 to determine calving success, calf survival, and calf mortality factors. We will also obtain information on cow survival rates and causes of cow mortality.

The goal of spatial and temporal separation of recreational and subsistence hunters has been realized. Subunit 26A is a controlled use area where aircraft cannot be used to hunt during August, allowing local people using boats to complete much of their hunting activities before recreational hunters arrive. In addition, local hunters tended to concentrate their efforts on the lower part of the Colville River, while recreational hunters generally flew to the upper portions of the drainage.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	53.9	41.9	95.8
Actual	53.9	99.9	153.8
Difference	0	-58.0	-58.0

Population declines in Units 22, 23, and Subunit 26A required greatly expanded survey, census, and radiocollaring activities in those areas.

Submitted by:

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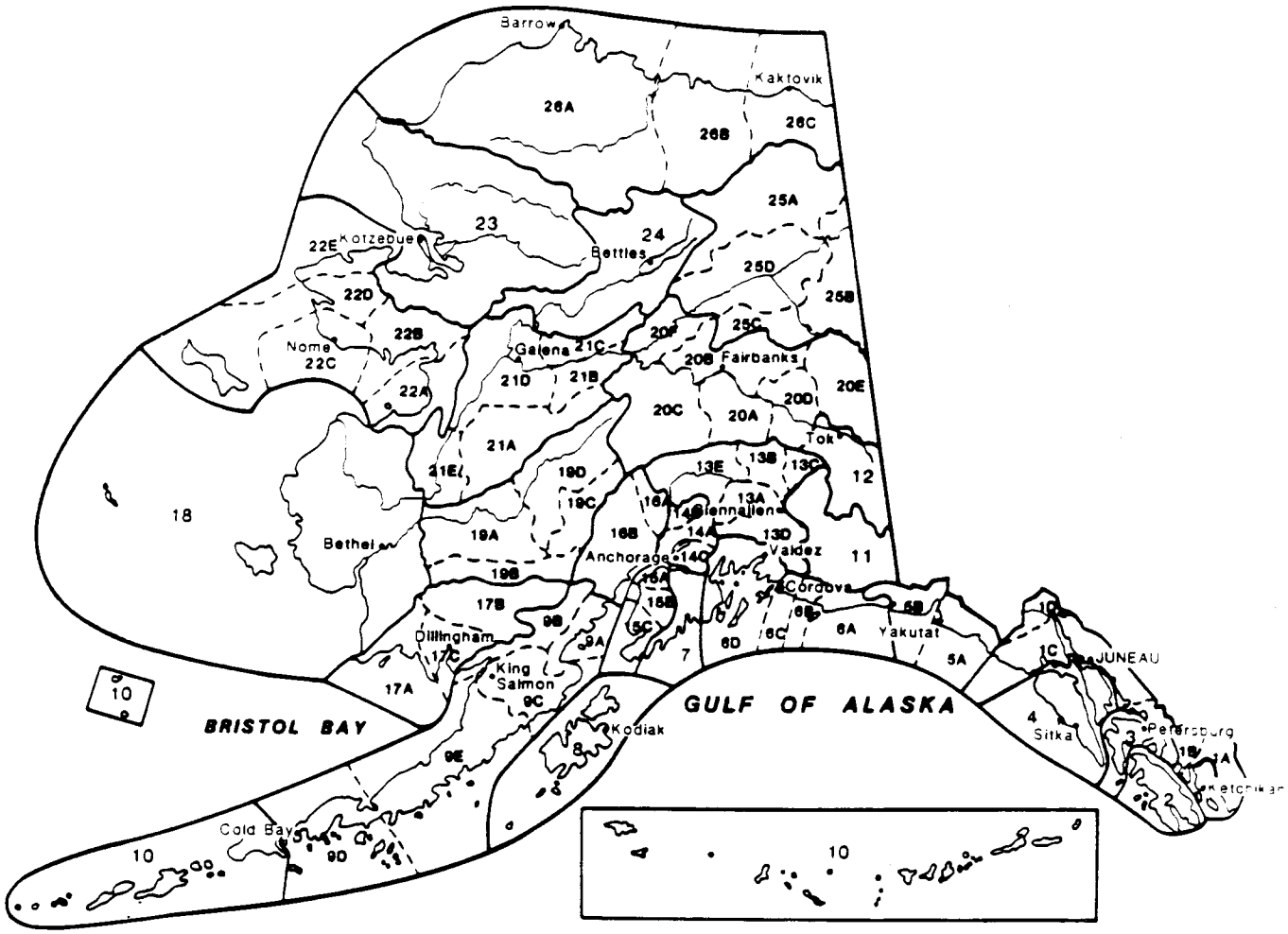
Alaska's Game Management Units



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

PAT COSTELLO