Alaska Department of Fish and Game
Division of Wildlife Conservation

ARLIS
3 3755 001 25276 6

Federal Aid in Wildlife Restoration
Annual Performance Report of
Survey - Inventory Activities
1 July 1993 - 30 June 1994

MOOSE

Mary V. Hicks, Editor

SK
367.2
.M6
1993-94

Grant W-24-2
Study 1.0
December 1994

STATE OF ALASKA
Tony Knowles, Governor

DEPARTMENT OF FISH AND GAME
Carl L. Rosier, Commissioner

DIVISION OF WILDLIFE CONSERVATION
Wayne L. Regelin, Acting Director

Persons intending to cite this material should receive permission from the author(s) and/or the Alaska Department of Fish and Game. Because most reports deal with preliminary results of continuing studies, conclusions are tentative and should be identified as such. Please give authors due credit.

Additional copies of this report and other Division of Wildlife Conservation publications are available from:

Publications Specialist
ADF&G, Wildlife Conservation
P.O. Box 25526
Juneau, AK 99802
(907) 465-4190

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the bases of race, religion, color, national origin, age, sex, marital status, pregnancy, parenthood, or disability. For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6173, (TDD) 1-800-478-3648, or FAX 907-586-6595. Any person who believes she/he has been discriminated against should write to: ADF&G, PO Box 25526, Juneau, AK 99802-5526 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

ARLIS
Alaska Resources
Library & Information Services
Anchorage, AK

SK
367.2
.M6

Project Title: **Southeast Moose Population Management**

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

Project Location: Subunit 1A (5,000 mi^2)
Ketchikan area including mainland areas draining into Behm and Portland Canals

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

Unit 3 (3,000 mi^2)
Islands of the Petersburg and Wrangell area.

3 3755 001 25276 6

Project Objectives and Activities:

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

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

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

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

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

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

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

Project objectives for Unit 3 have not been established.

Work Accomplished During the Project Segment Period: Staff issued registration permits for the first time in Subunit 1A. We collected incisors for aging. No surveys were conducted in Subunit 1A this report period.

ARLIS
Alaska Resources Library & Information Services
Library Building, Suite 111
3211 Providence Drive
Anchorage, AK 99508-4614

State and federal regulations conflicted for the Stikine River hunt in Subunit 1B. We collected incisors for aging and examined antlers. During a helicopter survey in February 1994, staff counted 50 moose, including four calves.

All of Subunit 1B north and west of LeConte Bay and Glacier was joined with Unit 3 into a single registration hunt. This opened an additional 2500 square miles to moose hunters. We checked hunters in the field and collected moose incisors for aging.

Progress Meeting Project Objectives: Three bulls were killed by 53 hunters, all in the Unuk River drainage, for a success rate of 6%. Hunter numbers exceeded objectives and moose kill equaled them, but the success rate fell below the desired level.

In the Stikine River area of Subunit 1B, an estimated 165 hunters killed 15 bulls. About 900 total hunter days were expended. All measurable parameters, including harvest, number of hunters, number of hunter-days, and success rate fell below objectives.

In the Thomas Bay area of Subunit 1B, 135 hunters reported 703 days of effort, up slightly from 1992. Twenty-five legal bulls were killed. Except for the number of hunters, all objectives. were met.

In Unit 3, 336 hunters reported 1546 days in the field, taking 13 bulls.

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

Project Objectives and Activities:

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

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

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

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

3. Measurable management objectives for Chilkat Range moose include the following:

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

Work Accomplished During the Project Segment Period: We issued 353 registration and 15 drawing permits for the 3 hunts in Subunit 1C, an increase of 37 registration permits and 5 drawing permits over 1992. An estimated 256 hunters participated in these hunts. Permit results for hunters reporting the location of their hunt are shown in the following table:

Management Area	Hunters	Success	Days Hunted
Chilkat Range (includes Gustavus)	147	20%	644
Taku River	80	18%	341
Berners Bay (bulls)	8	88%	22
(cows)	7	100%	14

Staff conducted an aerial survey in the Berners Bay area on 21 January 1994. We counted 68 moose in 2.2 hours. Bull:cow and calf:cow ratios were not determined due to antler drop. We estimated calf percentage in the herd at 21%.

Hunters were required to submit lower jaws of moose killed. Staff determined moose ages after sectioning incisors.

Progress Meeting Project Objectives: We met management objectives for the Berners Bay herd. With 68 moose observed during the winter survey, the posthunt population exceeded the objective of 90, although survey results were lower than in the previous year. Fourteen of the 15 permittees took moose, surpassing the objective of 80% success. Partly because the number of permits was increased to 15, the desired effort in hunter-days was exceeded.

Most Chilkat Range herd management objectives were achieved. The kill of 30 moose exceeded the goal of 10; the number of hunters was 147, compared to the goal of 65; 644 hunter-days were expended, above our objective of 195; the success rate objective (15%) was surpassed. A high take in the Gustavus area (13 moose) for the second year in a row contributed to the success rate for the Chilkat Range.

Management objectives for the Taku River moose population were not met, with harvest, number of hunters, and number of hunter-days declining. We conducted no aerial surveys, so the posthunt size of the population is unknown. Warm, foggy weather in the early season may explain the decreased effort and success in the Taku area.

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

Project Objectives and Activities:

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

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

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

Work Accomplished During the Project Segment Period: In 1993 the Chilkat valley moose hunt was held for the first time since 1990. Board of Game action established a spike-fork/50 inch requirement for this Tier II hunt. We offered 200 permits and issued 150. Staff monitored the hunt, measured antlers, and collected incisors for aging.

An aerial survey was flown on 20 January 1994.

Progress Meeting Project Objectives: Hunters legally harvested 22 moose in the first moose season in 3 years; however, most management objectives were not met. The winter survey indicated a posthunt population of about 350 moose. Hunt conditions only allowed for 200 hunters. Because the hunt closed after three days, hunter effort fell short of the objective.

Project Location: Unit 5 (6,200 mi^2)
Cape Fairweather to Icy Bay, eastern gulf coast

Project Objectives and Activities:

1. Measurable management objectives for Yakutat Forelands moose include the following:

Posthunt moose numbers	850
Annual hunter kill	70
Posthunt bull:cow ratio	20:100
Number of hunters	250
Hunter-days of effort	1,025
Hunter success	28%

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

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

3. Measurable management objectives for Malaspina Forelands moose include the following:

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

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

Work Accomplished During the Project Segment Period: We issued 295 registration permits for Unit 5 moose hunts (241 for Subunit 5A and 54 for Subunit 5B). Hunts were monitored by Division of Wildlife Conservation staff, Fish and Wildlife Protection officers, and enforcement staff from the U.S. Forest Service. We analyzed harvest and hunter data from registration permit reports. Staff collected and examined teeth for age determination.

Due to weather conditions and conflicting staff commitments, we were unable to complete aerial surveys.

Progress Meeting Project Objectives: In the Yakutat Forelands herd, we estimate the posthunt moose population objective has been achieved. However, hunter kill (51) and the number of hunters (206) were below objectives. Hunter effort (1192 days) was slightly greater than our objective, and hunter success (25%) was near the objective of 28%.

In the Nunatak Bench area in Subunit 5A, no hunt was held, so objectives there were not met. Previous surveys indicated a hunt may be possible in the near future.

In Subunit 5B, the Malaspina Forelands, the population is estimated to be at the desired 250 animals. Only one of the management objectives was approached for this population (hunter success was 48%). The number of hunters (31), hunter days (152), and kill (15) were below management objectives.

The lack of surveys precludes determining if the desired bull:cow ratio was reached in either subunit.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	29.3	21.3	50.6
Actual	33.6	11.3	44.9
Difference	+4.3	-10.0	-5.7

We spent additional time administering the new Tier II hunt in Haines; no moose surveys were flown in Yakutat.

Submitted by:

Bruce Dinneford
Management Coordinator

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

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

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

Work Accomplished During the Project Segment Period: We did not collect any population information because of poor conditions for aerial surveys. The winter was mild with only light intermittent snow cover. Total reported harvest in Unit 6 was 162 moose (109 males and 53 females). In Subunit 6A 166 hunters harvested 64 males and 27 females, a success rate of 55%. In Subunit 6B 169 hunters harvested 27 males and 16 females under drawing and registration permit hunts, a success rate of 25%. In Subunit 6C 18 males and 10 females were taken under drawing permit hunts by 29 hunters who had a success rate of 97%. No moose were reported taken in Subunit 6D.

Staff monitored the registration hunt for antlered moose in Subunit 6B by field checks of hunters. An emergency order closed the hunt on 4 September. Harvest of 20 antlered moose was allowable, and 27 were reported killed. The 7 animals taken in excess of the allowable harvest were killed the 12 hour period between issuance of the closure and its effective date.

Progress Meeting Project Objectives: No survey information was collected to assess progress meeting objectives.

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

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

Work Accomplished During the Project Segment Period: Poor weather conditions precluded all late fall sex and age composition surveys. Past surveys indicate the moose population is between 1000 and 1500 animals.

Preliminary harvest statistics indicated that approximately 408 hunters reported hunting in Unit 7 during 1993 and harvested 62 bull moose. Twenty-four (39%) hunters reported taking spike/fork bulls (less than 35") compared to 33 (53%) hunters who harvested large bulls (greater than 39") defined as a 50 inch antler spread or having 3 brow tines on at least 1 antler. Five reports indicated either unknown size or illegal classification. The largest moose reported had an antler spread of 58 inches

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

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

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

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

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

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

Work Accomplished During the Project Segment Period: Staff surveyed 3 trend areas in 1993. Poor snow conditions prevented further survey work. In Subunit 9C 650 moose were counted and the overall sex ratio was 42 bulls:100 cows. We recorded a ratio of 21 calves:100 cows. In the Dog Salmon count area, staff counted 81 moose and ratios were 33 bulls and 11 calves:100 cows.

Preliminary 1993 harvests by subunit were 7, 62, 50, and 90 for 9A, 9B, 9C and 9E, respectively.

Progress Meeting Project Objectives: Efforts to monitor moose density and composition were hampered in 1993 by poor snow conditions. Only the northern portion of Subunit 9C still has a cow moose hunt. Bull:cow ratios in 9C are at or above the desired ratio. More surveys are needed in 9E to assess ratios.

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

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

Work Accomplished During the Project Segment Period: Fall sex and age composition counts were not attempted in 1993 because the National Park Service (NPS) conducted a unitwide Gasaway census. Data from this census resulted in a density estimate of 0.58 moose/mi^2. Ratios included 68 bulls:100 cows and 20 calves:100 cows.

Preliminary harvest figures indicate hunters killed 30 moose in Unit 11 during the 1993-1994 season. Of these, nonresidents took 4 (13%) moose. Hunter success was 28%. The average hunt lasted 7.2 days. Harvest chronology figures show 77% (n = 23) of the take was between Sept. 9 and Sept. 20, the last 2 weeks of the moose season. The most important means of transportation were aircraft. The mean antler size in the harvest was 44.5 inches.

Staff discussed proposals on land use patterns, access, and development with appropriate and administering agencies.

We discussed annual review and proposed changes in the Copper River Fire Management Plan with participating agencies and landowners.

Progress Meeting Project Objectives: Composition data collected in Unit 11 during 1992 indicated moose numbers were very low with an observed density of only 0.1 moose/sq. mi. Moose density estimates by NPS personnel during a 1993 Gasaway census resulted in a density estimate of 0.58 moose/mi^2. This figure is appreciably higher than the density estimate from the 1992 composition count but similar to density estimates from composition counts in 1990 and 1991. The observed decline in moose numbers during fall 1992 was apparently the result of early migration of moose out of the count area because of early, unusually deep snowfall and record low temperatures. The bull:cow ratio of 68:100 by the NPS during the 1993 census was similar to the bull:cow ratio in most years during fall sex and age counts. The calf:cow ratio of 20:100 was higher than in recent years during fall trend counts. Calf-cow groups are frequently underrepresented in composition counts compared to censuses. During censuses more area is flown, often where calf-cow pairs are found, with more search time than a composition count. Also, the higher calf:cow ratio in the census could indicate higher calf production and/or survival in 1993.

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

The reason for the decline in hunting effort that started in 1992 is unknown. In 1993, hunting effort continued to decline, despite the longer hunting season.. The current harvest level is

sustainable, and human harvests have minimal impact on moose numbers in the unit. Wolf predation continues to be relatively high on moose. Wolves are abundant and there is a scarcity of an alternate prey species, especially since the Mentasta caribou herd has been moving out of Unit 11 into Unit 12 to winter. Snow depths in Unit 11 averaged 27" the winter of 1993-94, 8% above the 1964-1992 average of 25 inches. This average increased in southern portions of the unit as Dadina Lake averaged 36 inches of snowpack. Because snowpack exceeded the 30-inch average in the southern portion of the unit, overwinter mortality probably increased this year, especially for calves.

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

Project Objectives: To increase the moose population to an estimated 25,000 by 1995 with a posthunting sex ratio of no less than 15 adult bulls:100 cows.

Work Accomplished During the Project Segment Period: Staff conducted fall sex and age moose counts in 8 count areas located throughout the unit. A total of 4905 moose were counted at a rate of 60 moose per hour. The overall bull:cow ratio was 23 bulls:100 cows with 15 adult bulls:100 cows. Calves composed 17% of the herd.

The definition of legal bull was changed from one having 36-inch spread to one having spike/fork antlers or 50-inch spread. The hunting season was increased by 20 days. We instituted drawing permit hunts for cows in 3 portions of Subunit 13A.

Snow depths were recorded throughout the Basin to determine a winter severity index for moose. This winter was the first in 6 years that was not considered severe throughout Unit 13 because of deep snow depths.

Preliminary harvest figures show hunters killed 1187 bull moose and 36 cows in Unit 13 during the 1993-1994 season. A breakdown of the moose harvest shows that 1137 bulls were taken during the state-regulated fall season, while 50 bulls were taken under a federally regulated fall subsistence hunt held on federal land in Unit 13 for unit residents.

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

Staff reviewed the Copper River Fire Management Plan.

Progress Meeting Project Objectives: Moose numbers declined by an estimated 25-30% in Unit 13 between 1988 and 1991. This decline followed a 9-year period (1978-87) when moose numbers increased at an estimated 5% per year. Analysis of composition data indicated this decline occurred in all sex and age classes. Fall composition count data show

moose numbers stable or declining slightly between 1991 and 1993. In 1992 adult survival and calf production and survival to fall increased. However, calves were not surviving the winter and being recruited into the population as yearlings. During 1993 in Unit 13, the bull:cow ratio declined. This decline was attributed to high hunter harvests in Subunit 13A, following a liberalization of hunting regulations. The current overall bull:cow ratio is below management objectives for Unit 13.

Snow depths varied throughout much of Unit 13. Portions of all subunits except 13D had lower snow depths than observed in past winters. Subunit 13D had a higher snowfall and corresponding snow depths. The snowpack was deep enough in 13D to cause increased calf mortality this spring. At least a dozen dead calves were observed along the road system in 13D and reflects increased calf mortality attributable to increased snow pack throughout the subunit.

The current bull harvest increased by 95% from the previous year's take due to the liberalization of hunting regulations and changes in the definition of a legal bull. Preliminary analysis of harvest data indicated about 40% of the harvest came from Subunit 13A which had been closed to the taking of adult bulls since 1990. The bull harvest in the remainder of Unit 13 was similar to the previous year's take for the same portions of the unit. There were 4884 reported hunters in Unit 13 for a unitwide success rate of 23%. Hunting pressure was the highest ever reported in the unit. Initial indications are that the spike-fork 50-inch regulation shows potential of being an effective harvest strategy to limit the take of bulls to prevent more declines in the bull:cow ratio and still allow long hunting seasons.

The 1993 fire season was uneventful due to cool, wet weather with no major fires occurring in the unit. The last large fire was in 1991 when 5500 acres burned in Subunit 13D. Wildfire is the only feasible means of enhancing moose habitat in most of Unit 13.

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

Project Objectives: To maintain the moose population with a posthunting sex ratio of no less than 20 bulls:100 cows.

Work Accomplished During the Project Segment Period: During 25-29 November, we counted moose from aircraft in 27 of 119 survey sample units. We observed 1232 moose and estimated a population of 5672 ± 798 (80%CI) moose. We also estimated ratios of 16 bulls:100 cows: and 37 calves:100 cows. Calves were 24% of the estimated population. During 5-9 March, we counted 981 moose in the Knik and Matanuska River valleys and observed 17.8% short-yearlings. Overwinter calf survival indicated a mild-moderate winter.

A total of 2665 hunters reported hunting "spike/fork/50 inch" bulls in the 20 August-20 September season and 227 (9%) were successful. The first year of antler restrictions produced a harvest of 70% yearling bulls. Of the 470 individuals holding antlerless permits, 405 (86%) hunted and 204 (50%) of those who hunted were successful. There was no appreciable difference in success between early season and November season permit hunts.

During 1 July 1993 to 30 April 1994, 18 moose were killed by trains and during 1 September 1993 to 30 June 1994, 166 moose were killed by automobiles. The number of moose thought to have been killed illegally was 30-45, while 4 were reported killed in defense of life and property.

Progress Meeting Project Objectives: The Becker survey suggested the Subunit 14A posthunting moose population exceeded 5500 moose, and the bull:cow ratio, though higher than last year (12:100), remained below the objective. Spike/fork/50 inches antler restrictions are expected to bring the bull:cow ratio up to objective levels within the next 2 years. Issuing 500 antlerless moose permits for fall 1994 should stabilize the population near 5500-6000 moose.

Human use objectives, established prior to antler restrictions, will not be met by hunters until 1997. However, if road, railroad, illegal, and DLP moose kills are added to hunter-killed moose, total moose from 14A consumed by humans during 1993/94 approaches 650.

Project Location: Subunit 14B
Western Talkeetna Mountains

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

Work Accomplished During the Project Segment Period: No surveys were conducted during the reporting period. During November 1992 the population was estimated at 1900-2400 moose, with 14% calves.

Examination of harvest reports indicates 326 hunters harvested 31 bulls (9% success) during the 32-day (August 20-September 20) season. A selective harvest strategy was implemented; only bulls with spike, forked, or 50-inch-wide (SF/50) antlers, or an antler with 3 brow tines, were legal. The portion of Unit 14B west of the Anchorage-Fairbanks electrical intertie was reopened to hunting. In addition, at least 13 moose were killed by trains and 15 were killed by automobiles. No more than 5 moose were thought to have been killed illegally, and no moose were reported killed in defense of life and property.

Progress Meeting Project Objectives: Moose numbers in Subunit 14B have increased little since the severe winter of 1989-1990. During fall 1992 the bull:cow ratio (27:100) was well

above the objective ratio; it has probably increased with the SF/50 regulation. Fall surveys should be conducted to determine population trends and the effects of the SF/50 harvest strategy. Moose numbers may not increase without a substantial increase in winter moose habitat.

Moose harvest was well below the objective level and also below the estimated number of legal bulls available under the SF/50 strategy. The latter is probably due to the difficult access to much of the area. General season harvest will probably increase as more bulls become legal and access is improved. Harvest could also be increased by issuing drawing permits for any bull, or with a November general SF/50 season. However, the harvest objective will not likely be achieved without an increase in moose numbers.

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

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

Work Accomplished During the Project Segment Period: Herd population size and composition for Subunit 14C were determined by aerial surveys flown during November and December. Staff observed 897 moose. The ratios of bulls and calves per 100 cows were 37 and 31, respectively. The current subunit population is estimated at 1900 moose.

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

Over the past decade Subunit 14C has supported a large harvest of cow moose. During the past reporting period, cows composed 23% of the total harvest, or 31 animals. Despite this harvest the population remained high because of excellent calf survival over many years, possibly related to reduced numbers of predators throughout much of the wintering range. All cows were killed during special permit hunts. Hunters (n = 599) also took 105 bulls, of which 50 came from the general season and 55 during special permit hunts. Hunters average 4.6 days afield and were 23% successful. Nearly 45% of all moose were taken on either Fort Richardson or Elmendorf Air Force Base with an additional 9% taken from the Portage area hunts. Bowhunters took nearly 40% of the total harvest. Seasons ran continuously in 1 portion or another of the subunit from 20 August through 15 January, excluding from 16 November to 14 December. An additional 100 moose were killed by vehicles in the subunit during this reporting period.

Two severe winters since 1989-1990, coupled with deteriorating browse, have caused a 25% population decline in the Fort Richardson-Elmendorf population. The population on the

military bases was experiencing a gradual, long-term decline, while excellent habitat should allow the Portage population to recover rapidly. The bull:cow ratios have declined over 60% in the Hunter Creek, Knik River and Eklutna count area since the late 1980s. Calf numbers and the calf:cow ratio have also declined in these drainages

Progress Meeting Project Objectives: Aerial surveys conducted during 1993 found an overall ratio of 37 bulls:100 cows, above the project objective of 25 bulls:100 cows.

Project Location: Unit 15 (4,900 mi^2)
Subunit 15A
Northern Kenai Peninsula

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

Work Accomplished During the Project Segment Period: Unacceptable counting conditions in Subunit 15A during fall 1993 prohibited us from completing surveys. Subunit 15A was flown during the 1992 fall sex and age composition surveys, resulting in the following totals and ratios: 1331 moose classified; 36 calves:100 cows; 16 bulls:100 cows; and calves composed 23% of observed moose.

The Board of Game closed the August 25-29 archery season in Subunit 15A during the 1993 season. The reason for the closure was an extension of the general season from September 1-20 to August 20 to September 20.

A preliminary total of 1196 hunters reported hunting 15A during the August 20 to September 20 general 1992 season, harvesting 234 moose. The harvest comprised 143 (61%) spike/fork antlered bulls, 74 (32%) bulls with an antler spread of 50 inches or greater, or possessing at least 3 brow tines on one antler, and 17 (7%) unspecified or illegal bulls.

The department received 1373 applications for 20 permits to hunt antlerless moose in Skilak Loop Special Management Area (SLSMA). The season was September 21-30. All permittees hunted and 8 were successful in harvesting an antlerless moose.

Progress Meeting Project Objectives: The Selective Harvest Program, enacted in 1987, has allowed the moose population in Subunit 15A to exceed the department's objective of 15 bulls:100 cows. Surveys were not completed in 1993; however, survey results from 1987 to 1992 indicate the bull to cow ratio averaged 19:100, compared to 13:100 prior to the Selective Harvest Program.

Additionally, the department would like to maintain the population at its current size. Loss of habitat through human development or deterioration from natural plant succession is the primary factor controlling moose density in 15A. Attempts to enhance areas through

prescribed burning by the U.S. Fish and Wildlife Service and the department have been largely unsuccessful due to restrictions necessary to safely burn on the Kenai Peninsula.

The winters of 1992-1993 and 1993-1994 were mild with snow accumulation less than two feet over most of Subunit 15A. Although a winter census was not conducted in either of these years, the calf survival seemed normal. The moose population in Subunit 15A should have increased slightly due to mild winter conditions over the past two years.

No change in season or bag limit is recommended for fall 1994. The selective harvest program has again gained support during the 1993 season and should be continued.

Project Location: Subunit 15B
Central Kenai Peninsula

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

Work Accomplished During the Project Segment Period: Sex and age composition surveys were not conducted in 1993 due to unacceptable counting conditions.

Preliminary harvest reports indicate 348 hunters reported hunting in 15B West during the 20 August to 20 September 1993 season resulting in the harvest of 46 bulls. Hunter success rate was 13%.

The bag limit for 15B West was one bull with a spike/fork or 50 inch antlers. The 1993 harvest comprised 30 (65%) spike/fork antlered bulls, 14 (30%) bulls with an antler spread of 50 inches or greater or possessing at least three brow tines on one antler, and 2 (4%) with an unreported antler spread or an illegal bull.

Hunting for moose in 15B East was allowed by permit only with a bag limit of one bull with 50 inch or larger antler spread. Staff issued 100 permits, from 2342 applications, resulting in the harvest of 21 bulls. Mean age of harvest was 5 years with a range of 2 to 10. The average antler spread was 52.7 inches and ranged from 39.3 to 69.0 inches.

Progress Meeting Project Objectives: The Selective Harvest Program initiated in 1987 was designed, in part, to increase the bull to cow ratio. Since no areas were surveyed in 15B during 1993, an assessment of the population's status and trend cannot be determined. Due to the past 2 mild winters and selective harvest, the bull to cow ratio is suspected to be in excess of 15:100 in 15B West and 50:100 in 15B East. Staff observations and comments from permittees hunting the area suggest moose are becoming more difficult to find and trophy-sized bulls are less common compared to 5 years ago.

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

Since the season was extended in 1993, no change is recommended for 15B for the 1994 season. The Selective Harvest Program, designed to protect the male segment of the population from overharvest following a severe winter, should be continued.

Project Location: Subunit 15C
Southern Kenai Peninsula

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

Work Accomplished During the Project Segment Period: Poor weather conditions precluded all late fall sex and age composition surveys. Past surveys indicate the moose population is stable to slightly increasing around 2500 animals.

Preliminary harvest statistics indicated approximately 1296 people hunted in Subunit 15C during the 20 August-20 September season and took 269 moose. The overall hunter success rate was 21%. One hundred forty-four (53%) moose were classified in the spike/fork category and 113 moose were classified in the 50+ category with 11 moose antler spreads greater than 60 inches. Twelve moose had either sublegal or unknown antler sizes.

We documented 2 cases of winter mortality even though winter conditions were mild.

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

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

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

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

Work Accomplished During the Project Segment Period: During December 1993 the population was estimated at 3300 (± 900, at the 80% confidence level) moose. There were 24 bulls:100 cows and 24 calves:100 cows; calves composed 16% of the population.

Examination of harvest reports indicates 618 hunters harvested 70 bulls (11% success) during the 32-day (August 20-September 20) general, spike/fork/50-inch (SF/50) bull season. Of the 70 bulls taken, 23 had spike or forked antlers, 42 had either 3 brow tines or a 50-inch spread, and 5 had unknown antler configurations.

We issued drawing permits for any bull during a Nov. 1-15 season. The subunit was divided into 2 hunt areas, north (40 permits) and south (60 permits) of the Petersville Road and Peters Creek. Of the 100 permits issued, 79 people harvested 28 bulls (35% success).

During the report period an additional 9 moose were killed in collisions with autos, 1 moose was killed in defense of life and property, and 2 moose were dispatched after unspecified accidents. These figures should be considered minimum numbers.

Progress Meeting Project Objectives: The population is at or slightly below the objective, and the bull:cow ratio is above the desired level. Surveys should be conducted during fall 1994 to help determine population trends, the effects of the SF/50 selective harvest strategy, and the number of drawing permits needed in the late season hunt. Harvest is well below the objective, probably due to difficult access in many parts of the subunit. With the SF/50 regulation, harvest should increase slightly in coming years, and additional any-bull permits can be issued if the bull:cow ratio remains above 20 bulls:100 cows. If harvest during 1994 is still well below 300 bulls, and if population size and composition remain favorable, the department should consider other options.

Project Location: Subunit 16B
West side of Cook Inlet

Project Objectives: Maintain a population of 6500-7500 moose with a posthunt sex ratio of not less than 25 bulls:100 cows.

Work Accomplished During the Project Segment Period: We conducted Becker aerial surveys during November and December north of the Beluga river. We flew 42 of 294 sample units and observed and classified 879 moose. We estimated a bull:cow ratio of 30:100 and 14% calves in the estimated 5660 moose in this portion of the subunit.

The subunit population estimate was 6000-6500 moose.

Harvest opportunity in most of the subunit was during 20 August-20 September and 10-23 January and was limited to bulls with spike/fork/50 inch antlers. The exceptions were the general season on Kalgin Island and the Tier II seasons between Beluga and McArthur rivers where any bull was legal. Midwinter Tier II hunts in northern 16B also allowed harvest of antlerless moose. During the general season, 569 hunters took 132 bulls for a 23% success rate. The harvest comprised 12% yearlings because of antler restrictions. A total of 68 (65%) Tier II permittees went afield and killed 23 bulls and 21 cows. In total, 176 moose were taken from the subunit, which includes 8 bulls taken from Kalgin Island..

Progress Meeting Project Objectives: Becker surveys of 75% of the subunit indicate the total moose population is now below objectives and declining. Bull:cow ratios are above objective levels and will be exploited during fall/winter 1994 to help meet human-use objectives. Human-use objectives for the subunit were not reached during 1993 and are unlikely to be reached in the future as the population declines. Human-use objectives were attained on Kalgin Island.

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

Project Objectives: To establish a minimum population of 100 moose in Unit 17A.

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

Work Accomplished During the Project Segment Period: Fall sex and age moose surveys were conducted in 7 trend count areas within Unit 17 by Department and Togiak National Wildlife Refuge (TNWR) biologists. The overall ratios were 92 bulls:100 cows and 99 calves:100 cows (34% calves). Staff conducted a late winter aerial survey along the Mulchatna River and its major tributaries in March 1994. We saw only 70% of moose counted during 1993 in the same area. However, because of relatively low snow depths, many moose were dispersed on hillsides outside the survey area.

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

Data from harvest tickets returned by June 1994 indicated that 436 hunters killed 144 bulls during the 1993-94 general season. No moose were harvested in 17A; hunters harvested 126 in 17B and 18 in 17C. Hunter success was 44% (21/48) for local residents, 19% (28/145) for other Alaska residents, and 40% (93/235) for nonresidents. Aircraft was the most common mode of transportation (72%).

Harvest data from Registration Hunt 983 indicated that 433 permittees harvested an additional 103 bulls, 1 female and 1 moose of unspecified sex during the 1993-1994 season. One moose was reported harvested in 17A, 24 were taken in 17B, and 60 in 17C. Twenty moose were harvested in unspecified areas. Hunter success was 39% for local residents (84/214) and 38% for other Alaska residents (21/55). Nonresidents were not eligible to participate in this hunt. Boats were the most common means of access (75%). Fifty-nine (56%) moose were killed in August, 32 (30%) in September, and 14 (13%) in December.

Progress Meeting Project Objectives: Moose throughout Unit 17 experienced another relatively mild winter in 1993-1994. Although overall survival appeared to be high, many moose died during the winter when they fell through thin ice on the rivers. Reports from local residents suggest that up to 100 moose were seen floating in the Nushagak River during the spring, apparent victims accidents During this reporting period, wolf predation on the moose population increased.

Census data for Unit 17 have not been collected since 1987, so there are no recent measures of population compared to objective levels. We should allocate money for a moose census in some portion of the unit as soon as possible.

Moose numbers in Subunit 17A increased dramatically during this reporting period. Biologists from TNWR counted 84 moose in the Togiak drainage during a survey in February 1994. Habitat conditions in that subunit are excellent and healthy moose populations are available in adjacent areas. Illegal moose harvests were reduced during the 1993-1994 winter because of increased enforcement efforts, poor travel conditions for snowmachines, and an abundance of Kilbuck caribou near Togiak. Hunters harvested 5 moose from the subunit during this reporting period.

During the 1993-1994 hunting season, antler restrictions were imposed on Alaska residents hunting in Subunits 17B and 17C. The general season for those subunits was September 1-15 for all hunters. Residents could harvest bull with spike or forked antlers and those with 50 inch or greater antlers. Nonresidents were limited to 50″ or greater bulls. Resident hunters who received a registration permit in Dillingham were permitted to harvest any bull and could hunt from August 20 to September 15 and during December in selected areas.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	192.5	101.3	293.8
Actual	192.5	86.0	278.5
Difference	0	15.3	15.3

Explanation: Poor survey conditions prevented staff from conducting some moose surveys.

Submitted by:

Jeff Hughes
Management Coordinator

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

Project Location: Unit 12

Project Objectives and Activities:

1. Increase the moose population from an estimated 2500-3500 to 4000-4500 by the year 2010.
   a. Conduct fall sex and age composition counts in selected trend count areas.

2. Maintain a minimum posthunting sex ratio of 40 bulls:100 cows.
   a. Monitor hunting pressure and review harvest report data.

Northwestern Unit 12 (Robertson River and upper Tanana Valley):

3. Increase the (1) moose population from an estimated 400 to 800 moose by the year 2000, (2) maintain a minimum of 20 bulls:100 cows along the north slope of the Alaska Range.
   a. Conduct browse surveys to evaluate winter range condition.

Work Accomplished During the Project Segment Period: During November 1993, ADF&G staff flew fall moose composition and trend count surveys in 5 traditional count areas in Unit 12. We classified 850 moose in 14.9 survey hours. The moose per hour of survey was 57.0. The calf:100 cows ratio was 36:100, exceeding the 5-year average of 28:100. The yearling bull:100 cows ratio was 7:100, below the 5-year average of 11:100 and the lowest observed since 1979. Since 1989, yearling survival has declined below what is necessary for population growth. The bull:cow ratio was 26:100. Four of the 5 count areas had the greatest hunting pressure and a minimum objective of 20:100.

Preliminary reported moose harvest during FY94 was 86 bulls with a 24% success rate. During the past 6 years, the Unit 12 success rate for moose has ranged between 15% and 27% and has averaged 23%. The mean antler spread was 46.6 inches, exceeding the 5-year average of 44.0 inches. Of the successful hunters, 21% used horses, 21% used four wheelers, 20% used highway vehicles, 16% used ORVs, 14% used boats, and 7% used airplanes. During FY94, most of the harvest was in the Tetlin (15), Tok (12), and Little Tok (11) River drainages.

ADF&G staff did not conduct browse surveys in Unit 12 during FY94 due to conflicts with other projects.

Progress Meeting Project Objectives: Both of the unit's bull:100 cows objectives were met. Based on the current trend of the Unit 12 moose population, active management will be necessary to meet the other 2 objectives. The Alaska Board of Game took no action on a

wolf control plan designed to benefit the moose population in northwestern Unit 12. Therefore, other than the possibility of using prescribed burns in parts of the unit, there are no management tools available to cause a rapid increase in the unit's moose population. To improve the Unit 12 moose objectives by making them achievable through harvest management, I recommend replacing objectives 1 and 2 with the following objectives: 1) Maintain a minimum bull:cow ratio of 40:100 east of the Nebesna River; and 2) Maintain a minimum of 20 bulls:100 cows in the remainder of the unit. The activities to evaluate these objectives will remain the same as 1a., 2a., and 3a.

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

Project Objectives and Activities:

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

Work Accomplished During the Project Segment Period: No population estimation surveys and only two fall trend counts were conducted in the McGrath area during 1993-1994. An additional winter trend count area was surveyed three times during March to count winter concentrations of moose along the Kuskokwim River near McGrath.

Final results of the 1993-1994 moose harvests for the area have yet to be calculated. Therefore, this report will summarize the final 1992-1993 harvest results. We met the objective of maintaining at least 500 moose in the reported harvest from Unit 19. Five hundred ten moose were reported taken by 1057 hunters (success rate = 48.2%). In Subunit 21A, 101 moose were reported taken by 175 hunters, for a 58% reported success rate. This is substantially below the 125 minimum harvest targeted for the subunit. In Subunit 21E, 123 of 171 hunters were successful, for a success rate of 72%. Although 21A and 21E are capable of sustaining higher (targeted) harvests, the extremely early freeze-up in the area precluded much of the late season hunting activities.

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

Project Location: Subunit 20A

Project Objectives and Activities:

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

Work Accomplished During Project Segment Period: Between 18 and 28 November 1993, we completed 2 moose "superstrats" in 2,691 mi^2 in Subunit 20A, 1 in the central Tanana Flats (1,525 mi^2) and 1 in the western foothills (1,166 mi^2). Despite the deep snow and relatively severe winter in 1992-1993, calf:cow ratios were moderately good in the flats (40:100) and foothills (38:100), due in part to the long growing season in 1993. Bull:cow ratios improved in the flats (30:100) compared to 1991 (21:100) and were lower in the foothills (29:100), but still met our objective of at least 20:100 in each survey area. Yearling recruitment was moderately low (8:100 in flats, 12:100 in foothills), but confirmed that the unit did not have a large die-off of calves last winter. Between 1991 and 1993, the number of observable moose declined in both the flats (23%) and foothills (21%). We cannot calculate a decline in the total number of moose because in 1993 we did not do sightability plots for a correction factor. However, we believe the population has declined (although we do not know how much) and that we will probably not meet our objective of 10,000-12,000 adult moose by 1995.

We completed an 8.2 hour moose survey of 250 mi^2 in the northcentral Tanana Flats on 4-5 May 94 to assess overwinter survival of calves. We observed 718 moose, including 519 cows, 95 short-yearlings (11-month olds), 103 bulls, and 1 of unknown sex. The short-yearling:cows ratio of 18:100 was lower than we expected, with only 13% short-yearlings in the sample. The effects of wolf control on increased overwinter survival of moose calves may be difficult to assess because our survey was in a portion of Subunit 20A closed to wolf control and because immigration of moose from Subunit 20B as well as 20A can increase the density of moose on the Tanana Flats 2- to 4-fold.

We surveyed moose for 4.0 hours in the northern Tanana Flats on 20 and 22 May 1994 to determine twinning rates of parturient cows. During the first survey, we observed only 6 cows with calves so the survey was postponed. During the second survey, 18% (9/51) of the

cows with calves had twins. This compares to no twins observed in 1993, and 10%-22% from 1986-91 (no survey in 1992).
According to the interim report from the 1993-1994 harvest report cards, 1121 moose hunters harvested 386 bull moose in Subunit 20A (34% success rate). Of these bulls, 299 (77%) had antler spreads of 30 inches or larger, 65 (17%) had spreads less than 30 inches, and 22 (6%) had unknown antler spreads.

During this reporting period, we also completed a moose management report for Subunit 20A, which includes an analysis and discussion of data from 1991 through 1993.

Progress Meeting Project Objectives: Based on the decline (21%-23%) in the number of observable moose in the flats and foothills between 1991 and 1993, we will not likely meet our population objective of 10,000 adult moose by 1995. In 1991, the population was estimated to include 8788 adults and has probably declined. If the population includes about 8000 adults, then we would need a 12% annual increase in the adult population for the next 2 years to reach our objective. If the population currently includes 7000 adults, we would need a 20% annual increase for 2 years. And if the population currently includes 6000 adults, we would need a 30% annual increase for 2 years. Our ability to meet this objective depends largely on the current (unknown) population of adults, weather, and changes in predation rates from the wolf control program.

We are meeting our objectives for bull:cow ratios. In the Central Tanana Flats, the bull:cow ratio increased from 1991 (21:100) to 1993 (30:100). Even though the 1993 bull:cow ratio in the western foothills (29:100) was slightly lower than in 1991 (32:100), we still met our objective of at least 20:100 in each area.

We likely exceeded our objectives for a total harvest of <400 bulls, with $\leq$300 bulls 2 years or older. In 1993, the reported harvest of 386 bulls included 299 bulls 2 years or older. If we assume that 17% of successful hunters did not report (Gasaway et al. 1983), we estimate that 465 bulls were harvested, including approximately 360 bulls 2 years and older.

We will be reviewing current management objectives with the public prior to the spring 1995 Board of Game meeting. We will make recommendations for changes in regulations and management objectives at that time. Meanwhile, we recommend adding the following objectives and activities for the next reporting period:

1b. Monitor twinning rates of parturient cows annually in late May.
1c. Census moose population on Tanana Flats and western foothills in November 1995.
2a. Examine composition data from censuses in November 1995.
2b. Monitor composition of moose population in 3 trend areas in November 1994.

Project Location: Subunit 20B

Project Objectives and Activities:

1. Manage for a population of 10,000 adult moose (i.e., excluding calves) by 1995, with 4000 in Subunit 20B West, and 6000 distributed over Subunits 20B Central and East.
   a. Superstratify portions of Subunit 20B Central and West in November 1993.

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

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

Work Accomplished During the Project Segment Period: We did not complete any major moose surveys in Subunit 20B during this reporting period because of higher priorities in Subunit 20A. We did survey 52 mi^2 in the Fairbanks Management Area in November 1993 (prior to the November hunting season), however, and observed 4 bulls, 47 cows, and 14 calves. The resulting bull:cow ratio of 9:100 is less than half of our management objective of 20:100 but the area surveyed was relatively small.

In 1993-1994, hunters reported killing 526 bull moose in Subunit 20B, which is the highest harvest since at least 1984 (range 305-493). The 1993-1994 harvest included 438 bulls taken in the general season, 41 bulls taken by 387 participants in Registration Hunt RM 786 for bowhunters in the Fairbanks Management Area (FMA), and 47 bulls taken by 124 participants in the Tier II Hunt TM 785 for the Minto Flats Management Area.

The FMA registration hunt continues to be popular with local bowhunters, even though success rates are low (11% in 1993). The number of hunters registering for this hunt has steadily increased from 333 in 1991 to 545 in 1993. However, 25% (138/545) of the 1993 permittees did not hunt. The 1993 harvest of 41 bulls is nearly twice the average harvest reported for the previous 3 years (24) and included 35 bulls taken in September and 6 in November. The proportion of yearlings (antlers $\leq$30 inches) in the harvest has declined from 79% in 1991 and 75% in 1992 to 63% (25/40) in 1993, which may reflect poor recruitment or high harvest of the 1991 cohort.

Interest in the Minto Management Area Tier II hunt is also high, as reflected by the 599 applicants for the 1993-1994 hunt. The number of permits issued for the Minto Management

Area Tier II hunt increased to 200 in 1993-1994 (although 5 were not valid) from 150 during the previous 3 years. The harvest of 47 bulls was twice that of the previous 3-year mean of 24 bulls and included 10 bulls taken during the winter season. The 38% success rate was the same as in 1992-1993. Compared to 1992-1993, permit distribution shifted with residents of Minto, Manley, and Nenana receiving more permits (41% of 195) and Fairbanks vicinity residents receiving fewer permits (49% of 195). Three additional bulls were harvested under the federal subsistence permits and are not included in this report.

During this reporting period, we also completed a moose management report for Subunit 20B, which includes an analysis and discussion of data from 1991 through 1993.

Progress Meeting Objectives: For the following reasons, we consider Subunit 20B moose surveys a high priority for 1994:

- Subunit 20B receives the highest moose hunting pressure (2320 hunters reporting during the 1993 general season alone) in the Interior due to its proximity to Fairbanks, the second largest community in the state.

- The most recent surveys we have conducted in Subunit 20B (excluding the Fairbanks Management Area) have been in the Chena and Salcha drainages (1990) and in Minto Flats (1989). Since then, we have had several winters with record snowfalls.

- The harvest of moose in Subunit 20B has steadily increased from 305 in 1985 to 526 in 1993, with the exception of the low harvest of 342 in 1992 when we had record snowfalls in September. Annual harvests have exceeded our objective of 300-400 bulls for 4 out of the last 5 years.

- The wolf predation control program in adjacent Subunit 20A will affect summer calf survival because many of the Subunit 20B cows calve in the Tanana Flats. We would like to monitor the effects of the control program on both moose populations.

- The Board of Game will be discussing moose hunting regulations in spring 1995 and we will need to review objectives and current regulations, such as the longer season in the upper Chena and Salcha drainages.

- The legislature has approved a $350.00 CIP project for habitat and access improvement in Subunits 20A and 20B.

We recommend modifying objective 1a. to read: "Complete population and/or composition surveys in Subunit 20B in 1994."

If moose populations increase as a result of intensive management in Subunits 20A and 20B, human-moose conflicts such as motor vehicle accidents, moose in gardens, moose on dogtrails, will likely increase as well. We recommend adding the following objective:

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

During the next reporting period, we will plan to survey portions of Subunit 20B to obtain population estimates and composition data. In addition, we will be reviewing current management objectives with the public prior to the spring 1995 Board meeting. We will make recommendations for changes in regulations and management objectives at that time.

Project Location: Subunit 20D

Project Objectives and Activities:

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

Work Accomplished During the Project Segment Period: During fall 1993, we assessed project objectives with population trend count surveys in the Donnelly and Delta Agricultural Project Trend Count Areas (TCA) in southern Subunit 20D and in the Central Creek TCA in northern Subunit 20D and a composition survey in the Robertson River drainage of southern Subunit 20D. We analyzed reported harvest for the subunit.

Progress Meeting Project Objectives: It was not possible to determine progress toward population size objectives because no population estimation surveys were conducted in Subunit 20D.

Bull:cow ratios meet the objective in the Central Creek TCA (46 bulls:100 cows) but were below the objective in the Donnelly TCA (26 bulls:100 cows) and the Delta Agricultural Project TCA (18 bulls:100 cows). The Robertson River survey was not completed due to poor weather.

Calf:cow ratios were below the objective in the Donnelly TCA (24 calves:100 cows), the Delta Agricultural Project TCA (25 calves:100 cows), and the Central Creek TCA (21 calves:100 cows).

The bull age structure in southwestern Subunit 20D was nearly stable at 11% large bulls but did not meet the 1993 management objective. Antler restrictions for bull moose legal to shoot during the hunting season were changed so that a 50 inch bull was redefined as a bull

with antler spread of at least 50 inches or at least 4 brow tines on one antler. This regulation change was made to help accomplish management objectives for southwestern Subunit 20D.

Total harvest increased to 155 moose during the 1993-1994 hunting season; however, total number of hunters decreased to 575. Preliminary reported harvest in southwestern Subunit 20D totaled 74 moose and exceeded expectations despite more limited antler restrictions.

Work was initiated to evaluate and develop new bull age structure management goals for southwestern Subunit 20D; however, new goals had not been established at the time of this report.

Project Location: Subunit 20E

Project Objectives and Activities:

1. Increase the moose population from an estimated 2000-3000 to 8000-10,000 with an annual harvestable surplus of at least 3% by the year 2000 in the remainder of Subunit 20E.
   a. Conduct population censuses in portions of Subunit 20E.
   b. Conduct browse transect surveys to ensure habitat is capable of sustaining increasing moose densities.
2. 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.
3. Maintain a posthunting bull:cow ratio of at least 40 bulls:100 cows in all areas.

Work Accomplished During the Project Segment Period: No censuses or browse transect surveys were conducted in Subunit 20E during FY94. The next superstrat survey will be conducted in 1995. Due to conflicts with other projects during FY94, we did not conduct the browse surveys. Browse surveys will be conducted in portions of Subunit 20E during FY95.

During FY94, preliminary harvest data indicate 423 hunters harvested 128 bull moose (30% success). The average annual hunter participation rate and harvest during the past 5 years has been 330 hunters and 60 bull moose, respectively. The average success rate has been 18%. Probable causes of the higher harvest are: 1) the new regulation adopted throughout southcentral Alaska restricting harvest to bulls with spike/fork or antlers > 50 inches caused a displacement of hunters into the area, 2) the Fortymile caribou season was open concurrently with the moose season, attracting hunters for both species, and 3) several "little known" moose concentration areas were found and hunted intensely during this hunting season. Of the successful hunters, 28% used 4-wheelers, 24% used airplanes, 22% used highway vehicles, 14% used boats, and 12% used ORVs. Mean antler width was 48.5 inches, exceeding the 5 year average of 46.2 inches.

During November 1993 fall moose composition and trend count surveys were flown in 8 traditional count areas in Subunit 20E. ADF&G staff classified 854 moose in 14.8 survey hours. The overall bull:cow ratio was 63:100, exceeding the minimum management objective of 40:100. The bull:cow ratio has remained consistent over the past 4 years, ranging from 63 to 65:100. The overall calf:cow ratio was 28:100 but varied widely among count areas (18:100 to 46:100). Contrary to the past 5 years, the overall calf survival to 5 months during FY94 was better in the western portion of the subunit (35 calves:100 cows) than in the east (27 calves:100 cows). The only obvious difference between the two areas during the past year was a high wolf harvest (50%) occurred in the central and western portion of the subunit.

Progress Meeting Project Objectives: Based on results from superstrat surveys during FY93 and composition surveys in FY94, the moose population in central and western Subunit 20E has remained stable or slightly declined and remains at low density (0.2-0.6 moose/mi^2). The population in the eastern portion of the subunit has been increasing and the current density ranges between 0.8 and 1.0 moose/mi^2. Overall, the moose population in Subunit 20E remains at low density (0.4-0.5 moose/mi^2). Past and ongoing research has shown that wolf and bear predation is the primary limiting factor on the moose population. At the present predator levels, the moose population will not reach the population or human-use objectives by the year 2000. During June 1993, the Alaska Board of Game decided against a wolf control program in Subunit 20E. Based on that decision and on the current status of the area's predator populations, the moose population will remain at low density for an extended period and not meet the population and harvest objectives. I recommend that objectives 1 and 2 be deleted. At this time we have no management tools available to achieve those objectives. However, causing a significant growth of Subunit 20E's moose population will remain a long-term management goal. If in the future, the political and social attitudes become more accepting of active predator management or if different management tools become available, then we can alter the management objectives and activities to achieve this goal.

The bull:cow ratio in Subunit 20E exceeds the management objective. However, bull:cow ratios have declined in the most popular hunting areas. To protect against an excessive decline in bull numbers in a portion of Subunit 20E, the Alaska Board of Game established the Ladue River Controlled Use Area in the eastern portion of the subunit at the spring 1994 meeting.

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

Project Objectives and Activities: The management objectives we listed in the FY93 moose performance reports for this area were to:

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

2. Maintain an annual posthunting sex ratio of at least 30 bulls:100 cows.
3. Estimate moose densities by 1991.
   a. Estimate moose density and composition in Subunit 25C by 1993.
   b. Cooperate with BLM to superstratify approximately 1000 mi^2 in central Subunit 25C in November 1992.
4. Promote moose habitat enhancement by allowing natural fires to alter vegetation.
5. Establish definitive population objectives by 1992.
6. Provide for a sustained annual harvest of 30-50 bull moose in Subunit 25C.

Work Accomplished During the Project Segment Period: In Subunit 20C, preliminary data indicate 327 hunters reported taking 123 bulls during 1993-94. From 1986 to 1992, the number of hunters ranged from 224-308 and harvest ranged from 56-142 bulls, indicating a slight increase in the number of hunters.

In Subunit 20F, preliminary data indicate 64 hunters reported taking 23 moose during 1993-1994. This is a slight decrease in harvest from 1992 when 27 were reported harvested. From 1986 to 1991, the number of hunters ranged from 98 to 129 and harvests ranged from 20 to 38 moose.

In Subunit 25C, preliminary data indicate 154 hunters reported killing 55 moose in 1993. From 1986 to 1992 the number of hunters ranged from 97 to 186 and harvest ranged from 26 to 46 moose. This was a slight increase in harvest over the previous 6 year range.

We sent a letter of inquiry to the village of Tanana regarding their permit needs for the Nuchalawoyya Potlatch. We have not received a response as of the date of this report.

There is a federal subsistence season within the Dalton Highway corridor in Subunit 20F (Hunt 990).

No activities were conducted toward objectives 2-5 during this reporting period.

The 1993 harvest in Subunit 25C was 55 bulls. The harvest has ranged between 26 and 46 from 1986 to 1992.

Progress Meeting Project Objectives: We are meeting our objective to estimate hunting mortality and to document nonhunting mortality when possible. We are accomplishing this using harvest ticket reports and the Department of Public Safety moose/motor vehicle collision logs. Harvest and hunting pressure have been increasing slowly during the past 8 years in Subunits 20C and 25C. In Subunit 20F, total number of reporting hunters has decreased since 1991 from 155 to 64 in 1993. Harvest is not adversely affecting moose populations in these areas.

We have not collected composition information in any of these subunits since 1989. Therefore, we do not know if we are maintaining a posthunt sex ratio of at least 30 bulls:100

cows. However, we believe we are maintaining this objective. To maintain this objective, we should strive to collect composition information on a scheduled basis. We believe that 1 survey in 1 of the 3 subunits per year should be the minimum effort. This would put these lower density subunits with comparatively light hunting pressure on roughly a 3-year survey rotation which should be adequate for management.

Overall moose densities are low with some small areas of medium or high densities. We did not meet the objective to estimate moose densities in these subunits by 1991. We had plans for a survey in Subunit 25C in 1992, which were spoiled by weather, and made similar plans for 1993 which were changed because of a higher priority in Subunit 20A. Surveys are planned for areas in Subunits 20C and 25C for November 1994. A survey in the Minchumina trend area is planned for Subunit 20C to monitor composition and recruitment. In Subunit 25C, we are planning to cooperate with BLM to do a superstratification survey of approximately 1000 mi^2.

We did not meet our objective to establish definitive population objectives by 1992. This will be delayed until we analyze more current survey information, incorporate input from the advisory committees and the Board of Game, which will be addressing moose during the reporting period.

We met our objective to provide a harvest of 30-50 bulls annually from Subunit 25C. We have met this objective consistently between 1990 through 1992 and harvested 55 bulls in 1993.

We recommend the following changes to the project objectives and activities as follows.

- Delete objective 2 until we are able to collect more current data on composition and establish population objectives.

- Change objective 3 to "Estimate moose densities in Subunits 20C, 20F, and 25C by 1996." and delete section 3a. and subparagraph 1.

- Change objective 5 to "Establish definitive moose population objectives for Subunits 20C, 20F, and 25C by 1996."

- Delete objective 6 until we are able to collect more current data on composition and establish population objectives.

Add this objective: "To provide for a sustained yield harvest of these low-density populations until specific population management guidelines have been established."

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

Project Objectives and Activities:

Unit 21B:

The floodplain Areas of the Yukon and Novi Rivers:

1. Maintain or increase November moose densities to 2.5-4.0 moose per square mile.
   a. Conduct annual trend area surveys.
2. Maintain an average annual harvest of 40 moose from the desired population of 1000-1600 moose.
   a. Monitor harvest with harvest reports and check stations.
3. Determine the extent and sources of moose calf mortality from May 1988 through May 1990.
   a. Radiocollar 40 neonatal calves/year and investigate mortalities.

Remainder of the Novi Drainage:

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

Remainder of Subunit 21B:

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

Unit 21C:

1. Increase the moose population to 2500-3000 in the Melozitna River drainage to increase hunting opportunities.
2. Maintain the moose population of 550-750 in the Dulbi River drainage to sustain hunting opportunities.
   a. Monitor harvest with harvest reports.

Subunit 21D:

1. Maintain a population of at least 4000 moose south and east of the Koyukuk River, including the Three-day Slough floodplain.

Maintain an early winter density of at least 4.0 moose per square mile within the Three-day Slough floodplain.

a. Conduct annual trend area surveys.

2. Maintain a posthunting ratio of 30 bulls:100 cows in the population being monitored within the Three-day Slough trend count area.

a. Monitor harvest with harvest reports and check stations.

3. Develop guidelines for maximum winter browse use within the Three-day Slough area.

a. Conduct browse surveys.

4. Maintain a moose population level of 900-1000 in the Kateel River drainage and develop a population level for the Gisasa River by 1991.

a. Conduct a moose stratification survey.

5. Maintain an early winter density of at least 3.0 moose per square mile in floodplain areas along the Yukon River that are subject to both the September and February hunting seasons.

a. Conduct annual trend area surveys.

6. Develop a population level and density estimate by 1994 for the remainder of the subunit, including the Yuki and Nulato Rivers.

a. Conduct a moose stratification survey.

Unit 24:

1. Manage a moose population at the current level of 3000-4000 in the area south of Hughes, including the Koyukuk Controlled Use Area.

Increase the moose population to 5000-6000 in the area from Hughes to Bettles, including the Kanuti Controlled Use Area and the South Fork drainage.

Increase the moose population north of Bettles, excluding the Gates of the Arctic National Park, to 3000-3500.

Maintain the population in the Gates of the Arctic National Park at 1300-1500.

a. Conduct annual trend area surveys.

2. Determine harvest.

a. Monitor harvest with harvest reports and check stations.

Work Accomplished During the Project Segment Period: Fall moose composition surveys were flown in cooperation with USFWS during November 1993. In Subunit 21B 494 moose were classified in 211 mi^2 along the Novi River for a density of 2.3 moose per square mile. The bull:cow ratio at 30:100 was higher than in previous years, the calf:cow ratio was down to 23:100, and the yearling percent in the herd was up slightly to 4%. In Subunit 21D within the Three-day Slough trend count area, the observed density of moose was 13 moose per square mile. Productivity in the area was good with average calf recruitment. The bull:cow ratio was 38:100, the calf:cow ratio was 25:100, and the yearling percent in the herd was 10%. In the Koyukuk/Yukon Confluence count area, the bull:cow ratio was 21:100, the calf:cow ratio 38:100, and the yearling percent in the herd was 6%.

In May 1994 we conducted a moose calf twinning survey to determine the percentage of cows producing twins. The twinning rate was 22%. Numbers lower than 20% usually indicate environmental stress either from hard winters or poor forage conditions.

In Subunit 21B, 105 hunters reported taking 67 bull moose. USFWS staff operated a moose hunter check station at the mouth of the Nowitna. Fifty-six moose were taken by 130 hunters within the drainage which includes part of Subunit 21A. Nineteen hunters were unit residents, 91 were Alaska residents and 20 were nonresidents. The number of hunters using the Nowitna has remained stable.

Twenty moose were taken by 34 hunters in Unit 21C. Fifteen hunters were nonresidents, 17 were Alaska residents, and 2 hunters' residency were unknown.

In Subunit 21D, preliminary harvest data from Anchorage shows 268 hunters taking 234 moose of which 215 were bulls and 18 were females. Harvest has been slowly increasing within the subunit with the majority of the harvest coming from the Koyukuk River. A moose hunter check station was operated on the Koyukuk River and 281 hunters were checked through. They took 185 moose with residency and harvest as follows: 115 unit residents took 48 moose, 132 Alaska residents took 109 moose, and 34 nonresidents took 28 moose.

The total reported harvest in Unit 24 was 124 moose by 212 hunters. The number of hunters using the Dalton Highway for access has stabilized at about 100 and they took 36 moose.

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

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

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

The "Project Objectives and Activities" section should be revised as follows: In Subunit 21B the extent and sources of moose calf mortality from May 1988 through May 1990 were determined. Delete section 3.

In Subunit 21C the following objective can be added: 3. Develop a population level and density estimate by 1997 for the Melozitna River drainage by conducting a moose stratification survey.

In Subunit 21D the following objective and activities should be added: 7. Forage dynamics of moose will be determined by defining the choice of browse species during winter; measuring the nutritive quality of winter browse; estimating browse consumption as a proportion of current annual growth, and assaying moose body condition by urinary chemistry or ultrasound. 8. Determine the number and residency of hunters using the Koyukuk River to access the Three-day Slough area by operating a moose hunter check station at Ella's cabin. The date for determination of the population estimate in the Gisasa River drainage should be modified to 1997, and the Yuki and Nulato drainages should be modified to 1996.

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

Project Objectives and Activities:

Unit 25 Overall:

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

Subunit 25A:

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

Subunit 25B:

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

Subunit 25D:

1. In cooperation with USFWS, plan for and conduct periodic moose population surveys in the eastern and western portions of the subunit.
2. Educate local residents regarding the importance of not taking cow moose.

Work Accomplished During the Project Segment Period: Moose trend surveys were conducted in Subunits 25D East and 25D West during November 1993. Weather precluded composition surveys in Subunit 25A. FWS and ADF&G staff planned a cooperative study of moose population identity in Subunit 25A.

Harvest data for all subunits are being analyzed, and final figures will be available in July 1994. Based on interviews with hunters, the number of moose harvested in these areas will probably be higher than in previous years.

Progress Meeting Project Objectives: Overall management objectives for these subunits were met. There is progress in Subunit 25A meeting objectives 1 and 2. Weather precluded composition surveys and progress on objective 3. No surveys were accomplished in Subunit 25B, but educational moose management videos were developed and distributed to address objective 2. Composition surveys and distribution of educational videos on moose management represented progress with both objectives in Subunit 25D.

Population management plans and more definitive objectives will be developed during FY 95.

Project Location: Subunits 26B and 26C

Project Objectives and Activities:

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

Work Accomplished During the Project Segment Period: No surveys were conducted in Subunits 26B and 26C during this period. Planned surveys by USFWS could not be conducted because of weather and conflicting priorities elsewhere.

No browse utilization studies were conducted in Subunits 26B and 26C during this reporting period.

No radiotelemetry studies were conducted in Subunits 26B and 26C during this reporting period.

Harvest data are being compiled and analyzed. It is likely the 1993 harvest in both subunits returned to former levels after an unusually cold September in 1992 sharply reduced hunter harvest.

Progress Meeting Project Objectives: Budget and time constraints allowed only minimal progress with project objectives. However, objectives relating to posthunting sex ratios and hunter success continue to be met. No survey work was accomplished in Subunits 26B and 26C because of inclement weather.

Segment Period Project Costs:

	Personnel	Operating	Total
Planned	120.5	83.0	203.5
Actual	124.5	57.8	182.3
Difference	-4.0	25.2	21.2

Explanation: Poor fall survey conditions in the McGrath and Fairbanks areas prevented completion of all planned surveys.

Submitted by:

Kenton P. Taylor
Management Coordinator

Project Title: **Western Alaska Moose Survey and Inventory**

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

Project Objectives and Activities:

1. Increase the moose population in Unit 18 by 10% a year to maintain a population goal for the Yukon River population of 3000-5000 moose. A population goal for the Kuskokwim River population has not been set. The bull:cow ratio for both populations will be maintained at a minimum of 30 bulls per 100 cows.
   a. Conduct fall sex and age composition surveys and winter recruitment surveys of the Yukon River population annually.
   b. Conduct fall and/or midwinter surveys of the major drainages of the Kuskokwim and the main Kuskokwim River to assess the status and population size of the Kuskokwim River population.
   c. Conduct a moose census on the Yukon River every 5 years.
   d. Conduct a moose census on the Kuskokwim River every 5 years.
   e. Improve harvest reporting and compliance with hunting regulations.
2. Develop a moose management plan in cooperation with local communities along the Yukon River.

Work Accomplished During the Project Segment Period: ADF&G staff completed an aerial survey of the moose population on the Yukon River delta between 16 and 17 March 1994. We counted 65 moose in the delta portion of the Yukon River downstream of Mountain Village. Midwinter surveys were conducted along the Yukon River between Ohagamiut and Paimiut, and along the Kuskokwim River between Kalskag and Tuluksak during March 1994. The lack of snow and exposed vegetation made it difficult to observe animals, and moose were not aggregated in willowed riparian areas, which made comparisons to previous years difficult. We believe that moose numbers have not changed markedly, at least along the Yukon portion of the survey area. Surveys were also conducted along the Kanektok and the Arolik Rivers during March 1994, and no moose were seen.

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

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

We gathered additional harvest statistics from harvest ticket reports. In Unit 18, 234 hunters returned harvest reports, and 95 male moose were reported harvested. This is the highest reported harvest on record for Unit 18. Successful hunters needed an average of 6 days to harvest a moose. Ninety hunters used boats for transportation, 4 used snowmachines, and 1 used an aircraft. Hunters harvested 74 (78%) male moose along the Yukon River drainage and 21 male moose (22%) along the Kuskokwim drainage and the Johnson River.

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

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

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

Project Objectives and Activities: The overall population management objective is to maintain a minimum population level of 5000-7000 moose throughout the Unit. In Unit 22A, the objective is to increase population size from the current estimate of 400-600 moose to at least 800-1000 moose. In Units 22B and 22D, the objective is to maintain the population at 1500-2500 and 2500-3000 moose, respectively, with a minimum bull:cow ratio of 30:100. In Unit 22C, the objective is to maintain the existing population of 350 with a minimum bull:cow ratio of 20:100. In Unit 22E, the objective is to maintain the existing population of 250-350 moose.

These objectives will be attained through the following management activities:

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

Work Accomplished During the Project Segment Period: The known harvest from Unit 22 was 247 moose (225 males, 21 females, and 1 sex unknown). A breakdown of that harvest by Subunit is as follows: 22A-22, 22B-83, 22C-23 - 22D-100, and 22E-19. Five-hundred fifty-one hunters participated in this year's hunt, and 89% were residents of Alaska. Hunter success rate for the season was 45%.

We collected and analyzed incisors from 104 hunter-killed moose in an effort to determine age and the cause of the unusually high incident of tooth breakage among Seward Peninsula moose.

We did not conduct fall composition surveys during fall 1993 due to poor weather conditions.

We attempted a spring moose census in Subunit 22A. Although we were able to stratify the area and sample several of the sample units, high winds and severe turbulence prohibited sampling enough of the area to provide us a reliable population estimate. Limited spring surveys were also conducted within some drainages of Subunits 22B, 22C, and 22D.

Unit 22 schools continue to use a school program developed several years ago to explain the importance of wildlife management concepts and regulations. Staff made several trips to villages, explaining the need for regulations and harvest reporting, as well as assisting local license vendors. Staff members spend considerable time answering and making phone calls, writing articles, sending out mailings of regulation material, and assisting the unit's license vendors.

Progress Meeting Project Objectives: The unreported harvest of moose in Unit 22 is considerable. Much of this harvest is attributable to hunters who do not purchase licenses or pick up harvest tickets rather than by those who hunt outside of current season dates. Efforts to inform the public of the importance of wildlife conservation and the need for regulations are having an effect in some communities because the number of individuals purchasing

licenses and/or picking up harvest tickets has increased. However, additional contact with local residents is necessary for full compliance with current moose regulations.

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

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

Project Objectives and Activities: The population management objective of Unit 23 is to maintain the moose density at existing levels, and the bull:cow ratio at a minimum of 40:100. These objectives will be attained through the following management activities:

1. Identify a census area in the Noatak River drainage and conduct a quantitative census.
2. Conduct annual surveys in established trend count areas to monitor population composition and recruitment. Monitorharvest.
3. Collect data on moose movement patterns, distribution, and evaluate sources and rates of mortality in the Noatak drainage. Begin a similar study in the Selawik River drainage.

Work Accomplished During the Project Reporting Period: The middle Noatak River drainage upstream from the village of Noatak to and including the Kugururok River drainage (1,630 mi^2) was censused during November 1993. The overall density of moose was 0.69 moose per square mile with 25 calves per 100 cows and 43 bulls per 100 cows. At the 90% confidence level, the population estimate was 1125 moose $\pm$ 16%.

The following fall composition surveys were completed in the Tagagawik River and Wulik River trend count areas during November 1992:

Trend Count Area	Lg Bulls per 100 Cows	All Bulls per 100 Cows	Calves per 100 Cows	Total Moose
Tagagawik River	14	43	31	402
Wulik River	5	24	57	75

We completed the second year of a cooperative moose telemetry project in the middle Noatak River drainage. Collared moose were relocated monthly and 20 additional moose were

radiocollared during April 1994 to bring the sample size up to 61. There was no capture mortality. Hunting and natural mortality for collared moose in the second year of the study was 27% compared to 29% the first year. On the Tagagawik River in the Selawik River drainage, 50 moose were radiocollared and 20 additional moose were ear-tagged.

Progress Meeting Project Objectives: The Noatak moose telemetry project allowed us to identify a census area and improve our assessment of harvest and natural mortality rates. Results of the census indicated population objectives were being met in the Noatak. Trend count data in the Tagagawik also indicated population objectives were being met. We believe the bull/cow ratios in the Wulik drainage did not accurately reflect the population but rather were a result of the trend count area being too small relative to movements of moose at that time of year.

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

Project Objectives and Activities:

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

Work Accomplished During the Project Segment Period: Fall sex and age composition surveys were completed in the Colville, Anaktuvuk, and Chandler River drainages during November 1993. Of the 392 moose observed, 101 were bulls (37 bulls per 100 cows), 277 were cows, and 16 were calves (4% calves). The estimated antler size classification for bulls is as follows:

Inches	<30	30-39	40-49	50-59	60+
Percent	16	25	14	36	10

A survey to determine population trend and short-yearling recruitment was conducted during April 1994 in trend count areas in the Colville, Anaktuvuk, and Chandler River drainages. We counted 983 moose (943 adults and 40 calves), yielding a short-yearling recruitment rate of 4%.

Harvest data were compiled from hunters' harvest reports. Hunters reported killing 53 bulls and 8 cows during the fall 1993 hunting season. The chronology of the harvest is as follows: 22-31 August (4), 1-7 September (38), 8-14 September (14), 15-21 September (2), 22-28 September (1), and 29 September-3 October (1). The harvest was distributed throughout the Colville River drainage, and the largest number of animals were taken from the Chandler River (33%), the Anaktuvuk River (21%), the Colville River above the mouth of the Killik River (15%), and the Colville from the mouth of the Killik River to the Anaktuvuk River (10%). Antler sizes and percentage of animals having those sizes are as follows:

<25"	3.3%
25-29.99"	1.6%
30-34.99"	1.6%
35-39.00"	3.3%
40-44.99"	8.2%
45-49.99"	3.3%
50-54.99"	18.0%
55-59.99"	31.1%
60-64.99"	14.8%
>65"	0%

Twelve percent of the hunters were residents of Unit 26, 42% were nonlocal Alaska residents, 42% were nonresidents, and 4% were of unknown residency. The average hunt lasted 5.4 days, and the hunter success rate was 80%.

Progress Meeting Project Objectives: The number of moose counted in the sample trend count areas has declined, and the calf survival rate was very low. The decline was most noticeable along the Colville River between Umiat and the mouth of the Killik River where the number of adults counted decreased from 177 during 1991 to 93 during 1994, and no surviving short yearlings were seen during 1994. It is possible that moose had moved away from our counting area, but the trend counts indicate population size appears to be declining. We plan an areawide census in 1995 to determine the status of the population rather than wait for 7 years as in the past. A wolf census was conducted during 1994 to help determine the effect of wolf predation on the moose population. Because so few calves survived the summer of 1993, we will attempt to complete surveys during June of 1994 to determine if there is a problem with calving or if high calf mortality occurs during the summer.

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

Segment Period Project Costs:

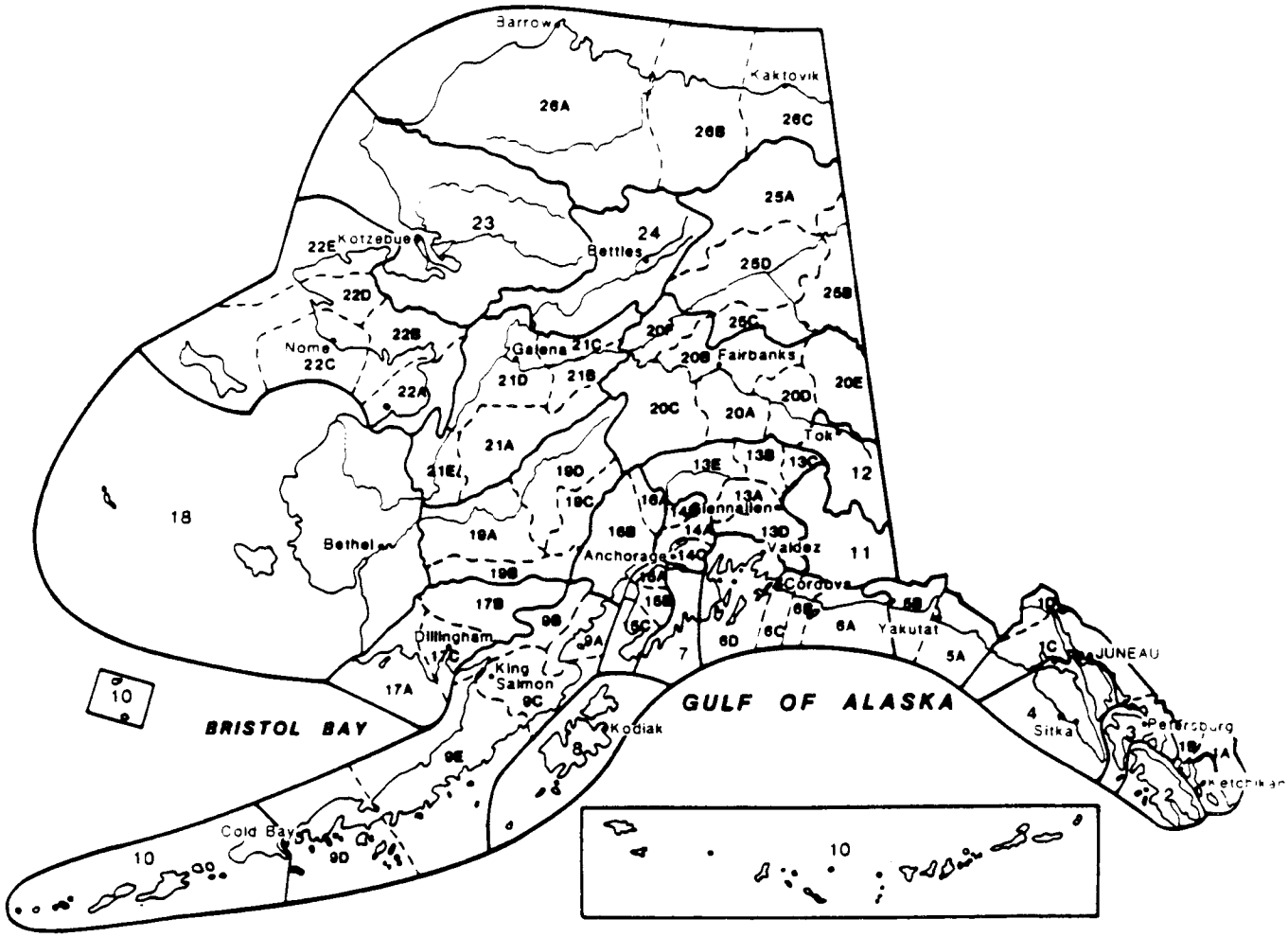
	Personnel	Operating	Total
Planned	53.9	41.9	95.8
Actual	53.9	41.3	95.2
Difference	0	-0.6	-0.6

Explanation: ADF&G staff conducted moose and wolf censuses concurrently in Unit 26A, saving aircraft ferry and travel expenses.

Submitted by:

Steve Machida
Survey-Inventory Coordinator

Alaska's Game Management Units



The Federal Aid in Wildlife Restoration Program consists of funds from a 10% to 11% manfacturer's excise tax collected from the sales of handguns, sporting rifles, shotguns, ammunition, and archery equipment. The Federal Aid program distributes funds to states using a formula based on each state's geographic area and number of paid hunting license holders. Alaska receives a maximum of 5% of revenues collected each year. The Alaska Department of Fish and Game uses its funds to help restore, conserve, and manage wild birds and mammals. These funds are also used to educate hunters to develop skills and attitudes for responsible hunting. Federal Aid funds paid for 75% of this study.