Alaska Department of Fish and Game
Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
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Survey-Inventory Activities
1 July 1990 - 30 June 1991

MOOSE

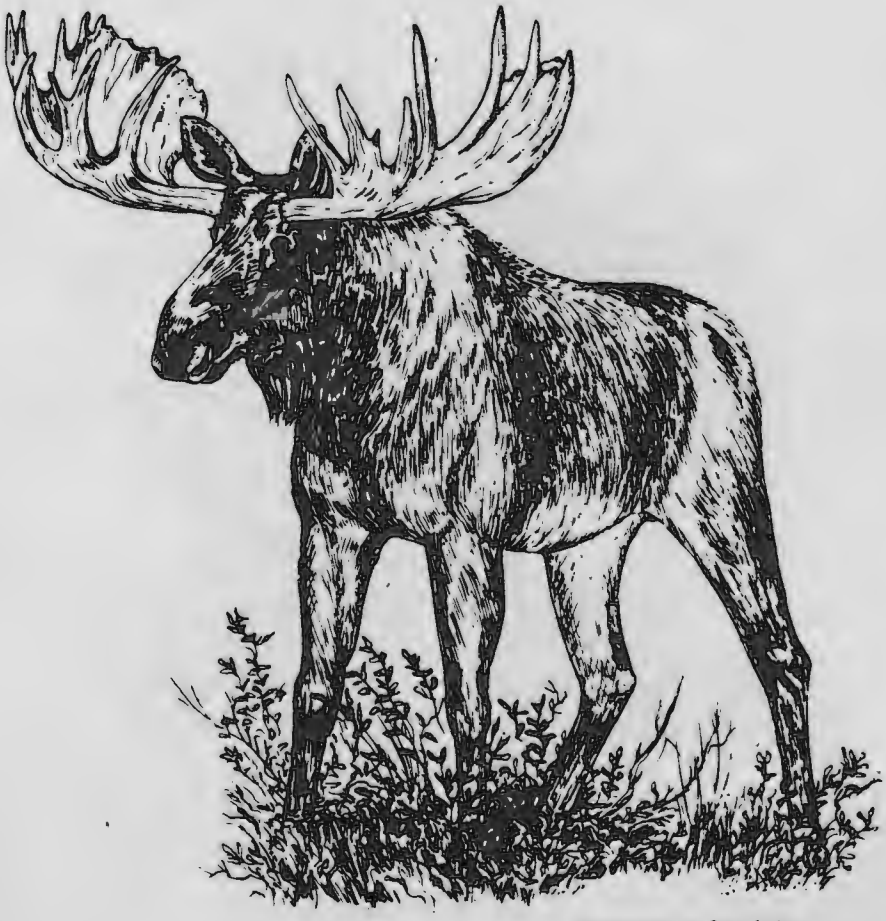

Illustration by Sue Arthur

Susan M. Abbott, Editor
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Project Title: **Southeast Moose Population and Habitat Management**

Overview: Moose are found on the mainland coast 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: Subunits 1A and 1B and Unit 3 (11,200 mi^2). Ketchikan area, including mainland areas draining into Behm and Portland Canals, Southeast mainland from Cape Fanshaw to Lemesurier Point and adjacent islands, and the islands of the Petersburg and Wrangell area.

Project Objectives:

Subunit 1A: Maintain a posthunting population of 35, annual harvests of 3, number of hunters at 20, 90 days of effort, and a 15% success rate in Subunit 1A.

Stikine River Area: Maintain a posthunting population of 450, annual harvests of 40, number of hunters at 300, days of effort at 2,100, and a success rate of 13% in Subunit 1B South of LeConte Bay.

Thomas Bay Area: Maintain a posthunting population of 200, annual harvests of 20, number of hunters at 160, days of effort at 675, and a success rate of 12% in Subunit 1B North of LeConte Bay.

Unit 3: The project objectives for Wrangell Island are under review.

Work Accomplished During the Project Segment Period: In Subunit 1A, the harvest was monitored with the harvest ticket report. No hunter surveys were made in Subunit 1A but 3 winter aerial surveys were done. The Stikine River area of Subunit 1B was monitored closely in the field during hunting season. An attempt was made to interview every hunter and to examine every carcass. Jaw and antler measurements were taken from each moose examined, and ages were estimated. The data collected were reconciled with the moose harvest ticket reports. Five late-summer, 1 mid-winter, and 2 late-winter aerial surveys were conducted to check calf production and survival.

In the Thomas Bay area, hunters and carcasses were monitored closely in the field. Registration permits were checked and all hunters were required to turn in their reports. All moose carcasses were checked for antler requirements, and the age of each moose was estimated. One winter aerial survey was done to check calf survival.

On Wrangell Island, the hunt was monitored with the harvest ticket report. This was complemented with checks by Department personnel of local sources of information.

Progress Towards Meeting Project Objectives: The herd in Subunit 1A is very small, and few people hunted here. The annual harvest varies from 0 to 6. In 1990, an estimated 5 moose were killed. An estimated 25 hunters were in the field.

In the Stikine River area, an estimated 300 hunters hunted over 1,300 days and killed 34 bulls. Hunter success was approximately 11%, and the average hunt lasted 5 days. Yearlings comprised 62% (n=21) of the harvest. Of the remainder, only three bulls were older than 3 years old. One was 4, one 5, and the other 7. One cow was killed illegally. One late winter survey on 20 February 1991 counted 14% calves and the last survey on 6 March 1991 found only 5%. Both were helicopter surveys.

The Thomas Bay hunt was restricted to spike/fork or 50" bulls only. Permits were issued to 221 people, and 162 hunted. Twenty-three bulls were killed during 751 hunter-days of effort. Hunter success was 14% and hunters averaged 4.6 days afield. Most hunters reported seeing many cows, calves and sub-legal bulls. Two illegal bulls, not meeting the antler requirements, were killed and 1 cow was killed in defense of life by a deer hunter 3 days after the end of the season.

Wrangell Island was open for the first time in 30 years for a spike/fork 50" season. An estimated 25 hunters participated and 3 legal bulls were killed. All were spike/fork yearlings.

Project Location: Subunit 1C (7,562 mi^2)
The southeast Alaska 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:

Subunit 1C moose management objectives:

Taku River area

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

Berners Bay area

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

Chilkat Range area

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

Subunit 1C moose management activities included conducting winter sex and age composition surveys and monitoring harvest.

Work Accomplished During the Project Segment Period: We issued 333 registration and 5 drawing permits for the 2 hunts covering 3 management areas in Subunit 1C. A total of 229 hunters participated in both hunts. Permit results are shown in the following table:

Management Area	Success	Days Hunted
Chilkat Range	25%	294
Taku River	20%	393
Berners Bay	100%	14

Aerial surveys were conducted in the Berners Bay area. Eighty-five moose were counted in 2.4 hours (35 moose per hour). Bull:cow and calf:cow ratios were 26 and 34:100, respectively.

Progress Towards Meeting Project Objectives: Population objectives for the Berners Bay herd were partially met. With 85 moose observed during the fall survey, the estimated post-hunt moose population of 90 was exceeded. All five permittees took moose, thus the objective of 80% success was surpassed. However, the desired number of hunters, hunter-days of effort and hunter kill was not reached because of the number of permits available. Fall 1990 survey data led to a liberalization of the 1991 quota, when up to 10 moose will be available.

All aspects of the Chilkat Range objectives were achieved. The kill of 24 exceeded the goal of 10; 97 rather than 65 hunters hunted; 294 hunter-days were expended rather than 195; and a success rate of 25% exceeded the goal of 15%. Because no survey was conducted, the post-hunt population objective was not measurable.

All population objectives for the Taku River population were met except for the number of hunter days (393 observed versus 450 desired). The hunter kill, number of hunters, and success rate precisely met the desired level.

Moose habitat is being examined in all 3 ranges by the U.S. Forest Service. Habitat work in the Endicott drainage is progressing, Berners Bay efforts will begin in the summer of 1991, and Taku field work is scheduled for 1992.

Project Location: Subunit 1D (2,670 mi^2)
That portion of the southeast Alaska mainland lying north of the latitude of Eldred Rock, excluding Sullivan Island and the drainages of Berners Bay.

Project Objectives and Activities:

Subunit 1D moose management objectives:

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

Subunit 1D moose management activities consisted of conducting winter sex and age composition surveys, and monitoring harvest.

Work Accomplished During the Project Segment Period: Area staff and local Advisory Committee members prepared data for the Board of Game in support of a proposed spike-fork/50 inch antler restriction. Court decisions related to subsistence resulted in a Tier II regulation being imposed and eliminating the possibility of an antler restricted harvest system.

Twenty Tier II permits were issued to the most qualified applicants. Harvest data were collected through Tier II subsistence permit mandatory reporting. Teeth from the moose of 19 successful hunters were aged using cementum annuli.

A partial aerial survey of the known winter range in the Chilkat drainage was flown in mid-winter and followed by a full survey in late winter.

Progress Towards Meeting Project Objectives: Moose populations in Subunit 1D had increased and were thought to be near management objectives for both total post hunt numbers and bull:cow ratios. A weather abbreviated survey in December determined that

few moose were using traditional wintering areas and calf counts were low (9 calves:100 cows). In a late winter survey conducted after record snowfall and accumulation, 28 moose, including only 1 calf, were counted in an area were 279 had been observed two years before. High snow depths on traditional wintering range probably caused many moose to use upland forest cover and go undetected during our surveys. However, because of the low counts the 1991 season 1991 will be closed by Emergency Order. If 1991 surveys indicate moose numbers are adequate to resume the hunt, the Tier II system now in place will make objectives related to days of hunter effort and number of hunters unattainable.

Project Location: Subunits 5A and 5B (5,770 mi^2)
Cape Fairweather to Icy Bay, eastern Gulf Coast.

Project Objectives and Activities:

GMU 5 moose management objectives:

Yakutat Forelands	
Post-hunt moose numbers	850
Annual hunter kill	70
Post-hunt bull:cow ratio	20:100
Number of hunters	250
Hunter-days of effort	1,025
Hunter success	28%
Nunatak Bench	
Post-hunt moose numbers	50
Annual hunter kill	5
Number of hunters	10
Hunter-days of effort	60
Hunter success	50%
Malaspina Forelands	
Post-hunt moose numbers	250
Annual hunter kill	25
Post-hunt bull:cow ratio	20:100
Number of hunters	50
Hunter-days of effort	200
Hunter success	50%

Unit 5 moose management activities included conducting winter sex and age composition surveys and monitoring harvest.

Work Accomplished During the Project Segment Period: Harvest and hunter data was analyzed from registration permit reports. Hunts were monitored by Department of Wildlife Conservation staff and Fish and Wildlife Protection officers.

Aerial surveys were done in Subunit 5A during the report period. On the Yakutat Forelands 445 moose were counted in 6.8 hours (66 moose/hour). Although 1990 surveys were limited to areas of known high moose density because of weather and time restraints, results continue to suggest a growing population. A 15-minute survey in the Nunatak Bench area revealed 14 moose. Moose are obviously moving back into this area following the 1986 floods.

Progress Towards Meeting Project Objectives: The 1990 aerial surveys were done after the onset of antler drop and were not extensive. Thus, both the observed bull:cow ratio (14:100) and the observed calf:cow ratio (30:100) was lower than actually existed. In the Yakutat Forelands herd, we estimate the post-hunt moose population level has been achieved. In fact, the need to curtail herd growth is a definite possibility. However, hunter kill, number of hunters, and hunter-days of effort were below objectives. The 32% hunter success rate exceeded the objective of 28%. In the Nunatak Bench area in Subunit 5A, no hunt was held, so it is unknown how close we may be to population objectives. The area survey indicated a hunt may be possible in the near future.

In Subunit 5B, the Malaspina Forelands, the existing population is estimated at the desired 250 animals. None of the objectives were met for this population. The lack of a survey precludes determining if the desired bull:cow ratio was achieved.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	$29.7	$21.3	$51.0
Actual	$24.4	$17.5	$41.9
Difference	-$5.3	-$3.8	-$9.1

Explanation: Few surveys were conducted in Subunits 1C and 1D, none in Unit 5.

Submitted by:

Bruce Dinneford
Regional Management Coordinator

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

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

Units 7 and 15 (8,400 mi^2)
Kenai Peninsula

Units 9 and 10 (36,250 mi^2)
Alaska Peninsula and Unimak Island

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

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

Unit 14 (6,600 mi^2)
Upper Cook Inlet

Unit 16 (12,300 mi^2)
West side of Cook Inlet

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

Project Objectives:

Unit 6: Maintain observed moose densities of between 1.8 and 2.0 moose/mi^2 and bull:cow ratios of 30:100.

Units 7 and 15: Maintain the existing moose population with a posthunting sex ratio of no less than 15 bulls:100 cows in Unit 7. Maintain the existing moose population with a posthunting sex ratio of no less than 15 bulls:100 cows in Unit 15 but with no less than 40 bulls:100 cows in Subunit 15B East.

Unit 9: Maintain existing moose densities in areas with moderate (0.5-1.5 moose /mi^2) or high (1.5-2.5 moose/mi^2) densities. Increase low-density populations (where habitat conditions are not limited) to 0.5 moose/mi^2 by 1995. 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.

Units 11 and 13: Maintain the existing moose population with a posthunting sex ratio of no less than 15 adult bulls:100 cows.

Subunit 14A: Maintain the existing moose population with a posthunting sex ratio of no less than 20 bulls:100 cows.

Subunit 14B: Maintain the existing moose population with a posthunting sex ratio of no less than 30 bulls:100 cows.

Subunit 14C: Maintain the existing moose population with a posthunting sex ratio of no less than 25 bulls:100 cows.

Unit 16: Maintain a moose population of 10,000 with a posthunting sex ratio of no less than 20 bulls:100 cows.

Subunit 17A: Establish a minimum population of 100 moose.

Subunit 17B: Achieve and maintain a density of 1 moose/mi^2 on habitat considered to be good moose range.

Subunit 17C: Maintain a minimum density of 0.5 moose/mi^2 in areas considered to be moose habitat.

Work Accomplished During the Project Segment Period:

Unit 6: Sex and age composition surveys were conducted on 20 November in Subunit 6C, 13 December in Subunit 6B, and 31 December in Subunit 6A. In Subunit 6C, 183 moose were counted (1.3 moose/mi^2): 28 bulls:100 cows, 22 calves:100 cows, 15% calves. The Subunit 6B survey resulted in a count of 305 moose (1.7 moose/mi^2): 31 bulls:100 cows, 29 calves:100 cows, 18% calves. In Subunit 6A, 286 moose were counted (1.4 moose/mi^2): 19 bulls:100 cows, 25 calves:100 cows, 18% calves.

The antlered moose registration permit hunt in Subunit 6B was monitored by check station and field checks. An Emergency Order closed the hunt on 9 September. A harvest of 30 antlered moose was allowable, and 26 were reported killed before the closure.

The total reported harvest in Unit 6 was 161 (106 males, 54 females, and 1 unspecified) moose. In Subunit 6B, 180 people obtained registration permits of which 135 (75%) hunted, and 30 (22%) succeeded in taking a bull. Successful hunters averaged 1.7 days afield (range = 1 to 7) compared to 3.1 days for unsuccessful hunters (range = 1 to 9). Thirty people drew anterless permits in Subunit 6B and of the 28 that hunted (93%), 16 (57%) harvested a female. Successful hunters averaged 3.9 days afield (range = 1 to 10) compared to 4.1 days (range = 1 to 12) for unsuccessful hunters. In Subunit 6C, 40 drawing permits were issued and the 37 people who actually hunted (93%) experienced 86% success in taking 32 (18 bulls and 14 cows) moose. Successful hunters averaged 4.5

days afield (range = 1 to 20) compared to 4.6 days (range = 2 to 15) for unsuccessful hunters. Most hunters used boats for access.

Unit 7: Five of the 32 count areas were surveyed during the 1990 fall sex and age composition surveys, resulting in the classification of 355 moose: 22 calves:100 cows, 39 bulls:100 cows, 14% calves. Since a census has not been conducted, a population estimate cannot be accurately determined for Unit 7. Total moose observed during recent fall surveys suggested a moose population between 1,000 and 1,500.

Salvage logging of spruce infested with bark beetles may provide increased visibility and access for moose hunters. Moose habitat quality may also be affected when the spruce overstory is removed. The effects of logging on moose in Unit 7 warrant further attention.

A total of 454 hunters harvested 69 bulls. Sixty-three (91%) successful hunters were residents, compared to 6 (9%) nonresidents. Eighteen (28%) of the 63 residents were also residents of Unit 7. Successful hunters (N=69) reported highway vehicles (41%) as the most often used transportation means; horses (23%) and airplanes (19%) were the 2nd and 3rd most popular means of transportation, respectively. Hunters using airplanes reported the highest success rate (38%), followed by those on horseback (34%).

Hunters in Unit 7 were restricted by regulation to bulls with spike/fork or 50-inch antlers. Twenty-nine (42%) hunters reported taking spike/fork bulls, compared to 40 (58%) who harvested large bulls with 50-inch antler spreads or 3 brow tines on at least 1 antler. Of the 69 hunters reporting the antler spread, 28 (41%) harvested bulls with $\geq$50-inch spreads. The largest single antler class was 60-65 inches.

Unit 9: Fall moose composition surveys were conducted in the Naknek drainage in November 1990. Because of poor snow and weather conditions only 2 trend areas were surveyed. Ratios were 36 bulls:100 cows and 25 calves:100 cows.

Hunters reported harvesting a total of 242 moose, including 5 females. Bull harvests were 6, 88, 59, and 84 for Subunits 9A, 9B, 9C, and 9E, respectively. For nonpermit hunts, residents had a success rate of 16% versus 22% for nonresidents.

Unit 11: A fall moose composition survey was conducted in November 1990. A total of 209 moose were counted at a rate of 51 moose per hour. The bull:cow ratio was 63:100 and the calf:cow ratio was 8:100.

Hunters reported killing 32 moose in Unit 11 during the 1990-91 season. Of these, nonresidents took 2 moose. Hunter success was 22%. The average hunt lasted 5.3 days. Harvest chronology data indicate that 48% (15) of the kill occurred during the September 5-9 state season, while 52% (17) occurred during the remainder of the 1-20 September

federal subsistence season for local residents. Mean antler size of harvested bulls was 44.1 inches.

Unit 13: Fall sex and age composition surveys were conducted in 10 count areas located throughout the unit. A total of 6,209 moose were classified at a rate of 59 moose/hour. The overall bull:cow ratio was 25:100 (21 adult bulls:100 cows). The ratio of calves:100 cows was 18; calves comprised 12.6% of the total sample. During flights conducted in March and April to assess overwinter calf mortality, calves comprised 5.4% of a sample of 430 moose suggesting substantial overwinter mortality of calves. The winter of 1990-91 was assessed as moderate to severe based on snow depths throughout the unit.

Hunters reported killing 520 bull moose during the 1990-91 regulatory year. During state-regulated seasons, 381 were killed in the fall general season and 65 were taken in the winter Tier II subsistence hunt. Seventy-four additional bulls were killed during a federal subsistence hunt held on federal lands for unit residents.

Subunit 14A: No subunit-wide surveys or censuses were conducted to determine moose population size or sex and age composition. A late winter (4-7 March) census was conducted on the Matanuska Valley Moose Range which produced an estimate of 860 (+/- 83, 80% confidence interval) observable moose with 11% calves. Additional calf recruitment data were collected in the Palmer-Wasilla area on 11 March where calves comprised 12% of a sample of 606 moose.

During the 1-10 September general hunting season, 258 bulls were reported harvested by 1,778 hunters. Residents killed 243 moose, nonresidents took 8 animals, and 7 animals were taken by hunters whose residency was unknown.

Between 1 July 1990 and 30 April 1991, 21 moose were killed by trains on the Alaska Railroad in Subunit 14A. From 1 October 1990 to 2 April 1991, 135 moose were killed in collisions with motor vehicles. Ten moose were reported as defense of life and property kills and 14 were thought to have been killed illegally.

Subunit 14B: Fall (post-harvest) estimates of "observable moose" and sex and age composition were obtained from a modified census ("Becker technique") conducted from 7-14 November 1990 (n = 754 moose). The estimated number of observable moose was 1,380 (+/- 190, 80% confidence interval) with ratios of 27 bulls and 20 calves:100 cows.

There was no open hunting season in 1990-91 and no moose were reported harvested.

Between 1 July 1990 and 30 April 1991, 17 moose were killed by trains and between 1 October 1990 and 30 April 1991, 5 moose were killed by automobiles in Subunit 14B.

Subunit 14C: Herd composition estimates and indices of population size were obtained from aerial surveys flown in November and December during which 825 moose were

observed. The large Fort Richardson population was not surveyed because of poor survey conditions and higher priorities for other areas. The ratios of bulls and calves:100 cows were 39 and 41, respectively.

During 1990-91 hunters reported killing 203 moose, including 97 cows. Permit hunts accounted for all of the cow harvest and 58 of the 106 bulls taken. The remaining 48 bulls were harvested during the general season. About 35% of all moose harvested were taken on Fort Richardson or Elmendorf military bases. The Portage area hunts produced 31% of the total. Bowhunters took nearly 35% of the total harvest. An additional 90+ moose were killed by highway vehicles in Subunit 14C between 1 June 1990 and 31 May 1991.

Subunit 15A: In Subunit 15A, 9 of the 13 count areas were surveyed aerially during the fall sex and age composition surveys, resulting in the classification of 1,580 moose: 35 calves:100 cows, 23 bulls:100 cows, and 22% calves. The bull:cow ratio increased by 1:100; however, the calf:cow ratio and calf percentage of total animals classified decreased by 3:100 and 2% respectively, compared with 1989 data.

An estimated total of 200 archery hunters participated in the 25-29 August preseason archery hunt; 5 spike/fork bulls were harvested. No bulls in the 50-inch or greater size class were taken. Successful hunters averaged 1.4 days afield (range = 1 to 2 days). Eighteen bulls were harvested by approximately 400 archers in 1989 and the reduced effort this past season was attributed to a mandatory bow hunter education course that many archers had not completed before the season.

A total of 998 people reported hunting during the 1-20 September season, resulting in a harvest of 93 bulls, 2 cows, and 2 unspecified. Successful hunters averaged 5.3 days afield compared with 6.1 days for all hunters. The harvest was composed of 60 (66%) spike/fork antlered bulls and 31 (34%) bulls with an antler spread of 50 inches or greater or possessing at least 3 brow tines on 1 antler. Residents harvested 97% of the moose taken.

Subunit 15B: In Subunit 15B West, 1 of 5 count areas was aerially surveyed and 127 moose were classified: 10 bulls:100 cows, 67 calves:100 cows, 38% calves. Count areas in Subunit 15B East were not surveyed during this period.

Two hundred ninety-five hunters reported hunting during the 1-20 September season, harvesting 54 bulls. Successful hunters averaged 5.5 days afield compared to 6.3 days for all hunters. Thirty-four (74%) of the 46 successful hunters reporting their means of transportation used a highway vehicle. The next most common method was horses (17%). Hunter success rate was 18%. The harvest was composed of 32 (62%) bulls in the spike/fork category and 20 (38%) in the 50-inch or larger class (N = 52).

Moose hunting in Subunit 15B East was by drawing permit only. The bag limit was 1 bull with a 50-inch or larger antler spread. One hundred permits were issued, resulting in the harvest of 31 bulls, ranging in age from 3 to 10 years (average age = 7 years), with mean antler spread of 55 inches (range = 39 to 62, N = 22).

Subunit 15C: One of 8 count areas was surveyed during 1990, resulting in the classification of 294 moose: 22 calves:100 cows, 37 bulls:100 cows, and 14% calves. Although a census has not been conducted, data collected during fall sex and age surveys suggested a population of 2,500 to 3,000 moose.

The 1-20 September season drew 938 hunters; 200 moose were harvested. One hundred eighty-nine (95%) successful hunters were residents, as compared with 3 (2%) nonresidents and 8 (4%) unspecified. One hundred forty-two (71%) moose were taken during the initial 10 days of the season, 48 (24%) during the latter 10 days when motorized vehicles, except airplanes, were restricted, and 10 (5%) were unknown or taken illegally. Successful hunters used the following transportation means for access to hunting areas: ORVs 86 (43%); highway vehicles, 58 (29%); horses, 32 (16%); aircraft, 7 (4%); and boats, 5 (3%). ORV users accounted for 33% of the reported transportation means and 43% of the reported harvest. The overall hunter success rate was 21%. The harvest was composed of 99 (50%) spike/fork antlered bulls and 101 (50%) bulls with an antler spread of 50 inches or greater which included 3 that exceeded 65 inches.

Subunit 16A: A census of Subunit 16A was conducted between 20 November and 3 December 1990 which produced an estimate of 3,100 (+/- 290, 80% confidence interval) moose with ratios of 27 bulls and 31 calves, respectively.

During the 1-10 September season, 510 hunters reported taking 36 bulls. Studies of radio-marked moose from Subunit 16A show that some moose winter near the Parks Highway/Alaska Railroad corridor in Subunits 14A and 14B. Numerous moose are killed in collisions with highway vehicles and trains in this area but the overall impact on Subunit 16A moose is unknown because of the mixing of moose from 3 subunits which occurs here.

Subunit 16B: Population size and composition for Subunit 16B north of the Beluga River were estimated by aerial census during November and December 1990. A census south of the Beluga River, conducted during March 1991, produced poor results because of inadequate snow conditions. An estimate of 7,300 moose was obtained from the combined censuses for Subunit 16B. For the area north of Beluga River, it was estimated that there were 34 bulls and 25 calves:100 cows, respectively. South of the Beluga River we estimated that calves comprised 7% of the moose present.

Hunters reported killing 69 bull moose during the 1-10 September 1990 general season. During the Tier II winter hunt, 30 additional bulls were taken.

Unit 17: Fall sex and age composition counts were conducted in 4 areas within Subunits 17B and 17C with an average of 62 moose observed per hour and 548 moose classified: 77 bulls:100 cows; 50 calves:100 cows; and 22% calves. In April, 4 moose (2 cows and 2 calves) were observed during a 2 hour aerial survey of the Togiak River drainage (Subunit 17A).

Fall harvest was monitored by personal interviews along the Nushagak and Mulchatna Rivers and harvest ticket returns. Four hundred eighty-nine hunters reported harvesting 225 bulls: 178 in Subunit 17B, 44 in Subunit 17C, and 3 unspecified. Fifty-three percent of the successful hunters were residents of Unit 17, 40% were nonlocal residents, and 46% were nonresidents. Hunters averaged 7 days afield and airplanes were the most often (76%) used transportation means. Eighty-nine percent of the harvest occurred in September and 9% in December.

Progress Towards Meeting Project Objectives:

Unit 6: The combined density in Subunits 6B and 6C was 1.5 moose/mi^2, compared with the unitwide objective of 1.8 - 2.0 moose/mi^2. Unfavorable survey conditions, especially in Subunit 6A, prevented sex and age surveys from being conducted before antler drop, and the actual number of bulls was probably underestimated. Sex ratio objectives were met for this report period in Subunit 6B and nearly attained in Subunit 6C.

Unit 7: Winter conditions were moderate, resulting in normal overwinter moose survival. The selective harvest program initiated in 1987 appears to be increasing the bull:cow ratio (39:100) exceeding the management objective of 15:100. However, hunting opportunities should not be increased until the ratio in Unit 15 allows both units to have similar seasons, thus avoiding major shifts of hunting pressure. Composition counts completed following the 1991 season will assist in an evaluation of the selective harvest system.

Unit 9: Bull:cow ratios met management objectives and although calf:cow ratios improved in the Naknek drainage, poor calf recruitment continued to hamper population growth in low-density areas. Efforts to monitor moose densities within trend count areas were confounded in 1990 by poor survey conditions. A significant number of moose in the northern one-half of the Naknek drainage moved into the Branch River drainage in 1989, and they remained there in 1990. The registration permit hunt, held in December, was restricted by Emergency Order to antlered moose only, north of the Naknek River, because there were only approximately 100 moose.

Unit 11: Survey data indicated moose numbers were relatively low and stable with an observed density of 0.7 moose/mi^2. The overall bull ratio of 63 bulls:100 cows (59 adult bulls:100 cows) greatly exceeded the minimum objective for the unit. Calf recruitment to 5 months of age was the lowest ever observed in this count area and if low recruitment continues the objective of maintaining a stable population will not be met. Three

consecutive severe winters and high predator numbers are probably largely responsible for the low recruitment.

Unit 13: Moose number declined in much of GMU 13 during 1990-91, thus maintaining a downward trend that started in 1988. Moose per hour observed during fall composition surveys declined by 9%. from the previous year and the percentage of calves in the herd was the lowest since 1975. The overall unit-wide adult bull ratio observed during fall 1990 exceeded the stated objective of 15 adult bulls:100 cows. However, few yearling bulls were present indicating inadequate recruitment to replace adult bulls harvested or lost to natural mortality.

Calf mortality was high again during the winter of 1990-91. Deep snow and wolf predation, particularly in 13A and 13E, resulted in exceedingly low calf recruitment. Adult mortality attributable to deep snow and predation was probably not as high as during the winter of 1989-90 but were well above levels during the mid-1980's when moose numbers were increasing. Moose numbers in Unit 13 will continue to decline if wolf numbers remain high and the recent pattern of severe winters continues.

The harvest declined substantially from previous levels because the fall moose season was shortened from 20 to 5 days. Season reduction was necessary because of high natural mortality during the previous two winters. The harvest quota for the 1990 winter Tier II state subsistence hunt was reduced from 400 to 75 by the Board of Game because of concerns by regional advisory committees and local residents after moose composition surveys showed low recruitment and declining bull ratios.

Unit 14A: It was difficult to evaluate if the population objective of maintaining 1987-88 levels of moose abundance was being met as a complete census was not conducted. A census of Unit 14A in November 1988 resulted in an estimate of 4,600 (+/- 700, 80% confidence interval) moose. A census of the Matanuska Valley Moose Range during March 1991 suggested that moose numbers in that area were similar or even higher than in March 1989 when a comparable census was conducted. This suggested that the population objective was probably being met. However, the low numbers of calves observed during March 1991 surveys raise concern that the population may be declining. Conducting a complete census of Subunit 14A is a high priority for fall 1991. Limited surveys conducted during research projects indicted that the objective of 20 bulls:100 cows was probably being met in Subunit 14A.

It was estimated that a harvestable surplus of 260-340 moose, including about 35 females, was available for the 1991-92 regulatory year. A 20 day general season for any bull, plus a limited antlerless hunt by drawing permit, was adopted by the Board of Game.

Subunit 14B: The winter of 1989-90 was unusually severe resulting in extremely high moose mortality in the subunit because of starvation and collisions with cars and trains. The modified census indicated that the moose population had declined by about 35% from

levels observed in 1987 and 1989. Much of the mortality occurred along the transportation corridor between Willow and Talkeetna. A February 1991 census of this area produced an estimate of 246 (+/- 36, 80% confidence interval) moose, down 70% from a comparable estimate in 1984.

The population objective for this unit was to maintain 1987 moose numbers, therefore we are now about 35% below that objective and the herd should be managed to maximize growth. The 1990 bull ratio (27:100 cows) was also below the unit objective of 30. However assuming reasonable recruitment, it will be possible to permit a harvest of 30 to 50 bulls and still allow herd size and the bull ratio to increase. It was recommended to the Board of Game that the portion of Unit 14B west of the powerline intertie, the area where extremely high mortality occurred, remain closed to hunting, but that a 1-10 September season, for any bull, be established for the remainder of GMU 14B. The Board adopted this proposal.

Subunit 14C: Although a total count of moose in 14C was not made it appeared that the population exceeded 2,000 animals, the desired population level. The ratio of bulls:100 cows in the sample was 39 which exceeds the objective of 25 bulls:100 cows. A census of moose on Elmendorf and Fort Richardson is a high priority activity for fall 1991.

Subunit 15A: The selective harvest program initiated in 1987 appears to have increased the bull:cow ratio (23:100) by 11:100, and it now exceeds the management objective of 15:100. Heavy calf losses during the previous winter dampened improvement in bull:cow ratios, however the decreased bull harvest was probably responsible for the modest improvement recorded. Loss of habitat, from human development and plant succession, is the primary factor controlling moose density in Subunit 15A. Attempts to enhance moose browse through prescribed burning have been largely unsuccessful due to fire safety restrictions on the Kenai Peninsula.

The winter was mild with less than two feet accumulation of snow over most of Subunit 15A. A winter census was not conducted due to poor snow conditions however, calf survival appeared normal.

No change in season length was recommended for 1991. The selective harvest program has gained further public support during the 1990 season and should be continued.

Subunit 15B: A status and trend assessment cannot be determined since only one area was surveyed during November 1990. This area has was roads and numerous dwellings. Moose populations in urban areas on the Kenai usually have high calf:cow and low bull:cow ratios and are not good estimators. The bull:cow ratio probably exceeded the 15:100 objective in Subunit 15B West. The bull:cow ratio probably exceeded 40:100 in Subunit 15B East, based upon staff observations and comments from permittees hunting the area. Moose habitat continued to deteriorate from advancing seral succession and to a lesser extent, human encroachment. The 1990-91 winter was mild and calf survival was

normal. No changes in season or bag limits were recommended for the 1991 season. Management objectives are being met at this time.

Subunit 15C: A status and trend assessment cannot be determined since only one area was surveyed. Hunter reports and staff observations suggested that bulls were abundant. The selective harvest program was accepted well and will be evaluated in 1992. No changes in season or bag limits were recommended for the 1991 season.

Subunit 16A: No specific population objective for Subunit 16A has been developed. The population objective for the entire GMU of 10,000 moose appears to have been met as over that number were estimated during censuses in 1990-91. The ratio of bulls to cows (27:100) was well above the stated objective of 20 bulls:100 cows for Unit 16, however this should be reevaluated specifically for Subunit 16A.

Following the severe winter of 1989-90, the hunting season in 16A was reduced from 30 days to 10 days. The shortened season combined with fewer hunters, and lower numbers of moose significantly reduced the harvest. It was felt, based on results of the census, that approximately 200 bull moose could be harvested from the area during fall 1991. The Board of Game established a 15 day season with a bag limit of 1 bull.

Subunit 16B: No specific population objective for Subunit 16B has been developed. The population objective for the entire unit of 10,000 moose appears to have been met as over that number were estimated during censuses in 1990-91. The ratio of bulls to cows (34:100) for the portion of 16B north of Beluga River was well above the stated objective of 20 bulls:100 cows for Unit 16, however this should be reevaluated specifically for Subunit 16B.

A 10 day extension for the fall 1991 season was adopted for Subunit 16B by the Board of Game because total numbers and composition were compatible with the objectives established for Unit 16.

Unit 17: Population objectives were apparently not met. In Subunits 17B and 17C, trend data suggested the populations were stable or increasing. Overharvesting may have been occurring along the Mulchatna River corridor as an increasing number of caribou hunters killed moose incidentally. Moose populations in Subunit 17A continued to be severely depressed despite excellent habitat and healthy moose populations in adjacent areas. Illegal harvesting was probably responsible.

Emergency Board of Game actions eliminated the August subsistence season in Subunits 17B, 17C, and the nonresident hunting season in Subunit 17C. The Board reinstated the August 1991 hunt as a registration hunt during their 1991 spring meeting, however, they continued the closure of Subunit 17C to nonresidents and adopted a 50-inch antler restriction for nonresidents in Subunit 17B.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	198.6	73.9	272.5
Actual	198.6	66.0	264.6
Difference	0	7.9	7.9

Actual operating costs were 7.9 less than planned as a result of poor moose counting conditions (very little snow) in Unit 9.

Submitted by:

John N. Trent and Kenneth W. Pitcher
Regional Management Coordinators

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

Project Location: Units 12, 19, 20, 21, 24, 25, 26B, and 26C

Regional Project Objectives and Activities: Maintain a stable or increasing moose population in the region. Conduct aerial trend count surveys and/or population estimation surveys to determine population status and trend. Evaluate harvest reports, contact hunters, and make field observations to determine harvest levels from various moose populations. Conduct browse use surveys on important fall–winter ranges and assess trend in relation to the moose population. Conduct radio-telemetry studies to determine sources of calf and adult moose mortality and their effect on population trend, and to determine seasonal movement patterns.

Unit 12: Increase the moose population from an estimated 2,500-3,500 to 5,000-7,000 with an annual harvestable surplus of at least 3% by the year 2000. Increase the overall hunter success rate to at least 35% without reducing participation from current levels (400 hunters/year) by the year 2000. Maintain a posthunting sex ratio of at least 40 bulls:100 cows.

Tetlin and Tok River drainages: Maintain the present population of moose (1,200-1,500). Increase the (1) harvestable surplus to at least 3% by the year 2000, (2) proportion of males in the population to 40 bulls:100 cows by the year 2000, (3) proportion of resident moose in the Unit 12 population to at least 50% by the year 2000, and (4) browse production on at least 100 acres/year for at least 10 years in known winter range in Tetlin and Tok River drainages.

Northwestern Unit 12 (Robertson River, upper Tanana Valley): Increase the (1) moose population from an estimated 400 to 800 moose by the year 2000, (2) proportion of males in the population to 40 bulls:100 cows along the north slope of the Alaska Range (adult bulls >5 years should compose no less than 20% of all bulls >17 months posthunting), and (3) browse production on at least 100 acres/year for at least 10 years in known winter range.

Eastern Unit 12 (Cheslina River to U.S.-Canada Border): Increase the (1) moose population from an estimated 1,200-1,300 to 2,200-2,500 by the year 2000 and (2) proportion of males in the upper Chisana River area to 40 bulls:100 cows and increase the proportion of adult bulls >5 years in that population to at least 20% of all bulls >17 months.

Work Accomplished During the Project Segment Period: Fall moose composition surveys were flown during November 1990. Seven hundred ten moose were classified during 17.8 hours of survey at a rate of 40 moose per hour. This figure was comparable

with those of recent years. In addition, 546 moose were classified during a moose population estimation survey conducted from 28 October to 4 November 1990 in the northeastern portion of the unit. The population estimate at the 90% level was calculated to be 1,339 $\pm$ 197 moose after correcting for sightability.

The overall posthunt sex ratio for Unit 12 was 47 bulls:100 cows, and there were 12 yearling bulls:100 cows indicating an acceptable sex ratio and recruitment in excess of natural mortality. The calf:cow ratio of 34:100 cows $\geq$2 years in 1990 represented no significant change from 1989 and was one of the highest recorded in Unit 12 since 1978. A high of 40 calves:100 cows $\geq$2 years was observed in fall 1988.

Harvest reports were analyzed. Four hundred twenty-nine hunters reported harvesting 98 bull moose for a hunter success rate of 23% during fall 1989. This represents a 20% decline in harvest and a 21% decline in hunter success compared with last year. Resident hunters took 69 (80%) of the 86 bulls for which hunter residency was reported; nonresidents took 17 (20%). Unit residents (Northway, Tetlin, and Tok) harvested 45 bulls or 46% of the harvest, but represented 59% of the hunting pressure with 222 hunters.

The mean antler width was 46.2 inches. Yearling bulls with antlers <30 inches ($\underline{n}$ = 12) composed 12% of the harvest, bulls with antlers 30-49.9 inches ($\underline{n}$ = 40) composed 41%, and mature bulls with antlers >50 inches ($\underline{n}$ = 39) composed 40% of the harvest. Mean antler width was slightly larger than the 1989 mean of 45.6 inches.

Increased protection effort by the Fish and Wildlife Protection Division, Department of Public Safety revealed 1 cow with calf and 1 lone cow that had been shot along the rivers in the fall and abandoned, and 7 moose that had been killed during the winter and abandoned.

One thousand plants were evaluated along transects at 14 sites in the Tok and upper Tanana River portions of Unit 12. Use by moose was normal for this area of low moose density.

A survey of local adult cow moose collared during the OTH-B Radar Tok Moose Study indicated initial calf survival to April 1990 of at least 69 calves:100 cows $\geq$4 years in the Tok area.

Progress Toward Meeting Project Objectives: While moose numbers in Unit 12 are still far below the population objective, all indications are that they have been increasing recently, although at a very low rate. Increased harvests of grizzly bears and black bears near Tok may be responsible for increased survival of calves.

Hunter success will remain below the objective of 35% until the moose population increases substantially. The posthunt sex ratio objective of at least 40 bulls:100 cows was achieved. Harvest and population monitoring objectives were met.

Unit 19, and Subunits 21A and 21E

Population Management Objectives:

Unit 19: Develop statistically sound population estimates for select portions of the unit by spring 1993. Annually assess population status and trend in portions of the unit where harvest levels make significant impacts on moose populations. Maintain a unitwide reported harvest of at least 500 moose. Maintain a unitwide reported hunter success rate of at least 45%.

Maintain a reasonable harvest of cow moose in Subunits 19A and 19D. Maintain an annual average antler spread measurement of at least 48 inches in Subunits 19B and 19C. Assess accuracy of harvest reporting in select portions of the unit.

Subunits 21A and 21E: Delineate moose survey areas in both subunits suitable for use in obtaining annual information on population status and trend. Maintain a moose population in Subunit 21A capable of sustaining a reported harvest of at least 150 bull moose with an average antler spread measurement in excess of 48 inches.

Maintain a moose population in Subunit 21E capable of sustaining a reported harvest of at least 125 moose that includes some reasonable opportunity to take cow moose. Maintain a reported hunter success rate of at least 50% in both subunits.

Encourage the USFWS, 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.

Increase compliance with the requirement to use harvest tickets and reports.

Work Accomplished During the Project Segment Period: Moose population status and trend surveys were conducted in 10 traditional count areas. The increasing or stable trends noted last year were again evident. Population status and trend indications were based on observations of a total sample of 2,570 moose. Moose observed per hour of survey time was 99, substantially higher than during 1989. Overall, calf:cow ratios averaged 41:100, while bull:cow ratios averaged 42:100. For the second year in a row, moose per hour figures remained at high levels on the trend count areas, and sex and age ratios rebounded somewhat over 1989 levels.

From January to April 1991, 7 repetitive surveys were flown along the main Kuskokwim River in the McGrath vicinity. Moose were extremely concentrated in riparian habitats adjacent to the river and mortality factors were investigated. The population initially consisted of 400-500 moose. However, throughout the winter surveys, 62 moose were found dead. Wolf predation accounted for the majority of the mortality, with starvation mortality being secondary. Additional, undetected mortality undoubtedly occurred. At least 12% of the population perished during the winter, and it is possible that with the addition of the undetected mortality, up to 20% of the moose population may have died.

Preliminary estimates of the harvest in Unit 19 and Subunits 21A and 21E indicate very little change from previous years. The season length reductions probably reduced the harvest in Subunits 19B and 19C, with little change in other subunits.

Browse surveys were completed on important wintering areas along the Kuskokwim River in Subunit 19D. Use of willow stands was extremely high in most areas, with 90-95% of the current annual growth being consumed. High spring water with accompanying ice floes scoured most of the willow bars. This will benefit the willow by keeping it in a relatively young seral stage and encourage sprouting. Moose will undoubtedly benefit also as a result of a 1 million acre wildfire that affected portions of the Kuskokwim drainage during summer 1990.

No telemetry studies were accomplished during this report period.

Progress Toward Meeting Project Objectives: Objectives for these units were largely met during this report period. The decline in average bull antler spread in the harvest of Subunit 19C moose was probably stopped by the newly required 50-inch minimum legal antler spread for nonresident hunters. Efforts to acquire statistically sound population estimates for selected areas should continue, but funding and manpower will have to be increased to achieve this end.

Subunits 20A and 20B

Population Management Objectives:

Subunit 20A: Maintain an adult population (i.e., excluding calves) of at least 8,000 and a total population of 10,000 moose. Maintain a bull:cow ratio of at least 30 bulls:100 cows overall and at least 20 bulls:100 cows in the Tanana Flats, western foothills (Yanert River and Alaska Range foothills west of the Totatlanika River), and central and eastern foothills (Alaska Range foothills east of the Totatlanika River).

Maintain an annual harvest of no more than 300 adult bulls and a total harvest of less than 400 bulls, including yearlings. Allow the harvest of females when the population is above 8,000 adult moose and exhibits a positive growth rate.

Subunit 20B: Increase the moose population to 10,000 by 1993 with 4,000 in western Subunit 20B and 6,000 distributed over central and eastern Subunit 20B. Maintain a minimum bull:cow ratio of 20:100 in each trend count area and an overall Subunit 20B bull:cow ratio of at least 30:100.

Sustain an annual harvest of at least 300 bulls in Subunit 20B.

Work Accomplished During the Project Segment Period: During FY91, work continued on the development of a new moose survey technique to assess moose population trends and composition. Two "superstratification" surveys, both in eastern Subunit 20B, were conducted in November 1990. In the 1,072 mi^2 survey area in the Chena drainage, observable moose density was estimated to be 1.61 moose/mi^2 ($\pm$19%, 90% CI). Bull:cow ratios were 28:100 and calf:cow ratios were 36:100. In the Salcha drainage density was estimated at 1.16 moose/mi^2 ($\pm$ 18%, 90% CI) in a 914 mi^2 area. The bull:cow ratio was 44:100 and the calf:cow ratio was 35:100.

In Subunit 20A, 3 trend count areas were flown to assess moose composition and evaluate changes in sex ratios resulting from the spike/fork 50-inch regulation in western Subunit 20A. Bull:cow ratios were 27:100, 23:100, and 33:100 in the Walker Dome, Windy Creek, and Japan Hills count areas, respectively. Calf:cow ratios were 50:100, 51:100, and 44:100, respectively. Bull:cow ratios increased from 17:100 to 27:100 in the Walker Dome count area between 1988 and 1990 after 2 years of spike-fork/50-inch antler restrictions. During the same period, bull:cow ratios increased from 29:100 to 33:100 in the Japan Hills count area which had no antler restrictions.

On 20 and 22 May 1991, aerial surveys were conducted over the northeastern Tanana Flats in Subunit 20A to assess twinning rates among the 1991 cohort and recruitment from the 1990 cohort. From a sample of 259 classified moose, recruitment was 11 yearlings:100 cows, and bull:cow ratios were 34:100. Among 24 cows observed with neonates, 5 (21%) had twins.

No browse surveys were conducted in Subunits 20A or 20B during FY91.

During September 1990, 1,194 hunters, 1,058 of which were residents, 112 nonresidents, and 24 hunters of unknown residency, reported taking 368 bull moose in Subunit 20A. In Subunit 20B, 2,237 hunters, 2,106 of which were residents, 90 nonresidents, and 41 hunters of unknown residency, reported taking 387 moose during the general September season.

In the Fairbanks Management Area (FMA) of Subunit 20B, 342 archery registration permits were issued for the September and November seasons combined. Archers reported taking 16 moose in September and 6 moose in November in the FMA.

In the Minto Management Area Tier II hunt 140 permit holders reported taking 21 moose. Seven additional moose were taken by 30 permit holders during the federal subsistence season in September.

Progress Toward Meeting Project Objectives: Project objectives were refined during FY91 to reflect more current understanding of moose population changes in Subunit 20A. The refined objectives are listed below.

> Maintain an adult population (i.e., excluding calves) of at least 8,000 moose and a total population of 10,000 moose.
>
> Maintain a bull:cow ratio of at least 30 bulls:100 cows overall. Maintain bull:cow ratios of at least 20:100 in count areas in the northeastern Tanana Flats and in the western and central foothills.
>
> Maintain an annual harvest of no more than 300 adult bulls (e.g., excluding yearlings) and a total harvest of less than 400 bulls.
>
> Allow the harvest of female moose when the population is above the objective of 8,000 adult moose and is exhibiting a positive growth rate.

The November 1988 population estimation survey conducted in Subunit 20A indicated a total population of 9,400 moose, slightly below the project objective. The population was believed to be growing at an annual rate of approximately 3% at that time. During 1991, additional population estimation surveys are planned to evaluate population size and growth rate.

Composition counts in the central foothills suggested that bull:cow ratios meet the project objectives. Bull:cow ratios have increased in western foothill count areas and now are above the minimum bull:cow ratio of 20:100. Surveys planned for 1991 will allow evaluation of the overall bull:cow ratio.

Project objectives were also further refined for Subunit 20B during the report period. The refined objectives are listed below:

> Icrease the moose population to 10,000 moose by 1993 with 4,000 in western Subunit 20B and 6,000 distributed over central and eastern Subunit 20B.
>
> Maintain a minimum bull:cow ratio of 20:100 in each count area and an overall Subunit 20B bull:cow ratio of at least 30:100.
>
> Sustain an annual harvest of at least 300 bulls.

The 1990 harvest of 437 moose substantially exceeded the minimum harvest goal of 300. Bull:cow ratios in the superstratification survey areas in the Chena and Salcha drainages of 28 and 44, respectively, met the minimum goal of at least 20:100 in each count area. The lower bull:cow ratio in the Chena drainage is the result of high hunting pressure along the Chena Hot Springs Road. Further restrictions in hunting seasons or bag limits will be considered if the bull:cow ratio declines in the Chena drainage.

Based on estimates of observable moose from the survey of 1,987 mi^2 in the Chena and Salcha drainages during November 1990, the 90% confidence limit of observable moose densities was 1.14-1.66 moose per mi^2. Using a mean sightability correction factor of 1.14 derived from 8 population estimation surveys conducted in the eastern Interior between 1982 and 1990, an extrapolated estimate of moose densities becomes 1.30-1.89 moose per mi^2 for the surveyed portions of central and eastern Subunit 20B. Extrapolating that range of probable moose densities over the entire 5,115 mi^2 area of central and eastern Subunit 20B the population estimate becomes 6,650-9,667 moose. However, because the surveyed areas were representative of the highest moose densities in central and eastern Subunit 20B, the actual moose population is probably closest to the lower confidence limit of 6,650 moose. Further survey work in lower density areas of central Subunit 20B, specifically the Chatanika drainage, is needed to confirm if the population objective of 6,000 has indeed been met.

In western Subunit 20B, a population estimation survey was completed in a 967 mi^2 survey area in November 1989. The survey area included some of the highest moose densities in western Subunit 20B. Therefore, direct extrapolation of the density estimate of 1.65 moose per mi^2 is unrealistic. However, the density in the 3,006 mi^2 remainder of western Subunit 20B is believed to be roughly half that found in the survey area. If so, the population estimate for western Subunit 20B is 4,000 moose. Further survey work is needed, specifically in the Baker Creek and upper Tolovana and Tatalina River drainages, to confirm if the population objective of 4,000 moose has indeed been met.

Subunits 20C and 20F

Population Management Objectives: Estimate hunting mortality and document nonhunting mortality when possible. Provide an annual posthunting sex ratio of at least 30 bulls:100 cows. Estimate moose densities by 1991. Promote moose habitat enhancement by allowing natural fires to alter vegetation succession. Establish definitive moose population objectives by 1992.

Work Accomplished During the Project Segment Period: No aerial surveys were conducted in Subunits 20C and 20F during FY91. In September 1990, 303 hunters reported taking 116 bull moose in Subunit 20C; 284 of these hunters were Alaskan residents, 10 were nonresidents, and 9 gave no residency on the harvest report. In Subunit 20F, 124 hunters, 122 residents and 2 of unknown residency, reported taking 38

moose during the September season. In addition, 51 permit holders harvested 2 moose during the 1-10 December Tier II subsistence season in Subunit 20F.

During 1990, rural residents in Subunit 20F expressed concern that the Fish Lake area was subject to excessive hunting pressure and harvest from nonlocal hunters. In response to those reports ADF&G conducted a patrol by riverboat of the Tanana River and Fish Creek between Manley and Fish Lake from 7 to 10 September 1990. Only 2 parties of hunters, one from Fairbanks and one from Tanana, were contacted during the 4 days. Both parties had taken 1 moose along the Tanana River near the confluence of the Cosna River. One additional boat was seen crossing Fish Lake on 9 September. There was no evidence of other hunters in the Fish Lake area during the 4-day patrol.

Progress Toward Meeting Project Objectives: No aerial surveys were conducted in Subunits 20C and 20F in FY91. Population objectives will be developed based on aerial surveys scheduled to be flown in 1992 and 1993.

Local residents' concerns about excessive hunting pressure in eastern Subunit 20F were investigated by conducting a field check station during 7-10 September 1990. Based on that field investigation, no recommendations were made for controlled use areas or other hunting restrictions.

Subunit 20D

Population Management Objectives: Maintain a total population in Subunit 20D of 5,500-7,000 moose; 1,600-2,400 in southwestern Subunit 20D, 3,000 in the northern portions of Subunit 20D, and 900-1,600 in southeastern Subunit 20D.

Maintain an overall posthunting bull:cow ratio of 30:100. Increase the age structure of bulls in southwestern Subunit 20D by 1993 so that at least 20% posthunting season bulls have antler spreads of 50 inches or larger.

Work Accomplished During the Project Segment Period: Specific management objectives developed for Subunit 20D include: (1) managing for a total posthunting season population of 7,000 moose with 3,000 in northern Subunit 20D, 2,500 in southwestern Subunit 20D, and 1,500 in southeastern Subunit 20D; (2) managing for a posthunting season bull:cow ratio of 30 bulls:100 cows; (3) managing for a calf:cow ratio of no less than 30 calves:100 cows; and (4) increasing the bull age structure in southwest Subunit 20D so that by 1993 at least 20% of the bulls observed after the hunting season have an antler spread of 50 inches or larger.

Population trend count surveys were flown in the Donnolly and Knob Ridge Trend Count Areas (TCA) in southern Subunit 20D and in the Central Creek TCA in northern Subunit 20D. Only 6 of 9 sample units were flown in the Donnolly TCA because poor weather interrupted the survey, therefore it was not possible to estimate moose density in the

TCA. Calf and yearling survival continued its decline with 31 calves:100 cows and 6 yearling bulls:100 cows. Bull:cow ratios also declined further to 18:100 and only 8% of all bulls had antler spreads >50 inches. Density of moose in the Knob Ridge TCA was 1.9 moose/mi^2. Calf survival increased to 39 calves:100 cows, possibly as a result of spring diversionary feeding of predators in the area. The bull:cow ratio remained steady at 39:100. Density of moose increased slightly in the Central Creek TCA to 2.6 moose/mi^2. Calf survival was poor with 10 calves:100 cows and yearling survival was poor with only 4 yearling bulls:100 cows. Bull:cow ratios were 63:100.

Composition surveys were flown in the Robertson River drainage of southern Subunit 20D. Moose seen per hour declined further to 25 moose/hour. Calf survival improved to 29 calves:100 cows and yearling survival increased to 8 yearling bulls:100 cows, possibly as a result of spring diversionary feeding of predators in the area. The bull:cow ratio was steady at 37:100.

Five hundred ninety-three people reported hunting in Subunit 20D during the general moose season. Hunters killed 118 moose for a hunter success rate of 21%. Ninety-three percent of hunters were Alaskan residents, 6% were nonresidents, and 1% had unknown residency.

Fifteen residents were issued Tier II permits to hunt the 1 January-15 February subsistence season in southeastern Subunit 20D. One bull moose was harvested by a resident of Delta Junction.

No moose browse surveys were conducted because of other higher priority commitments.

The Department cooperated with the U.S. Army to place radio collars on 9 moose in southwestern Subunit 20D during October 1990.

Progress Toward Meeting Project Objectives: Aerial surveys were conducted to determine trends in population. Harvest was analyzed from harvest ticket reports.

It is not possible to determine progress toward population size objectives because no population estimation surveys were conducted in Subunit 20D. However, it is believed that moose populations are probably increasing or stable in southwest Subunit 20D, stable or declining in southeast Subunit 20D, and declining in northern Subunit 20D.

In southwest Subunit 20D, calf:cow ratios met the Subunit 20D objective although the ratios continued to decline from a high of 47:100 in 1988. Bull:cow ratios are below the objective and continued to decline. The bull:cow ratio may be declining because of high harvest of bulls or a disproportionate increase in the number of cows as this population increases in size. Bull age structure is below the objective. To meet the age structure objective, regulations should be revised to redefine the definition of a 50-inch bull from

one having a 50-inch antler spread or at least 3 brow tines on 1 antler, to a bull having at least 4 brow tines on 1 antler.

In southeast Subunit 20D, calf:cow ratios met the Subunit 20D objective in the Knob Ridge TCA and nearly met the objective in the Robertson River drainage. Bull:cow ratio objectives were met in both areas.

Calf:cow ratios were significantly below the Subunit 20D objective in northern Subunit 20D; however, the bull:cow ratio met the objective. Poor calf survival is probably because of predation. Efforts to reduce predation by liberalizing bear seasons and bag limits in this area have been unsuccessful but should be continued.

Subunit 20E

Population Management Objectives: Maintain a posthunting sex ratio of at least 40 bulls:100 cows in the Charley River drainage. Increase the moose population from an estimated 2,000-3,000 to 8,000-10,000 with an annual harvestable surplus of at least 3% by the year 2000 in the remainder of Subunit 20E.

Increase the overall hunter success rate to at least 35%, while increasing hunter participation from 200 to 800 hunters by the year 2000 in the remainder of Subunit 20E. Maintain a posthunting bull:cow ratio of at least 40 bulls:100 cows in all areas.

Work Accomplished During the Project Segment Period: Fall moose composition surveys were flown from 18 October to 14 November 1990. Six hundred eighty-eight moose were classified during 22.4 hours of survey at the rate of 31 moose per hour.

The posthunt sex ratio was 66 bulls:100 cows. There were 9 yearling bulls:100 cows, down from 11:100 in 1989 and the 1981-85 mean of 12:100. Those observed bull:cow ratios are acceptable.

The ratio of calves:100 cows $\geq$2 years was 45:100 in the western portion of the subunit and 27:100 in the eastern portion, indicating good to fair survival of 1989 calves to age 5 months (compared to recent years). Recruitment of 1989 calves should be adequate for continued, yet slow, population growth.

Increased bear harvests in the western Subunit 20E contributed to higher calf survival there. Wolf numbers in the subunit are still increasing and are believed to have contributed to the downturn in calf survival. Conditions during winter 1990-91 were relatively normal in the southern Subunit 20E, but snow depths were probably above normal in the northern portion.

Harvest reports were analyzed. Two hundred ninety-five hunters reported harvesting 46 bull moose for a hunter success rate of 15.6% during fall 1989. Continued drought

conditions probably affected moose distribution which then reduced hunter success. Local resident hunters (n = 81) reported taking 16 bulls (35% of the harvest) for a 20% rate of hunter success. Other Alaskan resident hunters (n = 204) took 30 bulls for a 15% rate of success. Nonresidents could not hunt moose legally in Subunit 20E. Seventeen moose were taken in the Yukon River area and the remainder were taken from southern Subunit 20E with the Mosquito Fork yielding the most moose of any drainage (n = 14). Mean antler width was 49.8 inches, an almost 2 inche increase compared to 47.9-inch mean antler width in 1989.

No browse use surveys or radiotelemetry studies were conducted in Subunit 20E during this report period.

Progress Toward Meeting Project Objectives: Moose are probably still increasing in Subunit 20E based upon observed yearling recruitment and assumed low adult mortality rates. Grizzly bear and wolf predation still limit growth of this moose population, and the population objective of 8,000-10,000 may not be achieved by the year 2000.

The posthunt bull:cow ratio objective of at least 40:100 was achieved.

Subunits 21B, 21C, 21D, and Unit 24

Population Management Objectives:

Subunit 21B: Increase the overall moose population in Subunit 21B to 4,000-4,500 moose by 1995.

Floodplain areas of the Yukon and Novi Rivers: Maintain or increase November moose densities to 2.5-4.0 moose per mi^2.
Maintain an average annual harvest of 40 moose from the desired population of 1,000-1,600 moose. Determine the extent and sources of moose calf mortality from May 1988 through May 1990.

Remainder of the Novi Drainage: Maintain or increase November moose densities to 0.5 moose per mi^2. Maintain an average annual harvest of 20 moose from the desired population of 1,100-1,300 moose.

Remainder of Subunit 21B: Maintain or increase November moose densities to 0.5 moose per mi^2. Maintain a minimum annual harvest of 30 moose from the desired population of 1,600-1,700 moose.

Subunit 21C: Increase the moose population to 2,500-3,000 in the Melozitna River drainage to increase hunting opportunities. Maintain the moose population of 550-750 in the Dulbi River drainage to sustain hunting opportunities.

Subunit 21D: Maintain a population of at least 4,000 moose south and east of the Koyukuk River, including the Three Day Slough area. Maintain an early winter density of at least 4.0 moose per mi^2 within the Three Day Slough floodplain.

Maintain a posthunting ratio of at least 30 bulls:100 cows in the population being monitored within the Three Day Slough TCA. Develop guidelines for maximum winter browse use within the Three Day Slough area.

Maintain a moose population level of 900-1,000 in the Kateel River drainage and develop a population level for the Gisasa River by 1991. Maintain an early winter density of at least 3.0 moose per mi^2 in floodplain areas along the Yukon River that are subject to both the September and February hunting seasons. Develop a population level and density estimate by 1994 for the remainder of the subunit, including the Yukon and Nulato Rivers.

Unit 24: 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. 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.

Increase the moose population north of Bettles, excluding the Gates of the Arctic National Park, to 3,000-3,500. Maintain the population in the Gates of the Arctic National Park at 1,300-1,500.

Work Accomplished During the Project Segment Period: In November 1990, a population estimate survey was conducted in Subunit 21B in cooperation with personnel from U.S. Fish and Wildlife Service (USFWS) Koyukuk/Nowitna National Wildlife Refuge in a 2,701 mi^2 area in the lower Nowitna drainage. The population was estimated at the 90% confidence level to be 1,719 ± 13.8% moose. Productivity in the area is normal. The bull:cow ratio was 40:100, calf:cow ratio was 39:100, and the yearling percent in the herd was 5.5.

Results of the 1990 population estimate were compared within a 1,600 mi^2 subarea that had been surveyed in 1980, 1986, and 1990. The population apparently decreased by an average of 7.4% annually from 1980 to 1986 and increased by an average of 8.5% annually from 1986 to 1990.

No surveys were flown in Subunits 21C, 21D, or Unit 24 during this period because of extreme cold weather and unavailability of aircraft.

In Subunit 21B, 134 hunters reported taking 81 bull moose. A moose hunter check station was operated at the mouth of the Nowitna River. Fifty-five moose were taken by 134 hunters. Fourteen hunters were nonresidents, 91 were Alaska residents, and 21 were unit

residents. The number of hunters using the Nowitna River drainage has remained fairly stable.

Twenty-four bulls were taken by 36 hunters in Unit 21C. Ten hunters were nonresidents and the rest were Alaska residents.

The total reported harvest in Unit 24 was 141 moose, 2 of which were females. One hundred twenty-eight hunters accessing hunting areas via the Dalton Highway reported killing 61 moose.

In Subunit 21D, the harvest by 348 hunters was 279 moose of which 256 were bulls, 22 cows and one unknown. Harvest has slowly increased in the subunit. A moose hunter check station was operated on the Koyukuk River and 306 hunters were checked through. They took 183 moose with residency and harvest as follows: 137 unit residents took 48 moose, 133 Alaska residents took 105 moose and 36 nonresidents took 30 moose. The numbers of nonresident and nonlocal hunters have increased as opportunities and restrictions have increased in southcentral Alaska.

Two browse trend surveys were conducted in the unit. Use of the preferred species *Salix alaxensis* continues to be very high. Other surveys were attempted but the plots were covered by extensive spring flooding.

Sixty-five neonatal moose calves were radio-collared in the Three Day Slough area in May 1990. By May 1991, 75% of the calves were dead. Black bears accounted for 42% of the mortality, grizzly bears and wolves 5% each, unknown predator (either bear or wolf) 8%, drowning 1%, and unknown causes 5%.

Progress Toward Meeting Project Objectives: In Subunit 21B, moose populations within the Nowitna drainage reversed their decline but are still 23-42% below the population objectives. Moose calf mortality as high as 75% apparently does not limit moose population growth.

The moose population is currently at or above the population management objective level in Subunits 21C and 21D.

In southern and northern Unit 24, the moose population is currently at or above the objective level. In central Unit 24, the population is 66% below the population objective. However, predation is keeping the population low and until the predator:prey ratios are altered the objective probably will not be reached.

Subunits 25A, 25B, and 25D

Population Management Objectives:

Unit 25 overall: Estimate subsistence needs and harvest levels by 1991 and reduce the harvest of cows by 5-10% annually beginning in 1990.

Subunit 25A: Ensure that the mean annual antler spread of harvested bulls does not drop below 50 inches; maintain a posthunting sex ratio of at least 50 bulls:100 cows; and determine population size, composition, and distribution by 1991.

Subunit 25B: Determine population size, composition, and distribution by 1991.

Subunit 25D West: Increase the population to 1,300 moose by 1990; prevent the annual harvest from exceeding 50 bulls; and determine the effect of recent and older burns on moose distribution, movements, production, and survival by 1992.

Determine population size, composition, and distribution by 1990; maintain a stable population of approximately 2,300 moose; and determine productivity.

Work Accomplished During the Project Segment Period: No surveys were conducted during this report period in Subunits 25A and 25B. In Subunit 25D only 4 survey units, 1 in the western portion and 3 in the eastern portion, were surveyed (22-24 November 1990) because of the lack of snow and the onset of extreme cold. As a result, sample sizes were small.
Composition (n = 27) in the western count area was 64 bulls:100 cows, 5 yearling bulls:100 cows, and 32 calves:100 cows. Calves and yearling bulls comprised 16% and 2% of the sample, respectively. Composition (n = 43) in the eastern count area was 44 bulls:100 cows, 12 yearling bulls:100 cows, and 25 calves:100 cows. Calves and yearling bulls comprised 15% and 7% of the sample, respectively. Population status in both areas is believed to have remained similar to previous years.

Seventy-eight, 83, and 115 hunters reported hunting in Subunits 25A, 25B, and 25D, respectively, during the 1990-91 seasons. Harvests of 56, 47, and 53 moose were achieved in the respective subunits for respective success rates of 72%, 57%, and 46% among reporting hunters. A sizable number of hunters are believed to have not complied with reporting requirements. For example, only 6 unit residents reported hunting in Subunit 25A, and 18 reported hunting in Subunit 25B. Only in Subunit 25D, where there has been significant public education by the area biologist and refuge staff, was there sizable (66) reporting by unit residents.

Most of the reported harvest came from the Coleen River drainage in Subunit 25A, the Nation River drainage in Subunit 25B, and the Yukon River in Subunit 25D.

The preferred methods of access among reporting hunters were aircraft in Subunit 25A (66%), and boats in Subunits 25B (75%) and 25D (73%). Hunters reported spending an average of 7.6, 6.4, and 6.1 days hunting in Subunits 25A, 25B, and 25D, respectively.

Progress Toward Meeting Project Objectives: Minimal work toward the project objectives was accomplished in fiscal year 1991 because of the departure of the area biologist. Some survey work was accomplished in Subunit 25D as part of cooperative projects with the USFWS.

Subunit 25C

Population Management Objectives: Increase survey coverage of the moose population and derive a population estimate by 1990.
Provide annual harvests of 30-50 bull moose and an overall bull:cow ratio above 30:100.

Work Accomplished During the Project Segment Period: No aerial surveys were conducted in Subunit 25C during FY91.

In September 1990, 183 hunters (164 residents, 11 nonresidents, and 8 hunters of unknown residency) reported taking 42 bull moose in Subunit 25C.

Progress Toward Meeting Project Objectives: An aerial survey of central Subunit 25C is planned for November 1991. Following that survey, population and harvest objectives will be established. No aerial surveys were completed in Subunit 25C during FY91.

Subunits 26B and 26C

Population Management Objectives: Determine population distribution, composition, density, and trends by 1991.
Determine movements and habitat use in heavily harvested drainages beginning in 1991.
Maintain an annual posthunting season sex ratio of at least 50 bulls:100 cows.

Maintain a mean annual antler spread of at least 50 inches among bull moose harvested during the general season. Maintain an annual hunter success rate of at least 40%.
Determine subsistence needs and harvest levels by 1991.

Work Accomplished During the Project Segment Period: Aerial surveys were continued in 10 established trend areas on the north slope of the Arctic National Wildlife Refuge (ANWR) and initiated in 3 drainages west of the Dalton Highway during 18-19 October and 11-17 November 1990. Adverse weather conditions prevented a complete survey of all survey trend areas in ANWR. Four-hundred-and-forty-six moose were observed in those portions of the ANWR trend areas that were surveyed, and 84 moose were counted west of the Dalton Highway.

Calves and yearlings were more abundant in the area west of the Dalton Highway than in the ANWR trend areas. Calves composed 14% and 18% of the moose observed in the ANWR and Dalton west survey areas, respectively. Yearlings composed 5% and 17%,

respectively. However, calf survival in ANWR was greatly improved over last year. The low yearling presence in 1990 reflects the poor calf survival observed in fall 1989.

Within ANWR, moose populations fare best in the western areas and poorest in the eastern portion. In the Canning River, which has the longest history of aerial surveys, calf abundance was again low (12 calves:100 cows), continuing the declining trend evident in this subpopulation. Only 65 moose were counted within a portion of the Canning trend area which traditionally supported 80% of the total, suggesting that the Canning River moose population has probably declined to approximately 81 moose in 1990, down from 113 in 1989. Because there was apparently no recruitment to the Canning subpopulation for the past 5 years, a more precipitous decline is expected as the aging adults experience higher mortality rates.

Forty-five hunters reported hunting in Subunit 26B where 24 moose were reported harvested. Most hunting pressure occurred in the Sagavanirktok River drainage. In Subunit 26C, 8 hunters reported taking 3 moose, primarily along the Sadlerochit River. The preferred methods of access among reporting hunters were aircraft in 26B (43%), and 26C (50%). Hunters reported spending an average of 5.0 and 4.3 days hunting in Subunits 26B and 26C, respectively.

No browse use studies or radiotelemetry studies were conducted in Subunits 26B and 26C during this report period.

Progress Toward Meeting Project Objectives: Minimal work toward the project objectives was accomplished in fiscal year 1991 because of the departure of the area biologist. Some survey work was accomplished in Subunits 25D, 26B, and 26C as part of cooperative projects with the USFWS.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	124.9	78.0	202.9
Actual	124.9	64.1	189.0
Difference	0.0	13.9	13.9

Submitted by:

Kenton P. Taylor
Management Coordinator

Project Title: Arctic Moose Population Management

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

Project Objectives: Increase the moose population in Unit 18 by 10% a year. The population goal for the Yukon River population is 3,000 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:100 cows.

Conduct fall sex and age composition surveys and winter recruitment surveys of the Yukon River population annually. Conduct fall annual surveys of the Kwethluk and Kisaralik drainages to assess the status and population size of the Kuskokwim River population.

Improve harvest reporting and compliance with hunting regulations.

Work Accomplished During the Project Segment Period: Aerial surveys of moose populations on the Yukon and Kuskokwim rivers were completed in mid-winter 1991. Trend Count Areas were surveyed by use of fixed-wing aircraft during February along the Kuskokwim River and during March along the Yukon River.

In cooperation with the USFWS, 2 moose near the village of Marshall were immobilized and affixed with new satellite radio collars, replacing those put on in 1989. The Department, USFWS, and several school districts from the lower Yukon River and Kuskokwim River villages have been funding an ongoing cooperative project to monitor moose along the two drainages. The project incorporated the radiotelemetry information into the school's math-science curriculum. Ten radio-collared moose along the lower Yukon River were tracked periodically with students from the Lower Yukon School District. An additional 13 radio-collared moose were tracked periodically with students from the Kuspuk and Yupiit area school districts from the Kuskokwim drainage. Additional funding and support for the project was provided by the Association of Village Council Presidents, Lower Yukon School District, Kuspuk School District, Yupiit School District, and the U. S. Bureau of Land Management.

A hunter check station on the Yukon River in September 1990 was used to collect harvest and age information of moose taken in Unit 18 and Subunit 21E. A total of 201 hunters went through the check station. Of the 77 moose reported harvested, 70 were sampled for antler measurements and 59 were sampled for aging by extracting an incisor.

Harvest statistics were gathered from harvest tickets turned in by hunters. In Unit 18, 166 hunters turned in harvest tickets, and 46 moose were reported harvested. Further investigation and interviews revealed that 178 individuals hunted in Unit 18 and 59 total

moose were harvested. Successful hunters needed an average of 6.6 days to harvest a moose. Fifty-two successful hunters used boats as transportation, 6 used snowmachines, and 1 was unknown. Forty-seven moose (79.3%) were harvested in the Yukon River drainage, 3 (5.2%) were harvested in the Johnson River drainage, and 9 (15.5%) were harvested southeast of the Kuskokwim River.

Progress Toward Meeting Project Objectives: During the past 5 years, recruitment rates obtained from aerial survey data ranged from 12 to 25% for both the Yukon and Kuskokwim River populations. Steady increases in moose numbers have been observed in the Yukon River mid-winter trend count areas since 1985. However, fall sex and age composition surveys of the Yukon River population still need to be completed. During February 1991, mid-winter surveys of the Kwethluk, Kisaralik, and the Eek drainages of the Kuskokwim River were completed. Many other TCAs were not completed, however, because of poor weather and inadequate survey conditions. The Kuskokwim River population was estimated at greater than 300 moose in December 1989 and the Yukon River population was estimated at greater than 600 in March 1991. Improving harvest reporting and compliance with regulations is being achieved through hunter contacts at the check station, and through radio and newspaper announcements, law enforcement activities, and village meetings.

Project Location: Unit 22 (23,000 mi^2)
Seward Peninsula and that portion of the Nulato Hills draining west into Norton Sound.

Project Objectives: Overall, maintain the existing population level of 7,000-8,000 moose in Subunits 22B, 22D, and 22E. In Subunits 22A and 22C, allow continued population increase. Conduct aerial surveys throughout the unit both in late fall and early spring to provide an index of population status and trends, sex and age composition, and yearling recruitment. Conduct moose censuses (on 5 year rotations) in each of the 5 subunits to estimate changes in population size.

Monitor human and natural mortality factors affecting the population. Evaluate hunting mortality by analyzing all harvest data. Improve harvest reporting through public contacts and improved communication. Develop a moose management plan, with special emphasis on areas adjacent to the road systems.

Work Accomplished During the Project Segment Period: A total of 349 moose (279 males and 70 females) were reported harvested from Unit 22. Known locations of harvest by Subunit were as follows: 28 for Subunit 22A, 95 for Subunit 22B, 37 for Subunit 22C, 150 for Subunit 22D, and 37 for Subunit 22E. Seven-hundred hunters participated in this year's hunt; 92% were Alaskan residents. Hunter success rate was 50%.

One-hundred forty moose jaws were collected from successful Unit 22 hunters. Ages were determined and letters were sent to those hunters indicating the age of their moose. In spring, 21 hours were flown surveying moose in drainages of Subunits 22B, 22D, and 22E. Short yearling recruitment was calculated respectively at 7.5%, 12.0%, and 3.7%.

A school program explaining the importance of wildlife management concepts, rules, and regulations was used taught rxtensively throughout Unit 22 schools. Several trips were made to villages explaining the need for regulations and harvest reporting. Assistance was also provided to local license vendors during these trips. A considerable amount of time was spent answering and making phone calls, writing articles, sending out mailings of regulation material, and assisting the unit's license vendors.

Progress Towards Meeting Project Objectives: A combination of inclement weather and improper snow conditions in spring and fall prevented completion of adequate moose surveys in all subunits. An intensive survey rather than a census was conducted in Subunit 22E this spring because the amount of moose and moose habitat found in that subunit is limited.

It is suspected that the unreported harvest of moose in Unit 22 is substantial. Much of this harvest is thought to be attributable to hunters who do not purchase licenses or pick up harvest tickets rather than by those who hunt outside of current season dates. Efforts to inform the public of the importance of wildlife conservation and the need for regulations are thought to be having an effect in some communities as the number of individuals purchasing licenses and/or picking up harvest tickets has increased. However, additional contact with local residents, particularly village residents, needs to occur if complete compliance with current moose regulations is forthcoming.

Discussions pertaining to moose management took place on several occasions throughout the year. However, the actual ground work for development of a moose management plan was not initiated.

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

Project Objectives: Maintain the moose population in Unit 23 at existing levels, and a minimum bull:cow ration of 40 bulls:100 cows. Conduct spring aerial surveys in established TCAs to assess population trend and recruitment. Conduct aerial sex and age composition surveys during the fall in established TCAs. Monitor hunting activity through harvest reporting, hunter contacts, and field observations. Monitor other mortality factors through public contacts, other research and survey-inventory activities, and field observations. Improve communication with the public to reduce the incidence of

unreported harvests. Develop updated population management objectives in cooperation with the public and other agencies.

Work Accomplished During the Project Segment Period: Aerial composition surveys were conducted during November and early December 1990 in the middle Noatak, upper Nimiuktuk, and Wulik River drainages. The number of bulls:100 cows observed was 31 bulls:100 cows. Because of inclement weather, surveys planned for the Tagagawik, Buckland, and Inmachuk River drainages were not completed. Exceptionally early winter storms altered the distribution of moose in Unit 23 in relation to previous years when trend counts have been conducted. The early, deep, wind-hardened snow had little net effect on the middle Noatak River moose trend count because this area is large enough to compensate for local snow-induced movements of moose. However, more moose were observed in the Wulik River TCA in November 1990 because deep snow drove them out of upland areas and into the riparian count area. This process was reversed in the Nimiuktuk River where fewer moose were counted because deep snow drove moose out of the headwaters into lower reaches of the river.

Aerial trend count surveys were completed in the upper and lower Kobuk, the lower Noatak, the lower Nimiuktuk, and the lower Tagagawik River drainages. The TCAs in the Nimiuktuk and Tagagawik drainages were established this spring and surveyed for the first time. The recruitment observed was similar to that observed during previous years. Large numbers of carcasses were observed in all TCAs except the Tagagawik, indicating that winter mortality was exceptionally high, particularly in the northern portion of the unit.

During the 1990-91 hunting season, 199 moose (185 bulls and 14 cows) were harvested by 332 hunters in Unit 23. Of the successful hunters, 101 were Alaska residents, 85 were nonresidents, and the residency status of 13 hunters was unknown. Among the 101 successful residents hunters, 39 (39%) were residents of Unit 23. Most of the harvest (78%) was taken in September. Among the 199 successful hunters, 138 (69%) used aircraft as transportation, 32 (16%) used boats, 10 (5%) used 4-wheeler ATVs, and 14 (7%) used snowmachines. Five hunters did not report the method of transportation used.

As in past years, considerable time was devoted to maintaining the license vendor/harvest ticket distribution system in Unit 23. Because of a staff vacancy in Kotzebue, much of the information and education work planned was not completed.

Progress Toward Meeting Project Objectives: The bull:cow ratio declined for the 4th consecutive year in the middle Noatak River TCA. In November 1987, 56 bulls:100 cows were in this count area. In November 1990, the ratio declined to 31 bulls:100 cows. This decline has been largely limited to large bulls. We suspect that intense trophy hunting by increasing numbers of nonlocal hunters caused this trend. No such trend was evident for other moose TCAs in Unit 23.

Based on the number of carcasses observed during spring moose trend counts, the overwinter mortality of moose in Unit 23 was 2-4 times higher than observed during the previous 5 years. Large numbers of carcasses were observed during spring wolf radio-collaring operations, and while traveling by snowmachine in portions of Unit 23. Severe winter conditions caused many moose to starve and were probably the major cause of most overwinter mortality. Predation by wolves and brown bears undoubtedly contributed to winter and spring mortality as well. The large number of carcasses observed in upland areas in January and February suggests that bull moose were probably affected most severely by the deep, early snow. The lower Selawik and Tagagawik Rivers were the only exceptions to the pattern of high overwinter mortality observed throughout the remainder of Unit 23.

In 1991, the calf:cow ratio was higher in both the lower Noatak River and lower Kobuk River TCAs than during the previous year. The calf:cow ratio was roughly comparable to that observed during 1985-88. This supports the argument that the low calf ratios observed in these TCAs during spring 1991 resulted from extensive flooding in June 1990 rather than from a gradual decline in habitat quality.

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

Project Objectives: Maintain the Subunit 26A moose population at approximately the current level, and a minimum population of 1,500 moose in the Colville River drainage. Conduct late winter trend counts annually to monitor population trends and short yearling recruitment. The population will be completely surveyed at 7 year intervals. Conduct fall surveys biennially to monitor sex and age composition trends.

Manage for a hunter success rate of not less than 50%. Manage the moose harvest for spatial and temporal separation of recreational and subsistence hunters. Monitor the harvest through field contacts and hunter harvest reports.

Work Accomplished During the Project Segment Period: Fall sex and age composition surveys were flown in the Colville River drainage from 27-30 October 1990. During these surveys, 371 moose were observed. Of these, 69 were bulls (33 bulls per 100 cows), 208 were cows, and 94 were calves (25% calves). The estimated antler size of the bulls was as follows:

Inches	<30	39-40	40-49	50-59	60+
Percent	17.4%	20.3%	18.8%	34.8%	8.7%

A census to determine population size, status, and short yearling recruitment was conducted during 16-21 April 1991 in all river drainages of Subunit 26A that were

thought to contain moose. A total of 1,535 moose (1,231 adults and 304 calves) were counted yielding a short yearling recruitment rate of 20%.

Harvest data were compiled from harvest reports submitted by hunters. Hunters reported killing 57 bulls and 4 cows during the 1990 hunting season. The average hunt lasted 5.8 days, and the hunter success rate was 69%. The chronology of the harvest was as follows: 1-7 August (2), 1-7 Sept. (27), 8-14 Sept. (24), 15-21 Sept. (3), 22-28 Sept. (3), and 30 Oct (1). The harvest was distributed throughout the Colville River drainage and the largest numbers of animals were taken from the Chandler River (31%), Colville River from the mouth of the Killik River to the Anaktuvuk River (26%), and the Anaktuvuk River (18%). Antler sizes and percentage of animals having those sizes were as follows: <25" (1.6%), 25-29.99" (1.6%), 30-34.99" (4.9%), 35-39.99" (8.2%), 40-44.99" (4.9%), 45-49.99" (3.3%), 50-54.99" (18.0%), 55-59.99" (39.3%), 60-64.99" (8.8%), >65" (1.6%).

Of the 89 people who reported hunting, 11 (12%) were residents of the North Slope, 32 (36%) were nonlocal Alaska residents, 37 (44%) were nonresidents, and 9 (10%) were of unknown residency. Of the 61 successful reporting hunters, 7 (11%) were from the North Slope, 18 (29%) were nonlocal Alaska residents, 32 (52%) were nonresidents, and 4 (6%) were of unknown residency.

Progress Toward Meeting Project Objectives: The spring census indicated that there are at least 1,535 moose in Subunit 26A. The population apparently has not changed significantly in size during the last 20 years. The short yearling recruitment rate was 20% and the reported harvest was less than 4%, so the population size probably will not be reduced by hunting pressure. The hunter success rate was 68% which was well above the goal of 50%.

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

The number of bulls per 100 cows observed during surveys has dropped from 54 to 33 bulls per 100 cows during 1983 through 1990. Fall surveys will be flown in 1991 to further evaluate this situation. If this trend continues, future harvest restrictions may be necessary.

Segment Period Project Costs:

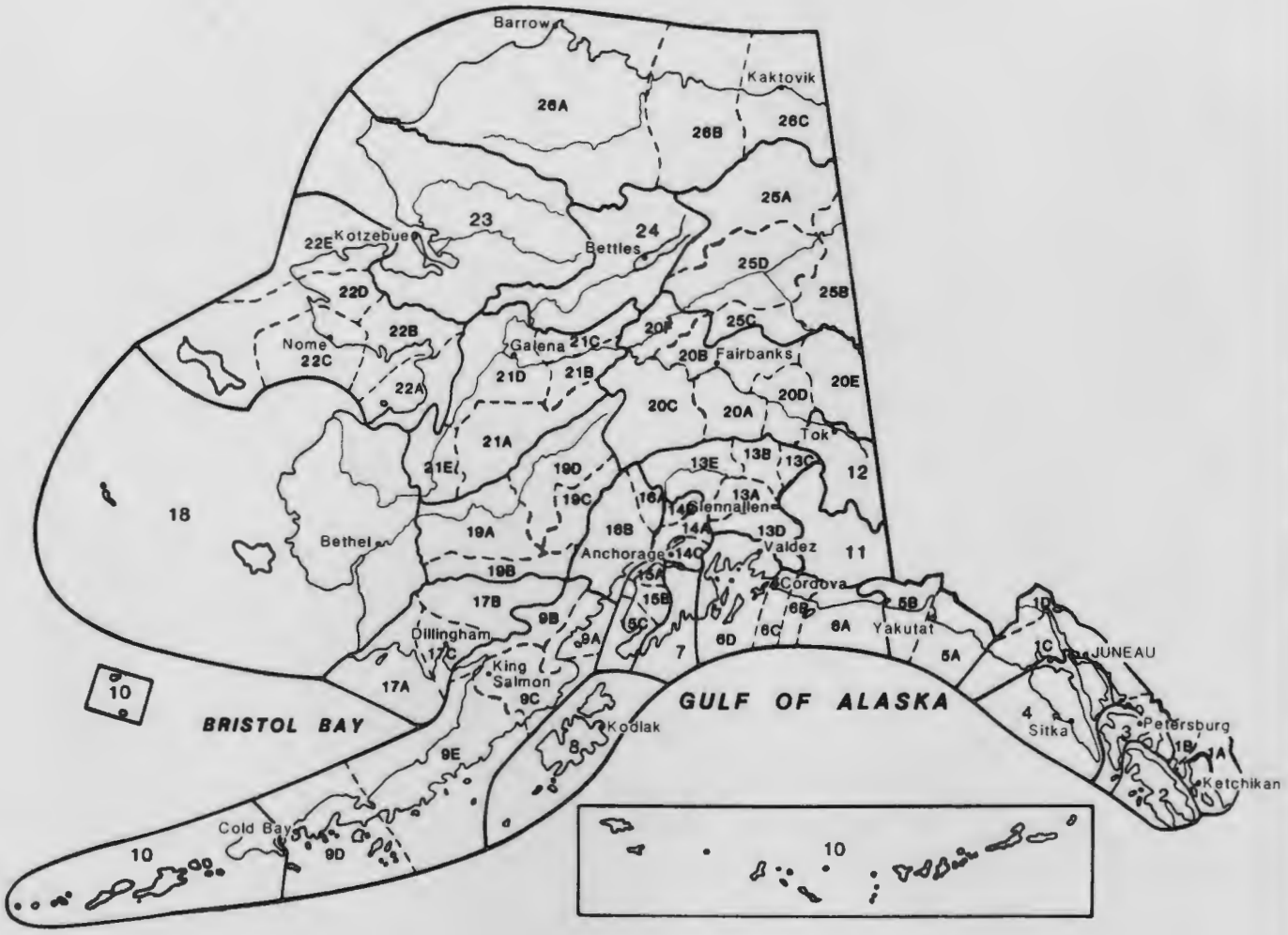
	Personnel	Operating	Total
Planned	56.8	37.5	94.3
Actual	50.1	34.5	84.6
Difference	-6.7	-3.0	-9.7

Explanation: A staff vacancy at Kotzebue resulted in less personnel expenditures from this project. Because of poor fall weather conditions, fall composition surveys were not conducted in Unit 22. In addition, state-owned aircraft were used for more survey work than originally anticipated which resulted in reduced expenditures.

Submitted by:

Steve Machida
Survey-Inventory Coordinator

Alaska Game Management Units



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