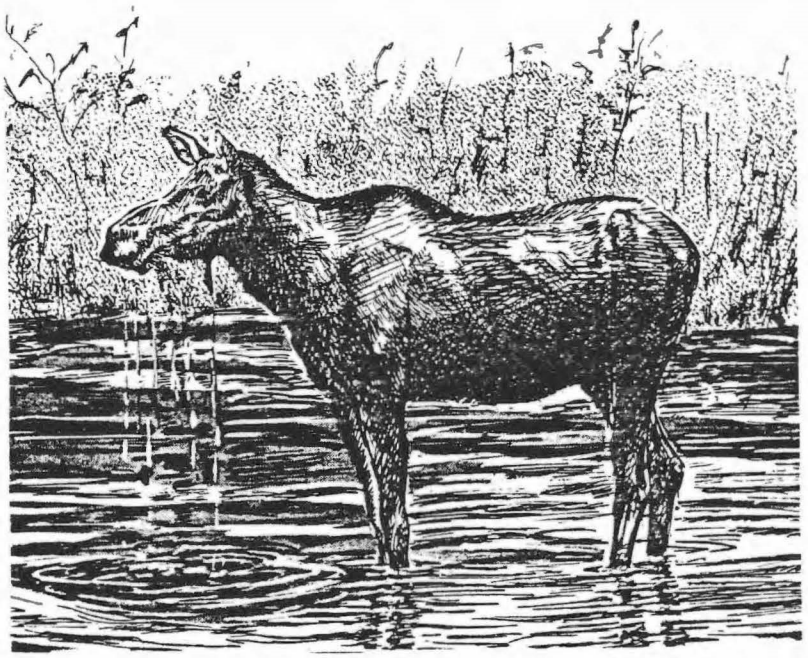
Alaska Department of Fish and Game
Division of Game
Federal Aid in Wildlife Restoration
Annual Report of Survey—Inventory Activities

MOOSE



Compiled and edited by
Barbara Townsend, Publications Technician
Vol. XVII, Part VIII
Project W-22-5, Job 1.0
January 1987

STATE OF ALASKA
Steve Cowper, Governor

DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

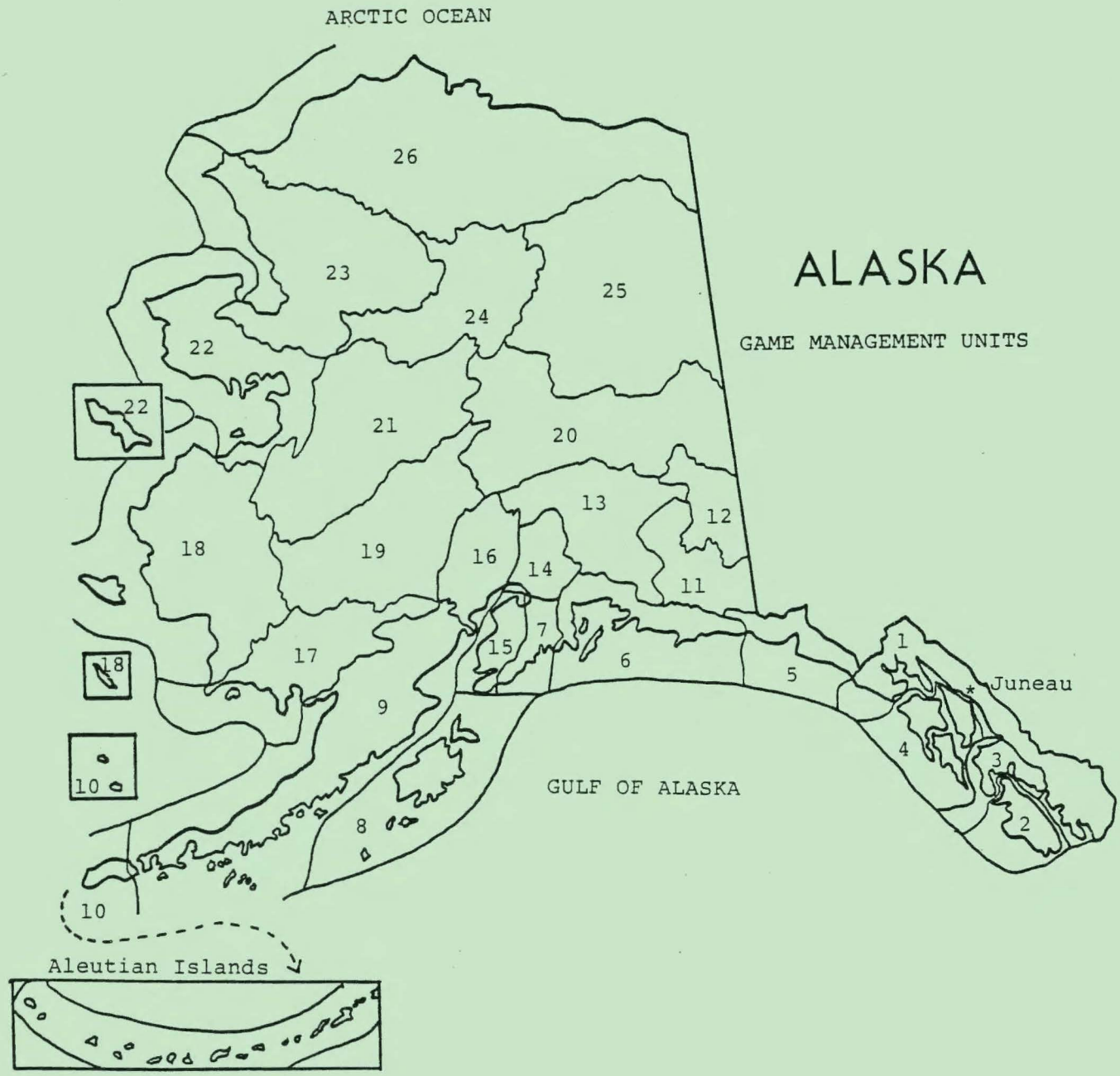
DIVISION OF GAME
W. Lewis Pamplin, Jr., Director
Robert A. Hinman, Deputy Director

Additional copies of this report, or reports on other species covered in this series may be obtained from:

Publications Technician
ADF&G, Game Division
P.O. Box 3-2000
Juneau, AK 99802
(907) 465-4190

Cover art by Todd Sherman, Fairbanks, Alaska.

CONTENTS


ARCTIC OCEAN
ALASKA
GAME MANAGEMENT UNITS
26
23
25
24
22
22
21
20
13
12
18
19
16
14
11
17
15
7
6
5
1
18
9
Juneau
4
3
10
GULF OF ALASKA
8
2
10
Aleutian Islands

STATEWIDE HARVEST AND POPULATION STATUS

The status of moose populations in the state is highly variable; generally, populations in the Interior (e.g., Units 12, 19, 21, 24, 25, and parts of Unit 20) are at low levels and either stable or slightly increasing, while many populations in northwestern Alaska (Units 22 and 23) and southcentral Alaska are at higher densities and stable or increasing. Winter weather was generally favorable to moose survival, although spring flooding adversely impacted populations along portions of the Yukon River, notably in Unit 21. Adverse weather had an impact on hunting in some areas.

The reported harvest by hunters totaled 6,320 moose (5,685 bulls, 601 cows, and 34 sex unknown) for the state. The largest unit harvest was reported from Unit 20 (947 moose), followed by Unit 13 (823 moose) and Unit 14 (820 moose). As noted in previous years, the actual harvest is considerably greater than the reported harvest, particularly in Interior and Arctic units.

Reported harvest of moose is summarized below:

Unit	Reported Harvest			
	Bulls	Cows	Unknown	Total
1	106	5	--	111
5	60	1	--	61
6	106	43	--	149
7	58	--	1	59
9	223	10	--	233
11	47	0	0	47
12	66	0	0	66
13	823	0	0	823
14	558	249	13	820
15	302	2	5	309
16	399	112	4	515
17	146	0	6	152
18	52	0	0	52
19	419	13	0	432
20	947	0	0	947
21	454	27	2	483
22	279	92	3	374
23	112	12	0	124
24	114	0	0	114
25	138	0	0	138
26	86	25	0	111

Robert A. Hinman
Deputy Director

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 1A, 1B, and 3

GEOGRAPHICAL DESCRIPTION: Southeast mainland from Cape Fanshaw to Canadian border and adjacent islands

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose occur along major drainages in Subunits 1A and 1B and on several of the major islands of Unit 3. The number of moose in Subunit 1A is low. A small herd in the Chickamin River drainage originated from an ADF&G transplant of 14 moose from Cook Inlet and the Chickaloon Flats in 1963-64 (Burris and McKnight 1973). Limited hunting occurs on the small indigenous moose population present in the Unuk River drainage.

The primary hunted populations of Subunit 1B, those at Thomas Bay and on the Stikine River, appear to be stable. An estimated 300 moose use the Stikine River drainage (Craighead et al. 1984). The Thomas Bay moose herd supported a small harvest during the years 1970 through 1981, but the season was closed in 1982 and 1983 because of poor calf production (attributed to winter mortality). The Thomas Bay season was reopened in 1984. Increased sightings of moose throughout Unit 3 indicate that the population is increasing there, but the future of moose on the islands of Unit 3 is uncertain. Logging of high-volume old-growth timber has occurred on many of the islands. Although moose usually prefer early seral stages of vegetation, the successional vegetation created by clear-cutting in this area has been found to be low in nutritive value (Doerr et al. 1980). During periods of deep snow, little forage will be available in clear-cuts. Because of the reduced availability and quality of forage, severe winter conditions will probably limit moose expansion in Unit 3.

Population Composition

The small kill in the Thomas Bay area of Subunit 1B does not justify expensive surveys, but aerial survey flights are made

occasionally to monitor gross changes in sex and age ratios. No flights were made in the Thomas Bay area in 1984, or in Subunit 1B during 1985, because of poor survey conditions.

Mortality

Subunit 1A:

No bulls were reported killed in Subunit 1A during the 1985 season (R. Wood, pers. commun.).

Subunit 1B (south of Le Conte Bay):

Biologists stationed at Kakwan Point, Stikine River, regularly visited hunting camps in southern Subunit 1B throughout the season to interview hunters and to examine kills for age and antler characteristics. This information revealed that 34 bulls were taken on the Stikine River during 1985, and 4 bulls were taken elsewhere (1 at Aaron Creek, 2 at Virginia lake, and 1 in the Bradfield River drainage). Of the 21 bulls (62%) examined for age and antler characteristics, 15 bulls (71%) were yearlings. An estimated 180 hunters were afield on the Stikine River in 1985 compared with about 200 hunters in 1984. The success ratio in southern Subunit 1B, based on the check station data, was 21%.

Based on the return of 246 moose harvest tickets, 215 unsuccessful hunters spent an average of 8.5 days afield in southern Subunit 1B; 31 successful hunters spent an average of 9.4 days. Hunting success reported through harvest ticket reports was 13%. Of the 31 bulls reported on harvest ticket reports, 57% were taken during the 1st week of the season, 7% during the 2nd week, 17% during the 3rd week, and 14% during the 4th week; 10% of the respondents did not report a kill date.

Subunit 1B (north of Le Conte Bay):

In northern Subunit 1B, 154 registration permits were issued; 95 (62%) of the permit holders participated in the 15-day season, taking 13 bulls. The percentage of successful hunters was 14%; these hunters spent an average of 2 days afield.

Unsuccessful hunters reported hunting an average of 3 days. Boats were used by 92% of the hunters, while 8% used aircraft to get to the hunting area.

Management Summary and Recommendations

The total Subunit 1B harvest was 51 bulls. The Stikine (southern Subunit 1B) harvest of 34 bulls was 7 less than in 1984. The 1985 moose kill in the Thomas Bay portion (northern Subunit 1B) was 13 bulls compared with 11 in 1984.

The continued heavy hunting pressure on the male segment of the Stikine herd is cause for concern because a majority of the available breeding males are killed each year. Although a bull is capable of breeding with many cows (Rausch and Bratlie 1965), the number of bulls could be reduced below a level needed for successful reproduction.

In recent years, numerous hunters have complained about the use of low-flying aircraft on the Stikine River for moose hunting. In order to remedy the problem of moose being disturbed by such aircraft, a letter was sent to all pilots operating in the area, as well as to charter services and the news media, explaining the problem and asking for cooperation in reducing the number of cases of low-flying aircraft. During the 1985 season, cooperation was excellent and few complaints were received.

In 1985, the definition of a legal bull in northern Subunit 1B was "a bull with at least 3 tines on at least 1 antler." This regulation, first implemented in 1984, seems to be achieving the objective of protecting a portion of the breeding males while providing hunting opportunity and avoiding the need for a limited permit system. The regulation will be in effect for at least 1 more year in the Thomas Bay area where calf survival has been poor during cold winters. If proven effective, a similar regulation will be considered for the Stikine. After a period of time, the regulation should be modified to protect a different segment of the bull population to avoid developing a herd with inferior antler characteristics through the continued selection of males with the best antler production. Close monitoring of the hunt and of the wintering herd will be necessary for an evaluation of the impact of the antler restriction.

Continued logging and road construction in southeast Alaska pose a problem in moose management. Logging has contributed to moose population explosions in Scandinavia (Lavsund 1981, Wilhelmson and Sylven 1979) because regrowth forest is used by moose extensively. Peak moose numbers in British Columbia during the mid-50's and mid-60's were attributed to logging and clearing for agriculture (MacGregor and Child 1982). However, the combination of clear-cutting and logging roads in Ontario has resulted in excessive moose harvests, declining populations, and closed hunting seasons in recently logged areas (Eason et al. 1981).

Recent calf declines in the heavily logged Thomas Bay area were not matched by similar losses in the unlogged Stikine-Le Conte wilderness during the same winter. In Thomas Bay, wolves may be using the road systems to reach and kill moose concentrated in residual unlogged stands as described in

Ontario (Bergerud 1981). Poor nutrition of the Thomas Bay moose (Doerr et al. 1980) may have contributed to calf losses during periods of deep snow. Deep snows do not seem to limit moose during most winters in the Stikine River watershed (Craighead et al. 1984).

While moose numbers in Units 1B and 3 may increase after logging in response to the increase in areas with seral vegetation, the development of dense spruce second-growth forest will, within 15 years, reduce moose carrying capacity and result in a population decline. The techniques which could keep the habitat in the early seral stages of vegetation are either impractical (burning, chemical control, etc.) or prohibitively expensive (thinning, bulldozing, etc.).

Literature Cited

Bergerud, A. T. 1981. Decline of moose in Ontario, a different view. Alces 17:30-43.

Burris, O. E., and D. E. McKnight. 1973. Game transplants in Alaska. Wildl. Tech. Bull. No. 4. Alaska Dep. Fish and Game. Juneau. 57pp.

Craighead, F. L., E. L. Young, and R. Boertje. 1984. Stikine River moose study, wildlife evaluation of Stikine-Iskut dams. Final report. Alaska Dep. of Fish and Game. Juneau. 72pp.

Doerr, J. G., E. L. Young, and A. W. Franzmann. 1980. Ecological and physiological aspects of a moose population in Thomas Bay, southeast Alaska. Proc. North Am. Moose Conf. 16:203-37.

Eason, G., E. Thomas, R. Jerrard, and K. Oswald. 1981. Moose hunting closure in a recently logged area. Alces 17:111-125.

Lavsund, S. 1981. Moose as a problem in Swedish forestry. Alces 17:165-179.

MacGregor, W. G., and K. Child. 1981. Changes in moose management in British Columbia. Alces 17:64-77.

Rausch, R. A., and A. Bratlie. 1965. Annual assessments of moose calf production and mortality in southcentral Alaska. Proc. 45th Annual Conf. of West. Assoc. of Game and Fish Comm. 11pp.

Wilhelmson, M., and S. Sylven. 1979. The Swedish moose population explosion, preconditions, limiting factors and regulation for maximum meat production. Proc. North Am. Moose Conf. 15:19-33.

PREPARED BY:

E. L. Young, Jr.
Game Biologist III

SUBMITTED BY:

Rod Flynn
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 1C

GEOGRAPHICAL DESCRIPTION: Southeast mainland from Cape Fanshaw to the latitude of Eldred Rock

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Although no surveys were conducted in the Chilkat Range area, comments by hunters indicate that moose numbers are higher than in previous years. Surveys conducted by National Park Service personnel in the Adams Inlet area of Glacier Bay National Park (located adjacent to the Endicott River drainage) reflect a rapidly growing population there. Calf production in the Berners Bay area has decreased greatly compared with the previous year. The cause of this decrease is unknown. The Taku River moose population seems to be stable. However, the harvest by Canadians in the upper Taku River drainage (adjacent to the U.S. border) is increasing. The increase in harvest may significantly reduce the Taku River population--and the availability of moose to U.S. hunters.

Population Composition

Helicopter surveys were conducted in the Berners Bay drainages on 5 November 1985 and 29 March 1986. In November, 70 moose were observed, including 20 bulls, 44 cows, and 6 calves. Sex and age ratios were 45 bulls:100 cows, 14 calves:100 cows, and 9% calves in the herd. The annual fall survey was flown about 1 month earlier than usual; some moose may have been missed because the animals are more widely distributed in early fall. During the March survey, 32 adults and 3 calves (9 calves:100 adults) were seen.

Mortality

Based on hunter reports from Hunt No. 901 (a Tier II permit hunt in 1985) and No. 956 (a general registration permit hunt), 46 animals (41 bulls and 5 cows) were taken in Subunit 1C during 1985. Two hundred and six hunters spent 739 days hunting

moose. Of the 46 moose killed, 33 bulls were taken in Hunt Area 956 (26 from the Taku River area and 7 from the Chilkat Range) and 13 moose were taken in Hunt Area 901, the Berners Bay drainages (8 bulls and 5 cows). In the latter hunt, 1 permittee was disqualified from participating because he had applied for more than 1 moose drawing hunt. All of the remaining 14 permittees hunted; 13 (93%) were successful in killing a moose.

Mean catch per unit of effort by successful hunters may be an index of moose density or abundance. These values for the major moose populations (expressed as moose per successful hunter-day) were as follows: Taku Inlet/River area, 0.3; Chilkat Range area, 0.5; and Berners Bay area, 0.6. The overall value for Subunit 1C was 0.4 moose per successful hunter-day.

Although no mortalities were observed during November or March aerial surveys, trappers reported finding 2 dead adult moose during the winter of 1985-86. One calf mortality was observed on 15 June 1986; the observer claimed it was a bear kill.

Management Summary and Recommendations

The management objective for the Berners Bay herd is to maintain a post-hunt/pre-winter population of about 80 moose with a minimum bull:cow ratio of 20:100. Surveys conducted in 1985-86 suggest a decline in recruitment and population size. The fall composition survey was conducted nearly a month earlier than usual, which may have resulted in reduced observability due to greater population dispersal. However, only 6 calves were seen, compared with 18 or 19 in past years. A survey conducted in March 1986 substantiated results of the fall 1985 survey. On the basis of available information, the Department recommended a reduction in the permit quota and elimination of the cow harvest in 1986-87. At its emergency meeting in May 1986, the Board of Game reduced the number of available drawing permits to 7 and restricted the harvest to bulls and no nonresident participation. We should continue to recommend a conservative harvest until survey data clearly indicate improved population status.

PREPARED BY:

David W. Zimmerman
Game Biologist II

SUBMITTED BY:

Rod Flynn
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 1D

GEOGRAPHICAL DESCRIPTION: Upper Lynn Canal

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Although no significant change in the size of the Subunit 1D moose population was documented in the past year, fall herd composition differed somewhat from that of 1984. A restrictive harvest of 14 bulls allowed the bulls:100 cows ratio to increase, but recruitment declined for the 3rd consecutive year. The calves:100 cows ratio is the lowest since statehood. Although no cause for the decline in recruitment has been identified, local residents speculate that an apparent increase in the brown bear population has resulted in increased predation on calves.

Population Composition

An aerial survey of the Chilkat Valley on 16 November 1985 resulted in a count of 207 moose. The count was similar to totals from the 7 fall surveys flown since 1978. The bulls:100 cows ratio was 15, up from 11 in 1984. The calves:100 cows ratio was 19, down from 27 last year (Table 1).

Ages of 13 harvested moose were determined from counts of cementum annuli. Mean age was 2.3 years, identical to the mean age of the 1984 harvest, but less than historical estimates. However, submission of jaws was not required of successful hunters before 1984, and young animals are noticeably absent from the age distributions for those years (Table 2). Therefore, the age structure data for years prior to 1984 is probably not indicative of the actual age structure of the population for those years.

Mortality

Forty-three hunters spent 152 days afield during the 1985 hunting season and killed 14 bulls, for a success rate of 33% (Table 3). The mean number of days afield per hunter was 4;

the mean number of days afield was similar for both successful and unsuccessful hunters. Chronology of the harvest was as follows: 15 September, 4; 16 September, 3; 17 September, 1; 18 September, 5; 19 September, 1; and 20 September, 3. Among successful hunters, 50% (7) used boats for transportation to the field and 50% (7) used automobiles. Conversely, among unsuccessful hunters, only 10% (3) used boats and 90% (17) used automobiles. Other documented mortality consisted of a moose killed in defense of life or property at Chilkat Lake in March and a highway mortality in May. Both animals were cows carrying twin fetuses.

Management Summary and Recommendations

The 1985 moose hunt in Subunit 1D was designated a Tier II subsistence hunt by the Board of Game. Forty-five applicants were notified by mail of their eligibility to hunt; 43 people hunted. The season was closed by Emergency Order on the 6th day of the season as the quota of 15 bulls was approached.

Two new advisory groups are involved in the regulatory process in Subunit 1D. The Klukwan Fish and Game Advisory Committee was established in 1985, bringing the number of local committees to 2 (the Upper Lynn Canal Advisory Committee represents Haines and Skagway). The Bald Eagle Preserve Advisory Council must, according to AS 41.21.616, be consulted if proposed regulations affect fish and game management within the Alaska Chilkat Bald Eagle Preserve. The Attorney General has issued an opinion stating that the Department is required to consult the council only when staff propose regulations to the Board of Game, not when responding to public proposals.

During the winter of 1986, 3 public meetings were held in Haines to develop a management plan for Subunit 1D moose. These meetings were productive, and a draft plan supported by the public was written. The plan contains specific objectives that will be used to guide future management activities. During the May Board of Game meeting the Upper Lynn Canal Advisory Committee requested a 1-year closure of the moose season because the current bulls:100 cows ratio is below the plan's objective of 20:100. Also, the committee was concerned with the low calf recruitment during the past few years. The Department concurred with the committee's position, and the Board ordered the hunt closed for the 1986-87 season.

PREPARED BY:

Kris Hundertmark
Game Biologist II

SUBMITTED BY:

Rod Flynn
Survey-Inventory Coordinator

Table 1. Game Management Subunit 1D moose survey data, 1962-85.

Year	No. bulls	No. cows	No. calves	Unid. sex and age	Total sample	No. bulls:100 cows	No. calves:100 cows	Percent calves in sample	Count time (hours)	Moose/ hour
1962	8	134	29	0	181	6	29	22	--	--
1963	0	0	36	157	193	--	--	19	--	--
1964	-[a]									
1965	--	--	--	--	349	41	49	21	--	--
1966	46	138	95	16	295	33	69	32	2.1	140
1967	50	173	75	0	298	29	43	25	2.8	106
1968	48	253	72	1	374	19	28	19	4.4	85
1969	23	91	31	0	145	25	34	21	2.1	69
1970	-[a]									
1971	27	170	34	0	231	16	20	15	4.9	47
1972	33	178	56	0	267	19	31	21	6.4	42
1973	30	189	45	0	264	16	24	17	4.4	60
1974[b]	30	135	41	0	206	22	30	20	6.2	33
1975[b]	--	--	30	151	181	17	00	17	4.2	43
1976	-[a]									
1977	30	186	71	0	287	16	38	25	5.8	49
1978	29	125	37	1	192	23	30	19	6.4	30
1979	15	149	36	18	218	10	24	17	4.5	48
1980[b]	-[a]									
1981[b]	--	--	38	173	211	--	--	18	4.3	49
1982[b]	--	--	29	154	183	--	--	16	4.3	43
1982[b]	34	115	51	0	200	30	44	26	4.8	42
1983[b]	--	--	19	69	88	--	--	22	5.6	16
1983[b]	16	148	47	0	211	11	32	22	5.8	36
1984[b]	--	--	11	77	88	--	--	13	3.8	23
1984	15	135	37	0	187	11	27	20	5.2	36
1985	23	155	29	0	207	15	19	14	5.5	38

[a] No survey.
[b] Late winter surveys; sex composition not available.

Table 2. Historical age distributions of Subunit 1D moose harvests[a].

Year	Known harvest	Age class												
		n	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5+[b]	Mean[c]
1960	Unk	17	0	9	3	1	4	0	0	0	0	0	0	2.5
1964	146	32	4	4	6	6	3	4	1	3	1	0	0	4.1
1969	78	13	3	1	6	1	1	0	0	0	1	0	0	3.3
1970	96	42	1	8	12	7	5	3	1	1	1	2	1	4.0
1971	97	30	2	7	10	3	2	1	1	1	0	3	1	3.7
1972	92	30	1	15	7	3	2	0	1	0	0	0	1	2.7
1973	115	50	7	15	2	8	3	5	5	0	3	1	1	4.1
1974	58	40	5	12	8	5	1	1	3	2	0	1	7	5.8
1975	26	26	0	11	5	4	3	1	0	1	0	0	1	3.1
1976	55	41	0	16	11	6	6	0	0	0	1	1	0	2.9
1981	35	21	0	1	6	6	3	1	2	1	1	0	1	4.6
1982	25	17	0	1	8	5	2	1	0	0	0	0	0	3.1
1983	62	31	1	3	7	10	6	0	1	2	0	1	0	3.8
1984	36	34	2	15	12	2	2	1	0	0	0	0	0	2.3
1985	14	13	0	7	4	1	0	1	0	0	0	0	0	2.3

[a] Age distributions through 1976, except 1975, include animals of both sexes.

[b] Includes animals 10.5 years and older; complete age structure data on file, ADF&G, Juneau.

[c] Calves (0.5 age class) were not included in computation of means.

Table 3. Game Management Subunit 1D moose harvest data, 1962-85.

Year	Season	Gender of legal moose	Hunter success (%)	Harvest			
				M	F	Unk	Total
1962	9/1-10/15	M	--	66	0	0	66
1963	9/1-10/15	M	--	81	0	0	81
1964	9/1-10/15	M,F	54	79	65	2	146
1965	9/1-10/15	M,F	--	66	34	1	101
1966	9/1-10/15	M,F	58	92	60	0	152
1967	9/1-10/15	M,F	--	80	47	0	137
1968	9/1-10/15	M,F	--	82	61	2	145
1969	9/1-10/15	M,F	--	52	24	2	78
1970	9/1-10/15	M,F	--	48	48	0	96
1971	9/1-10/15	M,F	31	67	30	0	97
1972	9/1-10/15[a]	M,F	28	46	45	1	92
1973	9/1-10/15[b]	M,F	23	69	46	0	115
1974	9/15-9/19	M,F	13	21	37	0	58
1975	9/15-9/18[c]	M	9	25	0	1	26
1976	9/15-9/30[d]	M,F	13	36	18	1	55
1977	9/15-9/30	M	15	30	0	1	31
1978	9/15-9/30	M	15	44	1	0	45
1979	9/15-9/30	M	20	38	0	1	39
1980	9/15-9/30	M	14	48	0	0	48
1981	9/15-9/30	M	11	34	1	0	35
1982	9/15-9/30	M	9	24	1	0	25
1983	9/22-10/6	M	17	62	0	0	62
1984	9/15-9/27[e]	M	11	35	1	0	36
1985	9/15-9/20[e]	M	33	14	0	0	14

[a] Cow season 9/1-9/10.

[b] Cow season 9/1-9/9.

[c] Season closed by Emergency Order.

[d] Two-day antlerless hunt during season.

[e] Registration permit hunt, closed by Emergency Order.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 5

GEOGRAPHICAL DESCRIPTION: Cape Fairweather to Icy Bay, eastern Gulf Coast

PERIOD COVERED: 1 July 1985-30 June 1986

Seasons and Bag Limits

See Hunting Regulations No. 26.

Population Status and Trend

The Yakutat Forelands population, Subunit 5A, appeared to be stable with a sex and age composition similar to that of fall 1984. Little information was collected on the status of the Nunatak Bench (Subunit 5A) or Malaspina Forelands (Subunit 5B) populations, but they are also thought to be stable.

Population Composition

Yakutat Forelands:

Annual sex and age composition surveys flown between 21 November and 3 December 1985 resulted in a count of 259 moose in 11 hours of survey time (Table 1). Calves composed 16% of the sample. Due to inclement weather, and survey aircraft not being available at the appropriate time, only about two-thirds of the usual survey area was covered. This year's moose-per-hour value (24) may have been lower compared with the fall 1984 figure because an inexperienced pilot was used this year. Also, moose appeared to be less concentrated compared with fall 1984, further lowering the moose-per-hour figure. Both the observed bulls:100 cows and calves:100 cows ratios declined slightly between 1984 and 1985 (Table 2). The decrease in the bulls:100 cows ratio (39 to 30) is probably the result of the incomplete survey. Although a slight decrease in the calves:100 cows ratio (26 to 24) was observed, the percentage of calves in the sample was the same as in 1984. The percentage of cows (with calves) having twins (8%) was lower than in 1984 (23%). No late-winter surveys were conducted.

Cementum ages were determined for the 46 moose killed by hunters in 1985 (Table 3). Yearlings composed 33% of the sample while 2.5- and 3.5-year-olds each composed 22%. The mean age

of the sample was 3.4 years with moose ranging up to 11.5 years.

Nunatak Bench:

No surveys were conducted.

Malaspina Forelands:

No surveys were conducted.

Mortality

Yakutat Forelands:

Forty-six moose, including 1 cow and 1 bull that were found dead but not reported, were killed during the 15 October-15 November season (Table 4). During the Board of Game's emergency 1985 meeting, a Tier II subsistence hunt was established for the Yakutat Forelands. Thus, certain restrictions were placed upon the hunt. The number of permits to be issued was limited to 200, and only Alaska residents were allowed to apply for permits. Because this hunt was undersubscribed, every legal applicant received a permit for the hunt. One hundred forty-six permits were issued; 26 permittees did not hunt and 76 permittees reported an unsuccessful hunt. Sixty-four percent of the kill was taken by Yakutat residents; the remaining 36% were taken by other state residents. The 44 successful reporting hunters spent 117 days afield ($\bar{x}$ = 2.7), while the 84 unsuccessful hunters spent an average of 5.4 days hunting. Thirty-four moose (77%) were harvested during the 1st week of the season. Nineteen moose (43%) were taken from locations east of and including the Dangerous River watershed; the remainder came from west of the Dangerous River. Transportation used by all hunters was primarily highway vehicles (48%), aircraft (30%), and boats (13%).

Nunatak Bench:

Two bulls were taken by 3 hunters during the 1985-86 season; 3 other permittees did not hunt. The 2 successful hunters spent an average of 22 days afield, and the unsuccessful hunter was out for 10 days. The 2 moose were both killed on 18 January.

Spring mortality due to bear predation is believed to have been relatively light. Both brown and black bears appeared to have emerged from dens later than usual. Also, in a survey of bear scats along Forest Highway 10 during the middle of moose calving season, no moose hair was found in the scats observed.

Malaspina Forelands:

Ninety-four permits were issued to 48 local residents, 39 other Alaska residents, and 6 nonresidents. Thirty-one permittees did not hunt, and 1 permittee did not return his report. Forty-nine permittees hunted unsuccessfully for 226 days ($\bar{x}$ = 4.6). Thirteen moose were taken by hunters who averaged 2.6 days afield. Two moose were taken in September; the remainder were taken in October. Nine bulls came from east of Sitkagi Bluffs, while 4 bulls came from the Yahtse River area at the western end of the subunit. The 13 bulls averaged 4.0 years in age, ranging from 1.5 to 7.5 years. Major transportation types used by permittees were reported as aircraft (67%) and boat (30%).

Management Summary and Recommendations

Snowfall records from the National Weather Service office in Yakutat (Appendix A) indicate that during the 1977-86 period the long-term mean snowfall was only exceeded once (1984-85). The current year was characterized by about 20% less snow than average, and the accumulation on the ground never reached 30 inches. A record cold November was followed by a wet December, and no measurable snow fell during the month of May. These factors allowed wintering moose to remain relatively dispersed throughout the season, to maintain (probably) a high nutritional plane, and to enter the calving season with no snow on the ground. No reports or observations of predation during the winter were received.

Because of the nature of the spring Game Board meeting, regulatory proposals from the public were not considered as in most previous years. Survey results continue to suggest that the Yakutat Forelands population could sustain a limited cow season which would provide more animals for harvest and would increase the calf to cow ratio. Local sentiment, however, continues to run contrary to such a proposal. With the 1986 hunt scheduled to be a registration permit hunt with an unlimited number of permits (same as in 1984), the number of permittees is likely to increase over the 1985 level.

Both the Malaspina Forelands and Nunatak Bench herds (especially the former) should be surveyed in 1986. Although the harvest remains relatively light and the age structure of the harvest is spread over several age classes, a fall sex and age composition count should be made in the coming year to better document the status of this population.

No changes in seasons or bag limits are recommended at this time.

PREPARED BY:

Bruce Dinneford
Game Biologist III

SUBMITTED BY:

Rod Flynn
Survey-Inventory Coordinator

Table 1. Yakutat Forelands, Subunit 5A, moose sex and age composition data, fall 1985.

Date	Location	No. bulls	No. cows	No. calves	Total moose	Percent calves	Survey time	Moose/ hour
21 Nov	Doame River-Alsek River	17	33	13	63	20.6	2.6	24.2
22 Nov	Alsek River-Tanis River	16	56	6	78	7.7	2.2	35.5
23 Nov	Tanis River-Ustay River	1	8	3	12	25.0	1.3	9.2
2-3 Dec	Dangerous River-Situk River (below highway)	16	71	19	106	17.9	4.9	21.6
Combined areas	Doame River-Situk River	50	168	41	259	15.8	11.0	23.5

Table 2. Yakutat Forelands, Subunit 5A, historical moose survey data, 1974-85[a].

Year	No. bulls	No.[b] cows	No. calves	Unk sex and age	Total sample	Bulls: 100 cows	Calves: 100 cows	Percent calves	Count time (hours)	Moose/ hour
1974	21	81	29	0	131	26	36	22	5.2	25
1975	43	183	32	30	288	23	17	11	10.9	26
1976[c]	0	0	22	186	208	--	--	11	6.1	34
1977	82	198	44	10	334	41	22	13	11.1	30
1978	50	134	32	13	229	37	24	14	7.4	31
1979[c]	0	0	25	95	120	--	--	21	2.8	43
1980[d]	19	23	8	0	50	83	35	16	2.3	22
1981	93	243	65	1	402	38	27	16	15.7	26
1984[c]	0	0	83	299	382	--	--	22	11.9	32
1984[e]	90	229	60	0	379	39	26	16	12.1	31
1985[c]	0	0	26	113	139	--	--	19	5.9	24
1985[f]	50	168	41	0	259	30	24	16	11.0	24

[a] No surveys were conducted in 1982 or 1983.

[b] All females older than calves counted as cows.

[c] Late winter count, sex indeterminate.

[d] Situk River-Ahrnklin River only.

[e] Yakutat Bay-Alsek River only.

[f] Situk River-Doame River only.

Table 3. Ages of moose killed on the Yakutat Forelands portion of Subunit 5A, 1981-85.

Age class	Number of moose in age class, by year				
	1981	1982	1983	1984	1985
0.5	0	0	0	2	1
1.5	0	2	0	13	15
2.5	4	10	9	11	10
3.5	6	13	8	6	10
4.5	5	8	10	7	2
5.5	4	5	6	3	1
6.5	1	6	4	2	3
7.5	1	1	2	3	1
8.5	1	2	2	0	0
9.5	1	0	0	0	1
10.5	0	0	1	0	1
11.5	0	0	0	0	1
12.5	1	0	0	0	0
13.5	0	0	0	0	0
14.5	0	0	1	0	0
Totals[a]	24	47	43	47	46
Mean age	6.0	4.3	4.9	3.2	3.4

[a] Total kill in 1981 = 27; 1982 = 49; 1983 = 47; 1984 = 49; and 1985 = 46.

Table 4. Yakutat Forelands, Subunit 5A, moose harvest data, 1978-85.

Year	Season	Quota	No. permits issued	No. hunters	Harvest[a]	Hunter success
1978[b]	15 Oct-15 Nov	25 antlered moose	165	123	28	23
1979	15 Oct-15 Nov	25 bulls	185	167	20	12
1980[c]	15 Oct-18 Oct	--	--	175	28	16
1981[c]	15 Oct-15 Nov	--	--	180	27	15
1982	15 Oct-15 Nov	50 bulls	226	199	49	25
1983	15 Oct-15 Nov	50 bulls	282	235	47	20
1984[d]	15 Oct-13 Nov	50 bulls	287	230	49	21
1985[e]	15 Oct-15 Nov	50 bulls	146	129	46	36

[a] All bulls.

[b] Includes Nunatak Bench.

[c] Harvest ticket data, 1-bull bag limit.

[d] Closed early by Emergency Order.

[e] Tier II subsistence hunt, 200 permits available.

Appendix A. Historical snowfall records, Yakutat, 1949-85.

Year	Number of days with "x" inches snow on ground					Total snowfall
	Trace-14	15-29	30-44	45-60	60+	
1948-49	NA					241
1949-50	NA					122
1950-41	NA					193
1951-52	84	35	41	33	3	242
1952-53	138	0	0	0	0	139
1953-54	128	53	7	0	0	190
1954-55	63	70	34	32	6	338
1955-56	83	57	22	30	21	278
1956-57	143	9	0	0	0	181
1957-58	106	2	6	8	1	121
1958-59	111	51	5	4	13	286
1959-60	119	30	23	0	0	246
1960-61	109	14	22	9	0	238
1961-62	119	47	3	6	0	207
1962-63	124	7	6	1	0	129
1963-64	160	25	7	0	0	286
1964-65	120	24	15	5	0	253
1965-66	76	62	22	20	0	219
1966-67	85	48	59	2	5	293
1967-68	115	17	0	0	0	177
1968-69	43	53	70	10	0	237
1969-70	103	5	0	0	0	130
1970-71	98	40	55	0	0	313
1971-72	48	16	21	12	119	317
1972-73	61	44	42	22	0	239
1973-74	65	75	23	0	0	178
1974-75	69	58	35	4	0	327
1975-76	16	80	85	10	0	403
1976-77	83	26	0	0	0	168
1977-78	126	31	2	0	0	124
1978-79	67	55	43	0	0	139
1979-80	101	24	2	0	0	129
1980-81	71	3	0	0	0	71
1981-82	84	81	0	0	0	175
1982-83	100	8	2	0	0	86
1983-84	99	12	0	0	0	136
1984-85	81	30	49	0	0	275
1985-86	128	14	0	0	0	166
Average	95	34	20	6	5	210

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 6A

GEOGRAPHICAL DESCRIPTION: Katalla to Icy Bay

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Population composition survey data suggest that moose populations east (Tsiu River) and west (Bering River/Controller Bay) of Suckling Hills continue to increase. East of Suckling Hills, moose observed during surveys have increased from 77 (53 adults) in 1977 to 346 (286 adults) during this reporting period. West of Suckling Hills, the number of moose observed peaked in 1983 at 307, including 228 adults; however, during this period 279 moose, including 243 adults, were observed. Although these surveys were not complete censuses with associated variances, moose were observed at densities of 2.6 moose/mi^2 in the east to 1.7 moose/mi^2 in the west.

Population Composition

Sex and age composition surveys were flown on 7 and 8 November east and west of Suckling Hills. Survey conditions were very good to excellent. Survey data from east of Suckling Hills indicated 34 bulls:100 cows and 28 calves:100 cows. West of Suckling Hills, survey data indicated 19 bulls:100 cows and 18 calves:100 cows. Calves represented 24% and 13% of their respective populations.

Mortality

A minimum of 75 moose were killed by 105 hunters reporting they hunted in the subunit. East of Suckling Hills 27 moose (17 bulls and 10 cows) were reported killed by 42 hunters, for 64% success. West of Suckling Hills, 48 moose (33 bulls and 15 cows) were reported killed by 62 hunters, for 77% success. Successful hunters used airplanes (51%) and boats (35%) as their primary means of transportation to their hunt areas. No winter mortality was reported.

Management Summary and Recommendations

The reported kill of 75 moose probably represents 70-90% of the actual kill. During this reporting period, regulations required only a harvest ticket to hunt in the subunit. Since harvest ticket reporting is generally less complete than registration permit reporting, the actual total kill is expected to be higher. The reported kill was slightly less than reported in 1984 (81), but the kill was composed of a higher percentage of cows this period (40%). The kill in 1984 included 27% cows.

The adult segment of both the eastern and western populations in the subunit continues to increase, but hunters are selecting for bulls disproportionately. West of Suckling Hills, the bull harvest level has reduced bull:cow ratios below the desired ratio of 30:100. Hunters were encouraged to harvest cows or calves this period, and an increase in the percentage of cows harvested did occur.

While desirable observed moose densities have not been established for this subunit, adult segments should be managed to maintain conservative densities, below 2.0 moose/mi^2, to avoid habitat degradation. Liberal hunting seasons and bag limits are recommended. If the bull:cow ratio of either population falls below 15:100, emergency closure should be considered.

Efforts to quantify habitat quality and utilization by moose should be emphasized during the next reporting period.

PREPARED BY:

Herman J. Griese
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 6B

GEOGRAPHICAL DESCRIPTION: Martin River

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Population composition surveys since 1982 suggest that the post-season number of moose has remained stable. Since 1982, between 166 and 182 moose, including 147-159 adults, have been observed during composition surveys. One hundred sixty-nine moose, including 159 adults, were observed this period.

Population Composition

The 19 November sex and age composition survey was flown under good conditions and 169 moose were observed in 181 mi^2 (0.9 moose/mi^2). Survey data indicated 33 bulls:100 cows and 8 calves:100 cows. Calves represented only 6% of the population, the lowest calf percentage recorded for any herd in Unit 6 since moose were introduced.

Mortality

A minimum of 37 moose were killed during this period. One hundred and thirty-five hunters reported participating in a 13-day hunting season for bulls only. Thirty-six (27%) hunters reported being successful. Successful hunters used boats, primarily airboats (67%), airplanes (19%), and highway vehicles (14%) to arrive at their hunting areas. One additional male moose was killed illegally. No winter mortality was reported.

Management Summary and Recommendations

Low calf survival observed during the post-hunting sex and age composition surveys suggests a significant management problem. The mean percentage of calves observed during surveys since 1979 is 12.7% ($n = 7$); the previous 7-year mean was 23.3% ($n = 6$). Other than moderate winters (snow depth = 30-44 inches for 5-30 days) in 1977 and 1978, winters have been mild since 1971-72.

Harvest has been adjusted annually to strive for a bull:cow ratio near 30:100 and a post-hunting population of between 150 and 175 animals. Winter utilization transects conducted in late March suggest selective use of willows (Salix spp.) and do not indicate winter browse availability as a problem. A riparian transect showed 10-15% utilization of all willow species, and a coastal delta transect showed 15-20% utilization. Brown bears are suspected of being the major predator of moose calves in this population; however, the extent of their impact has not been verified.

In lieu of, or in combination with, regulatory changes liberalizing brown bear seasons and bag limits, moose seasons should continue to be adjusted annually to preserve the desired bull:cow ratio and a minimum post-hunting population. Due to the current low calf production and/or survival, the cow segment of this moose population should be allowed to increase to a minimum post-season count of 150-175.

A harvest of no more than the current annual increment is recommended. Because the cow segment is below the recommended minimum count, the harvest should be restricted to bulls. Participation should be limited to 15 hunters; the expected harvest should approach 10 bulls.

PREPARED BY:

Herman J. Griese
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 6C

GEOGRAPHICAL DESCRIPTION: West Copper River Delta

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Population composition surveys over the past 6 years indicate a slowly increasing trend. In 1979, the survey produced 124 moose including 106 adults. In 1985, 194 moose including 148 adults were observed.

Population Composition

A moose sex and age composition survey was flown on 3 December. Survey conditions were good and 194 moose were observed in 155 mi^2 of search area, yielding 1.3 moose/mi^2. Survey data indicate 19 bulls:100 cows and 37 calves:100 cows. Calves represent 24% of the observed population.

Mortality

A minimum of 39 moose were killed by humans this period. Forty-one hunters holding 21 antlerless and 20 antlered Tier II moose permits killed 18 female and 19 male moose during the 31-day season. One hunter was unsuccessful, 1 permittee did not hunt, and 1 permittee did not report. In addition, 1 female moose was killed illegally and another female was killed in a collision with an auto. Winter mortality was not detected.

Management Summary and Recommendations

Casual observations of willow (Salix spp.) throughout the subunit suggest winter utilization is well below 50%. In moose winter concentration areas, as much as 90% utilization of available willow stems occurred. Some locations peripheral to these heavily used habitat areas showed almost no use.

The moose population in this subunit should be allowed to continue to increase at a slow rate. Willow continues to invade

the uplifted delta. This additional browse will allow a larger wintering population and ultimately a higher harvest by hunters if current natural mortality rates continue.

PREPARED BY:

Herman J. Griese
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 7

GEOGRAPHICAL DESCRIPTION: Kenai Peninsula (except the Placer and Portage River drainages)

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose occur throughout the intermountain valleys of Unit 7. Aerial surveys indicate this moose population stabilized in about 1980 and remains at a relatively low density.

Population Composition

Aerial surveys were conducted in 3 trend count areas in Unit 7 during 1985; 96 moose were observed. Although the ratios of bulls to cows (20:100) and calves to cows (26:100) are comparable to historical survey results, the sample size is too small to adequately determine population trend.

Mortality

The 1985 reported harvest was 58 bulls and 1 moose of unspecified sex. Sixteen percent of the 368 reporting hunters were successful. Ninety-nine percent of all hunters were Alaska residents; these hunters harvested 98% of the moose. Transport means, in order of importance, were: highway vehicle (67%), boat (13%), airplane (8%), horse (8%), and off-road vehicle (4%).

Wolves, brown bears, and black bears are common in Unit 7 and are thought to exert a significant influence on the moose population. However, no quantitative data exist on the level of mortality inflicted on moose by these predators.

Management Summary and Recommendations

A comprehensive survey of moose in Unit 7 has not been conducted since 1980, primarily due to inadequate snow conditions during the October through December period. Survey coverage of

a majority of the important fall ranges in Unit 7 should be a high priority in 1986.

Since 1981, a total of 5,905 acres of moose winter range has been burned on the Chugach National Forest by the U. S. Forest Service. These habitat enhancement activities are expected to substantially improve winter conditions for moose. However, predation by wolves, black bears, and brown bears is believed to be more important in controlling the Unit 7 moose population than habitat, at the present time.

No changes in the season or bag limit are recommended.

PREPARED BY:

Ted H. Spraker
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 9

GEOGRAPHICAL DESCRIPTION: Alaska Peninsula

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

No major changes in moose densities were detected during the reporting period; few surveys were completed, as snow conditions were poor.

Population Composition

Fall moose surveys were completed only within the Naknek drainage in Subunit 9C and in the Dog Salmon trend area in 9E. Within the Naknek drainage, 397 moose were counted; 7.8% were calves. The bull:cow ratio of 30:100 is lower than in past years, but that may be partially the result of our not completing the King Salmon Creek trend area before a few bulls had dropped their antlers. Nevertheless, the bull:cow ratio has declined in the Park border area. Calf production/survival, as is evident from fall surveys, was the lowest since 1981 when surveys were initiated in these trend areas. The extremely late spring in 1985 may have contributed to poor calf recruitment.

Results of the survey in the Dog Salmon area showed that the bull:cow ratio (60:100) was similar to ratios of previous years; however, the results also reflected very poor calf recruitment (9 calves:100 cows).

Mortality

Hunters reported killing 233 bulls and 10 cows during the September and December seasons. The total of 243 moose killed represents a 29% increase over the 1984 harvest, and is the largest kill since 1980. Approximately 89% of the harvest occurred during the September season. The most dramatic increases in harvest were in Subunits 9B and 9C which increased 52% and 54%, respectively. In 9B, virtually all the increases

in harvest came from the area west of Lake Clark, where for the 1st time in several years, moose and caribou hunting seasons overlapped. The opportunity for a multi-species hunt may have resulted in the 150% increase in the number of moose hunters, compared with 1984, and an increase in the moose harvest from 18 to 44 animals.

Overall hunter success (45%) was the same as in 1984, and the larger harvest can be attributed to increased hunting pressure, primarily from nonresidents. Compared with the previous year, 64% more nonresidents hunted moose in Unit 9. The 1985 harvest was distributed as follows: local residents, 44; other Alaskans, 83; nonresidents, 103; and unknown residency, 13.

Management Summary and Recommendations

In most of Unit 9, chronically low calf recruitment was exacerbated in 1985 by a very late spring which prevented any noticeable improvement in moose densities. Meanwhile, harvests have been steadily increasing. The most dramatic increases in harvest have come in the area west of Lake Clark and throughout Subunit 9C. It is extremely important to conduct composition surveys in these 2 areas as well as in 9E to document any effects of increased harvest levels on bull:cow ratios. Pending results of the 1986 hunting season and the fall composition surveys, it may be necessary to shorten the September season in 9B and 9C or to implement other restrictions to reduce harvests to sustainable levels.

Cow seasons were eliminated in 9E and southern 9B in 1983 to maximize reproductive potential where calf survival was particularly poor. Only 2 cows were reported taken outside the Naknek drainage in 1985.

The Naknek drainage registration hunt for antlerless moose continues to be very popular, with 69 permits issued in 1985. Fifty-two active hunters took 7 bulls and 8 cows, of which all but 3 were taken by local residents. Poor travel conditions reduced the success rate and precluded the need for an emergency closure.

PREPARED BY:

Richard A. Sellers
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 11

GEOGRAPHICAL DESCRIPTION: Chitina Valley and the eastern half of the Copper River Basin

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

A stratification survey was completed in Unit 11 in early April 1986. A total of 1,106 mi^2 out of 5,232 mi^2 of estimated moose habitat was evaluated. The number of moose and moose tracks observed were used to rate all available moose habitat as to relative population density. Although our methods were crude and no estimate of the variance was available, we estimated approximately 1,000 moose were present in Unit 11.

Population Composition

One hundred forty-nine moose were counted during a late fall 1985 survey of the Mt. Sanford-Mt. Drum area. The bull:cow ratio was 80:100, slightly higher than last year's 75:100 and somewhat less than the prior 4-year average of 92:100. The calf:cow ratio was 12:100, substantially less than last year's 17:100 and greatly reduced from the prior 4-year average of 31:100.

Mortality

Hunters reported taking 47 bull moose, a slight increase over last year's harvest of 41, but less than the prior 4-year average of 52. One hundred seventy-six people reported hunting in Unit 11 for a success rate of 27%. In 1984, 224 hunters reported an 18% success rate. The prior 4-year average was 201 hunters and 26% success. Nonresident hunters killed 2 moose, 4% of the total take. The most popular methods of transportation used by hunters were: highway vehicles, 32%; aircraft, 26%; and all-terrain vehicles, 24%.

Management Summary and Recommendations

Although total moose observed and moose per hour of survey time have increased in the Mt. Sanford-Mt. Drum count area since 1982, the concurrent downward trend in calf survival in this area suggests that any such increase is about to come to an end. Since sample sizes over this period are small, especially for early 1980 when the calf:cow ratios were high, the observed trend may be more apparent than real. On the other hand, if the trend is real, it may relate to increases in predator populations seen throughout many portions of Unit 11 in recent years.

Our stratification effort this year supports the idea that, with the exception of a few small pockets where moose occur in moderate densities, moose densities are very low throughout most of Unit 11. South of the Chitina River, this scarcity may be due to deep snow limiting available winter range. North of the river, predation, in combination with locally poor range conditions, may be responsible for limiting moose numbers. A high bull:cow ratio in the area where population composition is surveyed indicates hunting is not restricting population growth. No changes in the season or bag limit are recommended.

PREPARED BY:

James W. Lieb
Game Biologist II

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 12

GEOGRAPHICAL DESCRIPTION: Upper Tanana and White River drainages

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Overall, moose numbers are low in Unit 12 and are declining noticeably in the Little Tok River drainage. In Unit 13, populations of migratory moose that rut and winter in the Tok River drainage continue to increase slowly. Strategic management goals of (1) providing for maximum opportunity to participate in moose hunting and (2) providing for an optimum harvest of moose, are not currently being met. Approximately 2,500-3,000 moose are estimated to inhabit Unit 12.

Population Composition

Thirty-seven and one-half hours were spent classifying 1,342 moose in Unit 12 and small adjacent portions of Subunits 20D and 20E during the period 28 October-29 November 1985. An average of 36 moose was observed per hour of survey. Survey conditions were good to excellent in most areas, but poor conditions prevented surveys in the Nabesna Road area and along the foothills of the Nutzotin Mountains east of Stuver Creek.

Calf:cow ratios ranged from 12 calves:100 cows in the Little Tok survey to 53 calves:100 cows along the north slope of the Alaska Range. The average for Unit 12 was 24 calves:100 cows. Yearling recruitment (observed) ranged from 4% in the Little Tok River to 24% on Tower Bluff, with a Unit 12 mean of 10%. Bull:cow ratios ranged from 19 bulls:100 cows in the Little Tok to 120 bulls:100 cows on Tower Bluff, with a mean of 47. Of concern is the declining trend in the bull:cow ratio along the north face of the Alaska Range despite apparently high calf production and survival for a number of years. This decline indicates harvests of bulls are in excess of recruitment. Also of concern are the poor calf and yearling survival observed in the Little Tok drainage and the low number of bulls present.

Habitat Conditions

Few moose were observed on low-elevation winter ranges during winter 1985-86. Warm winter temperatures and normal to below-normal snow accumulations allowed most moose to winter at higher elevations.

As a result of a citizen volunteer effort, approximately 50-60 additional acres of decadent felt-leaf willow winter range were crushed during March 1986 in the Tok River drainage. Since 1982, an estimated 400-500 acres of winter range have been improved to meet the needs of Unit 13's slowly increasing migratory moose population.

Two major fires occurred in moose winter range within Unit 12 during June 1986. The Porcupine Creek fire is expected to result in a marked improvement of more than 6,000 acres of moose habitat north of Tok along the Tanana River. The Deep Creek burn near the Nabesna River is in an area of numerous small lakes interspersed with white spruce. This burn probably exceeds 2,000 acres in size. Continued implementation of the Alaska Interagency Fire Management Plan is expected to enhance seral habitat conditions for moose throughout much of Unit 12. Logging, prescribed fires, and willow crushing are being used where wildfires cannot be tolerated.

Mortality

Predation by wolves, grizzly bears, and black bears is believed to be limiting moose population growth throughout much of Unit 12. The relationship between moose and their predators in the Little Tok River area is believed responsible for a 9% annual decline in moose numbers in that drainage. Continued poaching in the vicinity of villages and communities is possibly responsible, in part, for extremely low densities of lowland, resident moose in the Northway-Tetlin Flats. Poaching may also be controlling moose population growth along the north slope of the Alaska Range despite high observed rates of calf survival. An estimated 20-30 moose were killed by poachers and highway accidents during this reporting period. However, unitwide, losses to predation far exceed losses to poaching.

Four hundred twelve hunters reported hunting in Unit 12 during fall 1985. Sixty-six (16%) were successful, compared with 84 in 1984, 73 in 1983, and 86 in 1982. The shorter hunting season in the Little Tok drainage and fewer bulls available in other popular areas were the factors believed responsible for the lower harvest and hunter success in 1985. A harvest of 66 bulls, plus the estimated loss of an additional 30 moose annually to poaching and accidents, represents man-caused mortality of approximately 3.0-3.8%.

Of the 66 bulls reported taken in Unit 12, 20 (30%) had antlers less than 36 inches wide. These were mostly yearling bulls, although some bulls with this antler spread could be 2-4 years old. Twenty-eight bulls (43%) had antler spreads 50 inches or greater. Most bulls taken in the heavily hunted Tanana and Tok River drainages had antlers less than 36 inches wide.

The harvest was well distributed throughout the unit with 18 moose (27%) coming from the large Chisana River drainage, 13 moose (20%) from the Tanana River drainage, and 12 moose (18%) from both the Tok and Nabesna River drainages. The remaining take occurred in the Tetlin, White River, and Little Tok River drainages.

Access modes used by successful hunters varied. Fifteen (23%) used highway vehicles, 13 each (20%) used aircraft or boats, 12 (19%) used off-road vehicles, and 11 (17%) used horses.

Management Summary and Recommendations

Neither use nor moose population objectives as outlined in the strategic management plan are currently being met in Unit 12. The situation is worsening in certain areas as a result of low recruitment and high adult mortality attributable primarily to predation. All moose hunting in the once productive and popular Little Tok River drainage will be stopped to avoid aggravating the current population decline. Any reduction of recruitment in the Tok and Tanana River populations will result in further declines in both harvest levels and bull:cow ratios.

Moose inhabiting the Northway-Tetlin Flats and the Mentasta and Nutzotin Mountains foothills are predominantly old animals. Through research conducted jointly by the Department and the U.S. Fish and Wildlife Service, wolf predation has been identified as the limiting factor controlling moose population growth in this area. Present and anticipated future habitat conditions could support considerably more moose.

Initiation of a program to reduce wolf numbers throughout Unit 12 should be seriously considered to allow the present population of moose to increase. Current, liberal grizzly bear hunting regulations should be maintained to contribute to lowering predation until the moose population objective of 4,500 is achieved.

With the hunting closure in effect for the upper Little Tok River drainage, no other changes in seasons or bag limits are recommended at this time.

PREPARED BY:

David G. Kelleyhouse
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 13

GEOGRAPHICAL DESCRIPTION: Nelchina and upper Susitna Rivers

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Sex and age composition counts completed in 1985 indicate that the Unit 13 moose population continued to increase slightly compared with the previous year. Over the past 11 years, the trend in moose/hour has indicated an annual increase of approximately 5.5%.

Population Composition

Moose composition counts were conducted in 9 count areas. A comparison of count data since 1979 is shown in Table 1. The bull:cow ratio, unit-wide, was 32:100 this year--a substantial increase from last year's 25:100 and the prior 6-year average of 22:100. The unit-wide calf:cow ratio of 29:100 was approximately the same as last year's 28:100 and up slightly from the prior 6-year average of 26:100.

In the 2 count areas within the western half of Subunit 13A, bull:cow ratios increased from an average of 17:100 last year to 23:100 this year. Approximately 55% of the bulls counted were classified as yearlings, compared with 84% last year. The calf:cow ratio within these 13A count areas averaged 26:100, compared with 23:100 last year.

Mortality

The total reported harvest was 823, a 2% decrease from the prior year's kill of 839, but 11% higher than the prior 5-year average annual harvest of 743. The reported success rate for 3,576 hunters this year was 23% compared with 25% for 3,426 hunters in 1984 and 24% for the 3,110 average annual number of hunters over the past 5 years.

Nonresident hunters took 60 moose in 1985, representing 8% of the successful hunters reporting residency. The most popular

methods of transportation used by nonsubsistence hunters were: highway vehicles, 37%; off-road vehicles, 23%; aircraft, 13%; boats, 12%; and three- or four-wheelers, 12%. Nonsubsistence hunters spent an average of 6 days afield.

A subsistence moose hunt, by drawing permit, for any bull moose was held in Unit 13 (except for the western half of Subunit 13A). All state residents were eligible to apply for this hunt, but only 1 permit application per household was allowed. Applicants were rated as to their subsistence qualifications and permits were issued to those with the 200 top-rated scores. Four hundred sixty-nine applications were submitted for these permits. One hundred fifty permittees reported hunting and 31 moose were harvested for a hunter success rate of 21%. The most popular methods of transportation used by subsistence hunters were: highway vehicles, 63%; off-road vehicles, 14%; aircraft, 10%; boats, 6%; and both horses and three- or four-wheelers, 4% each. Subsistence hunters spent an average of 8 days hunting.

A spike/fork moose hunt was held in the western half of Subunit 13A to direct hunting pressure to the smaller yearling bulls in the area and thus provide for an increase in the survival of larger bulls. The hunt was monitored from a voluntary check station on the Glenn Highway near Tahneta Lake. The total reported harvest was 70 spike- or fork-antlered bull moose. This number represents a 59% decrease from the 1984 harvest in the western half of 13A, of 171 bulls with a minimum antler spread of 36 inches. Post-hunting season surveys found the proportion of bulls with a <29-inch antler spread in the 13A West bull population increased from 16% last year to 47% this year, while unit-wide these larger bulls represented 52% of the bull population in 1984 and 53% in 1985.

The upper Susitna area was changed back to a 36-inch bull regulation after having been a spike/fork bull-only area in 1984. The 1985 harvest in this area was 238 bulls, which contrasts with 71 taken in 1984 and 175 taken in 1983. After 1985's large harvest, surveys found a post-hunting season increase in both total bulls (+20%) and the number of bulls in the <36-inch class (+28%), suggesting that a substantial portion of the bulls protected in 1984 survived the 1985 hunting season.

Additional sources of mortality include collisions with vehicles, poaching, and predation. Thirty-one moose were reported killed by collisions with highway vehicles along the Glenn and Richardson Highways. Information concerning the extent of poaching is sketchy. Seven poachings were recorded for the eastern half of the basin from November 1985 to March 1986.

Management Summary and Recommendations

Over the past 6 years, in large part as a result of relatively mild to normal winters, calf survival has been good and Unit 13's moose population has been slowly increasing.

Much of our effort this period has been focused on developing and implementing a management program which would increase the number of bull moose in the population. Since instituting the 36-inch hunting regulation in 1980, unit-wide harvests have been reduced and both the number of bulls and the bull:cow ratio have steadily increased. However, in many areas of Unit 13, because of high hunter harvests, this expanding bull cohort consists almost entirely of yearling and 2-year-old bulls. To reverse this trend, both in 1984 and 1985, a regulation allowing the taking of only bulls with a spike or forked antler on at least 1 side was instituted in a portion of Unit 13 that has a large amount of hunting pressure and low numbers of large bulls. Results indicate that harvest levels in these areas were reduced by 50% or more and surveys of post-hunting populations found a dramatic increase in numbers of large bulls present.

As in 1984, hunter attitudes were evaluated with a questionnaire addressing both the spike/fork regulation and Unit 13 moose management in general. The results this year were much the same as last year. Most hunters favor the 36-inch regulation. They support the spike/fork regulation over a permit hunt. Most hunters oppose going to a drawing permit system, fearing that they would no longer be able to hunt moose on a regular basis in Unit 13. While most hunters don't want to lose their chance to take large bulls, they are willing to forego this opportunity, at least for a few years, if that will ensure their continued opportunity to hunt.

We recommend that the spike/fork regulation be retained in 13A West. Even after the substantial increase in large bull survival seen in 1985, this area still has the lowest bull:cow ratio of all count areas in the unit.

No other changes in the season dates or bag limits are recommended.

PREPARED BY:

James W. Lieb
Game Biologist II

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

Table 1. Moose sex and age composition data for Unit 13, fall 1979-85.

Year	Adult bulls	Yearling bulls	Cows	Bulls: 100 cows	Calves	Calves: 100 cows	Unclassified moose	Total moose	Moose/ hour
1979	280	133	2,594	15.9	646	24.9	0	3,653	47.6
1980	341	355	3,350	20.8	783	23.4	28	4,857	51.3
1981	455	294	3,508	21.4	1,054	30.0	0	5,311	56.4
1982	427	475	3,773	23.9	970	25.7	0	5.645	65.3
1983	417	437	3,557	24.0	887	24.9	0	5,298	56.0
1984	537	542	4,265	25.3	1,204	28.2	1	6,549	65.4
1985	700	616	4,116	32.0	1,182	28.7	0	6,614	67.9

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 14A

GEOGRAPHICAL DESCRIPTION: Matanuska Valley

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

A census of the Subunit 14A moose population was attempted in March 1986, but was canceled prior to completion due to high winds and deteriorating snow cover. Moose habitat within the subunit was divided into 112 sample units of approximately 10-12 mi^2 each. Stratification of these sample units was completed from a Cessna 185; the units were grouped into high-, medium-, and low-density areas. To provide a statistically valid estimate, at least 25 of the 112 sample units were intensely searched from a Super Cub-class aircraft. Intensive searches were completed on only 16 sample units before climatic conditions prevented completion of the census. Using the incomplete data set, a population estimate of 2,823 moose, with ±40% at the 90% CL was calculated. This estimate indicates that 1,698 to 3,948 moose wintered in Subunit 14A. Prior to this census, the moose population in Subunit 14A was considered stable at 4,000 individuals.

Population Composition

Moose composition surveys were not conducted because of inadequate snow cover.

Mortality

In 1985, 2,294 hunters killed 454 moose (321 bulls, 123 cows, and 10 of unknown sex) in Subunit 14A. During the general open season, 1,950 hunters killed 325 moose including 315 bulls and 10 of unknown sex. In addition, 400 individuals were successful in drawing antlerless moose permits. Three hundred forty-four reported hunting, with a harvest of 123 cows and 6 bulls. Analysis of hunter success data reveals 96% were Alaskan residents, 2% were nonresidents, and 2% were of unknown residency.

Climatic conditions during the winter of 1985-86 were very mild and characterized by warm temperatures and little snow accumulation. No winter mortality was reported in the area. A review of records acquired from the Department of Public Safety indicates 24 moose were killed on the highway during this reporting period. This number is substantially lower than the 51 and 94 moose killed in 1984-85 and 1983-84, respectively.

Habitat

The moose population in Subunit 14A is believed to be at or near the maximum desired for the available habitat. Efforts are being made to improve and increase habitat in the Moose Creek Management Area. Approximately 800 acres have been manipulated for improved habitat since the inception of the program in 1980. However, these gains continue to be offset by losses to expanding agricultural and residential areas and commercial developments.

Management Summary and Recommendations

For the 3rd consecutive year, inadequate snow cover forced cancellation of surveys of moose sex and age composition. The harvest of 454 moose is near the 4-year mean of 462. The 2,294 hunters are below the 4-year mean of 2,531. Considering the stable season and bag limit, mild winters, hunter numbers, and resultant harvest, the Subunit 14A moose population is believed stable.

A population estimate of 2,823 moose ±40% was determined from an attempted random stratified census. The census was terminated prior to completion because of deteriorating snow conditions. The ±40% is too wide a variation for use as a population estimate for management purposes. It should be considered informational only. The historical moose population estimate derived from sex and age composition surveys, hunter harvest, and hunt success ratios is 4,000 animals. Pending completion of an accurate random stratified census, the population estimate of 4,000 moose should be used for management decisions.

Extremely mild winter conditions allowed moose to remain on range normally used in summer and fall. The lack of conflict with humans was evidenced by the reduction in the number of moose killed in collisions with highway vehicles.

No changes in seasons or bag limits were recommended.

PREPARED BY:

Jack C. Didrickson
Game Biologist III

Nicholas C. Steen
Game Biologist II

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 14B

GEOGRAPHICAL DESCRIPTION: Willow to Talkeetna

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The moose population is estimated to be stable and at a relatively high density, although no survey data were available for this period. The moose population density is believed to have remained high despite a decline in the moose population following the large harvest (534) and severe winter-related mortality (estimated at 300+), which occurred in 1984-85.

Population Composition

No composition surveys were conducted during this reporting period due to inadequate snow cover.

Mortality

In 1985, dates for the moose hunting season in Subunit 14B were changed from 1-30 September to 1-20 September. In addition, regulations were altered to permit taking of either-sex moose east of the Anchorage-Fairbanks powerline intertie only. West of the intertie, the bag limit was 1 bull moose. These modifications are reflected in the 1985 harvest of 216 moose including 126 bulls, 88 cows, and 2 of unknown sex. These figures contrast with the 354 moose, including 258 bulls, 271 cows, and 5 of unknown sex, harvested in 1984. In 1985, the moose were harvested by 1,269 hunters, yielding a success ratio of 17%.

Records obtained from the Alaska Railroad indicate 4 moose were killed by trains in Subunit 14B during the winter of 1985-86, compared with 184 moose killed by trains during the previous winter.

Records obtained from the Department of Public Safety indicate 5 moose were killed by highway vehicles during this reporting period, compared with 77 in 1984-85.

Management Summary and Recommendations

The lack of adequate snow forced cancellation of moose sex and age composition surveys; therefore, no survey data are available to assess the impact of the severe winter of 1984-85. However, observations of moose during other field activities indicate the Subunit 14B moose population remains at a relatively high level.

During this reporting period, the mild winter conditions and small amount of snow accumulation allowed moose to remain on traditional summer range in the remote portions of the subunit for much of the winter. The lack of conflict with humans was evidenced by the dramatic reduction in highway vehicle- and train-induced moose mortality.

Moose hunter success (17%) declined slightly from the 1984 level of 21%. However, the total number of hunters who reported using the area declined by 50% compared with 1984. This reduction in hunting pressure is believed to be the result of the 10-day season reduction and the closing of antlerless moose hunting along the highway system. The season reduction brought the hunting dates in line with adjoining units, so hunters no longer had an additional 10 days to hunt in Subunit 14B after adjacent units closed. The subunit division along the Anchorage-Fairbanks powerline intertie restricted the harvest of antlerless moose to the eastern portion only. Access to this portion of Subunit 14B is limited to ATV and aircraft, which limits hunting pressure.

No changes in seasons or bag limits are recommended.

PREPARED BY:

Jack C. Didrickson
Game Biologist III

Nicholas C. Steen
Game Biologist II

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 14C and 7

GEOGRAPHICAL DESCRIPTION: Anchorage area, including the Portage and Placer River drainages

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

With the exception of the Portage area population, moose numbers throughout the subunit are thought to have increased slightly. Excellent calf production and/or survival, fewer road kills, and decreased hunter harvests all may have contributed to the population increase.

Population Composition

Inadequate snow cover precluded composition surveys throughout most of the subunit. Timely surveys were flown only within the Portage area where 168 moose were observed, 31 fewer than in 1984. A ratio of 24 bulls:100 cows was observed. Additional surveys were not flown until late spring after the vast majority of bulls had shed their antlers. Including the Portage population, 462 moose were observed, of which 28.4% (131) were calves. The percentage of calves observed was one of the highest recorded for this area and is substantially above the mean of 23.9% for 1981-85.

Mortality

The total reported mortality (from hunting, poaching, vehicles, and trains) for the subunit was 254 moose. Six hundred forty-four hunters killed 150 moose, including 111 bulls, 38 cows, and 1 of unknown sex. The cow moose were taken during several drawing or registration permit hunts throughout the subunit. Twenty-eight bulls were taken in permit hunts, and 83 were taken during the general open hunting season.

Ninety-two moose, at least 32 of which were calves, were killed by vehicles on Subunit 14C roadways between 1 June 1985 and 31 May 1986. This compares to 87 killed on these highways during 1984-85 and an annual average of 90 killed between 1978-84. Twelve additional moose were killed by poaching or by collisions with trains.

Ages of moose killed by various means during the past reporting period were not compiled.

Management Summary and Recommendations

Increased calf production and/or survival was noted within the subunit. This increase, when combined with reduced mortality, resulted in an overall moose population increase in the subunit. The exception was the Portage area, where an excessive harvest brought about a population decline. To prevent excessive hunting pressure and possible overharvest, the general nonpermit hunting season should be reduced by 10 days to bring it into agreement with general open seasons in adjacent road-accessible game management units. The Portage area permit hunt should be limited to bulls only.

PREPARED BY:

David B. Harkness
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 15A

GEOGRAPHICAL DESCRIPTION: Kenai Peninsula

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The 85,000-acre area burned during 1969 is still providing excellent browse for moose, and it is suspected that the moose population there is still increasing. However, this area only makes up about 9% of the total acreage in Subunit 15A; the remainder of the subunit, except for a few scattered areas of improved habitat (<3% of the subunit), is classified as an unproductive moose range. The moose population in this area is believed to be stable due to mild winters since the mid-1970's.

Population Composition

Moose surveys were conducted in only 2 of the 13 count areas in Subunit 15A during the fall of 1985 due to lack of snow cover. These areas are in the 1969 burn. Results of these surveys suggest that the ratio of bulls to cows has remained unchanged since 1983 at 12 bulls:100 cows. However, the ratio of calves to cows (25:100) indicates poor calf survival during the spring of 1985. The spring of 1985 was cold and wet, which is believed to be the primary reason for the reduced calf:cow ratio.

Mortality

In addition to the bulls-only season generally held in Subunit 15A, for the 3rd year a limited antlerless permit hunt was proposed for that portion of the subunit burned in 1969. However, subsistence regulation changes delayed the opening of the season beyond the acceptable period for harvesting resident antlerless moose in this area, and the hunt was cancelled.

Harvest reports, including reminder letters, indicate 1,737 hunters harvested 255 bulls, 2 cows, and 5 moose of unspecified sex during the 1985 bulls-only season in Subunit 15A. Hunter

success was 15%. Alaska residents accounted for 96% of the successful hunts; 99% of the unsuccessful hunters were Alaskans. Reported kill locations indicate the majority of the harvest came from the 1969 burn and from the Swanson River drainage.

Seventy percent of all bulls taken had an antler spread of less than 35 inches; 4% had an antler spread greater than or equal to 50 inches.

Management Summary and Recommendations

The harvest of 262 moose by 1,737 hunters represents a slight decrease in harvest and hunting pressure compared with 1984-85 figures. The percentage of young bulls in the harvest increased. A high percentage of yearling and 2-year-old bulls in the harvest is normal for an area supporting heavy hunting pressure. Increased awareness of the dense moose population in the 1969 burn and limited road access to the remainder of the subunit have concentrated hunters and increased their success in the burned area. The percentage of young bulls in the harvest should be monitored closely for the next 2 years. If this trend continues and the public supports a change, an antler restriction should be proposed in 15A to reduce the bull harvest. Although studies suggest the current bull:cow ratio is adequate to assure high breeding success, public opinion may demand a more natural balance of sex ratios in the moose population.

If the mild winter weather pattern and fall surveys indicate the moose density in the 1969 burn area is still increasing, I recommend continuing the limited-permit, antlerless hunt. Thirty permits should be issued for fall 1986.

PREPARED BY:

Ted H. Spraker
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 15B

GEOGRAPHICAL DESCRIPTION: Kenai Peninsula

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Aerial surveys were not conducted in Subunit 15B in 1984 and 1985 due to poor weather conditions. However, since 1983 there have been no major habitat improvements and winters have been relatively mild. Therefore, it is expected that the moose density has not significantly changed and that the population remains stable.

Population Composition

No data are available.

Mortality

Residents and nonresidents were allowed to hunt moose in Subunit 15B West and a portion of 15B East during 1985. The remainder of 15B East was open only to qualified subsistence hunters through a permit system. Fifty permits were issued to subsistence hunters who scored above other applicants on questions dealing with local residency, prior use of the resource, dependency on the resource, availability of alternative resources, and income.

Four hundred seventy-nine hunters reported harvesting 55 bulls in 15B West during the 1985 season. Residents accounted for 100% of the harvest and the hunter success rate for all hunters was 12%. Antler spread measurements were obtained from 46 of the bulls harvested and can be grouped as follows: 23 ≤ 29.9 inches, 21 between 30 and 49.9 inches, and 2 ≥ 50.0 inches.

Thirty-one of 50 permittees reported hunting in Subunit 15B East as subsistence hunters. They harvested 18 bulls, yielding a success rate of 58%. Mean antler spread was 55 inches (n = 18), and the largest antler spread recorded was 71.5

inches. Two types of transportation means were used by successful hunters: horses, 67%; and boats, 33%.

The extent of weather-related mortality and predation by wolves and bears on moose in Subunit 15B is unknown.

Management Summary and Recommendations

The reported harvest of 55 bulls in Subunit 15B West is 29% lower than the previous year's harvest of 77. Yet, the season was unchanged and the number of hunters reporting increased only slightly. If the harvest continues to decline and the percentage of young-aged bulls occurring in the reported harvest increases, action should be taken to reduce the harvest of bulls in 15B West.

The bull harvest and percentage of small bulls in the harvest should be closely monitored for 2 years to accurately assess the availability of bulls in the population.

The trophy bull moose hunt in 15B East continues to provide excellent hunting opportunities and is highly popular among resident sportsmen. However, the 1985 subsistence regulations eliminated most of the residents and all of the nonresidents that generally would have applied for a permit. The 38% reduction in harvest (compared with 1984) is attributed to the reduced season and half the previous number of permits being issued. Subsistence hunters were more successful than hunters in any previous year in which the same minimum antler size requirement was a condition of the permit. To better utilize the resource potential in 15B East, it is recommended that the number of permits be increased to 100 for fall 1986.

Summer and winter moose range on the Kenai National Wildlife Refuge in Subunit 15B continues to deteriorate due to wilderness lands management policies which favor advanced forest succession. The Department and the U. S. Fish and Wildlife Service should cooperate on habitat enhancement projects (mechanical manipulation and prescribed burnings) to improve moose habitat in the Slikok and Coal Lake areas.

PREPARED BY:

Ted H. Spraker
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 15C

GEOGRAPHICAL DESCRIPTION: Kenai Peninsula

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose are moderately abundant and probably near the ecological carrying capacity of the maturing forest habitats in Subunit 15C. A minimum density of 5.9 moose/mi^2 was observed on 230 mi^2 of fall range in 1983. The overall minimum density for the entire subunit, however, was probably between 2.0 and 3.0 moose/mi^2.

Population Composition

A complete aerial survey of the Caribou Hills and partial surveys of the Deep Creek and Anchor River drainages were made between 12 and 23 November. Snow conditions on the ground were good to excellent above 1,000-foot elevations where moose were aggregated. Intensive search efforts were made in fall ranges to increase count accuracy and to allow the classification of yearling bulls by the number and form of antler tines.

One thousand, three hundred fifty-one moose were classified: 141 bulls, 970 cows, and 240 calves. Bull:cow ratios ranged from 2:100 south of the South Fork of the Anchor River, to 28:100 in the Caribou Hills, with a mean of 15:100. Seventy-eight percent (n = 25) of the yearling bulls had either a spike or fork configuration on at least 1 antler, and 22% (n = 7) had 3 or more tines on both antlers. Calves composed 18% of the sample with a mean of 27 calves:100 cows, and a ratio ranging from 15:100 in the Caribou Hills to 44:100 in the area between the South Fork of the Anchor River and Kachemak Bay.

Mortality

The reported 1985 harvest was 174 bulls, compared with 14 bulls in 1984 (19% decline) and the 5-year mean harvest of 208 bulls (16% decline). The ratio of 1st-half season kills to 2nd-half

season kills was not significantly different from those of the previous 2 years (X^2 = 1.661, P > 0.10) (Table 1). During the 2nd half of the season, the largest kill reductions occurred in the Deep Creek and Anchor River drainages (Table 2).

One thousand seventy-five hunters reported hunting moose in Subunit 15C compared with 1,265 in 1984. The numbers of hunters in the Deep Creek and Anchor River drainages were reduced by 26% (n = 217) and 11% (n = 342), respectively. The success rate for moose hunters in the subunit was 16%. The hunter population consisted of Kenai Peninsula residents (88%), other state residents (11%), and nonresidents (1%).

The harvest chronology was 105 bulls killed in the 1st week, 32 bulls in the 2nd week, and 29 bulls in the 3rd week. Seventy-two percent of the harvest was reached by the 10th day.

The rank of transportation types used by moose hunters in 1985 was not different from previous years: highway vehicle > off-road vehicles > boat > horse > airplane. However, the number of off-road vehicle users declined from 400 in 1984 to 269 in 1985 (X^2 = 13.34, P < 0.001); and among successful hunters, highway vehicle users (41%) exceeded off-road vehicle users (38%). The distribution of kills, by major drainage, was similar to distributions of recent years (Table 2).

Antler spread information was obtained from 159 harvested bulls and grouped as follows: 76 bulls < 30.0 inches; 57 bulls 30.0-39.9 inches; 18 bulls 40.0-49.9 inches; and 8 bulls ≥ 50.0 inches. The proportion of bulls with antler spreads < 30.0 inches (i.e. yearlings) increased from 30% in 1983-84 to 48% (X^2 = 14.57, P < 0.001), while the proportion of bulls with antler spreads ≥ 40.0 inches declined from 33% in 1983-84 to 16% (X^2 = 14.11, P < 0.001).

Management Summary and Recommendations

The Lower Kenai Controlled Use Area regulation (Subunit 15C) was put into effect for the 1985 moose season. This regulation restricts the use of motorized land vehicles, for moose hunting, to the 1st 10 days of the season. Its purpose is to lower hunting pressure in remote, trail-accessible portions of the subunit, and to thereby increase the abundance of bulls in these areas. The Department's management goal is to reduce the annual subunit harvest to approximately 175 bulls, and to restore the post-hunt bull:cow ratio to at least 15:100 in areas outside the Kenai National Wildlife Refuge.

Assessment of 1985 harvest data shows the numbers of hunters and bulls killed declined throughout Unit 15. Intermittent rainy weather accompanied by fog and wind was probably the most

important cause of the general declines. On the lower peninsula, weather conditions were judged to be favorable for moose hunting on 76% (n = 10) of the season's week days, but only 33% (n = 2) of weekend days. Similar weather conditions were reported for the northern end of the Kenai lowlands (Spraker, pers. commun.).

Field observations made during the 2nd half of the 1985 season provide clear evidence that the controlled-use-area regulation dramatically reduced the numbers of hunters in those areas normally hunted by off-road vehicle users. I made an extensive fixed-wing aerial survey of the Deep Creek and Anchor River drainages on 11 September. Only 3 three-wheelers, parked at separate hunting camps in the North Fork of Deep Creek, were observed during the flight, where 100-200 vehicles could have been counted in previous seasons. In addition, I spent the last 5 days of the season camped at Center Plateau, which provided a vantage point for both the headwaters of Deep Creek and the South Fork of the Anchor River. During this period, I saw 2 hunters on horseback, but never saw an off-road vehicle.

Harvest ticket data suggest that the off-road vehicle closure caused reductions in both numbers of hunters and of bulls killed, in addition to the general declines experienced in the unit. Although there was a unit-wide decrease in hunting pressure, the number of moose hunters reported in Subunit 15C dropped 15% compared with just 6% in the remainder of the unit. The ultimate effect of this was that during the 2nd half of the season the number of bulls killed declined 42% in Subunit 15C, compared with only a 3% decline in Subunits 15A and 15B (X^2 = 4.51, P < 0.05) (Table 3). Based on this difference, I believe the decline in the 2nd-half season harvest in Subunit 15C is a fairly accurate measurement of the off-road closure's effect. If this assumption is valid, the controlled-use-area regulation reduced the 1985 kill by about 30 bulls.

It does not appear that hunters made any major adjustments to their normal hunting patterns in ways that would have compensated for the effects of the off-road vehicle closure. If all off-road users had concentrated their hunting effort in the 1st half of the season, we would expect to see an increase in the bull kill for that period, relative to previous years or other 1st-half season harvests in Subunit 15A and 15B. To the contrary, the ratio of the 1st-half season harvest to the 2nd-half season harvest between years in Subunit 15C (X^2 = 1.66, P > 0.10), and the ratio of the combined 1983 and 1984 1st-half season harvests and 1985 1st-half season harvests between Subunit 15C and the remainder of Unit 15 (X^2 = 0.55, P > 0.25) were not different.

Another anticipated scenario was that displaced off-road vehicle users would redirect their efforts to areas along the road

system during the 2nd-half of the season. If this had happened in significant portions, a noticeable increase in the 2nd-half season harvest of yearling bulls should have resulted because the majority of the bulls available in intensely hunted, road-accessible areas are yearlings. However, even though a significant increase in the number of yearlings killed in the entire season occurred, the chronology of the yearling kill was not different from previous years ($X^2 = 0.138$, $P > 0.50$). The overall increase of yearlings in the harvest probably reflects high overwinter survival for the 1984 calf cohort. Finally, only minor changes occurred in the distribution of hunters by major drainages and types of transportation used by all hunters.

During fall, the population density of bulls on the lower peninsula decreases along a north-south gradient from the Caribou Hills to Kachemak Bay (Table 4). The gradient is inversely related to, and probably the result of, hunting mortality; but it may also reflect natural patterns of habitat selection by moose. The moose population in the Caribou Hills (Kenai National Wildlife Refuge), where access is by foot and/or horse travel and hunting pressure is light, averages 5 bulls/10 mi^2, 28-34 bulls:100 cows. Antler spreads over 50 inches are common. The area between the South Fork of the Anchor River and Kachemak Bay represents the gradient's lower limit. Road and trail systems are well developed in this area, which facilitates hunter access. The mean fall density of bulls is 0.3 bulls/10 mi^2, there are 2-4 bulls:100 cows, yearling bulls predominate in the harvest, and large bulls are extremely rare. The status of bulls in the Deep Creek drainage and the headwaters of the Anchor River fits between these extremes. Moose hunters utilize the area's extensive seismic trail system (cleared trails which facilitate travel) and hunting pressure is heavy and increasing. The area supports a mean density of 3 bulls/10 mi^2, and 11 bulls:100 cows. Antler spreads over 50 inches are uncommon and declining in frequency.

Aerial surveys flown in 1985 show some improvement in the bull population in the area encompassed by the Deep Creek drainage and headwaters of the Anchor River. Seventy bulls (45% yearlings) were observed in count areas 15C-24 and 25, compared with 50 bulls (40% yearlings) in 1982. However, the bull:cow ratio remained at 11:100. The number of bulls between the Anchor River and Kachemak Bay remains quite low. Only 6 bulls (2 yearlings) were observed in the entire 165 mi^2 area in 1983, compared with 3 bulls (all yearlings) in 119.5 mi^2 in 1985. In contrast, 68 bulls (46% yearlings) were counted in the Caribou Hills (146.5 mi^2) in 1985.

The Lower Kenai Controlled Use Area regulation appears to have lowered the bull harvest to the desired level during its 1st

season in effect. It is yet too early to determine whether the off-road closure can reduce harvest enough to increase the abundance of bulls and the bull:cow ratio. One obvious weakness in the controlled-use-area regulation's application is that it will not relieve hunting pressure in road-accessible areas. Other strategies such as selective harvest through antler restrictions or a combination of antler restrictions and controlled access may be needed to strengthen bull populations in these areas. The Department should continue to place high priority on the evaluation of the controlled-use area's effect on bull harvest and population status.

PREPARED BY:

David A. Holdermann
Game Biologist II

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

Table 1. Comparison of 1st-half season (1-10 September) and 2nd-half season (11-20 September) harvests of bulls in Subunit 15C, 1983-85.

Year	Bull harvest, September				Totals
	1-10		11-20		
	n	%	n	%	
1983	160	69.0	72	31.0	232
1984	132	62.6	79	37.4	211
1985[a]	120	72.3	46[b]	27.7	166
Totals	412	67.7	197	32.3	609

[a] Introduction of Lower Kenai Controlled Use Area.

[b] $P > 0.10$, X^2 test.

Table 2. Comparison of the reported 2nd-half season harvest (11-20 September) of bulls, by drainage, in Subunit 15C, 1983-85.

Drainage	Bulls harvested 1983 n	1983 %	1984 n	1984 %	1985 n	1985 %	Difference between 1983 & 1984 $\bar{x}$ harvest and 1985 harvest
Tustumena Lake	7	10.1	5	6.5	11	23.9	+ 5
Ninilchik River	9	13.1	7	9.1	4	8.7	- 4
Deep Creek	25	36.2	28	36.3	12	26.1	- 14.5
Stariski Creek	2	3.0	1	1.3	1	2.2	- 0.5
Anchor River	13	18.8	16	20.8	8	17.4	- 6.5
Kachemak Bay	9	13.1	14	18.2	5	10.8	- 6.5
Fox River/Sheep Creek	3	4.3	5	6.5	3	6.5	- 1.0
Seldovia River	1	1.4	1	1.3	1	2.2	0
English Bay River	0	--	0	--	1	2.2	+ 1.0
Rocky River	0	--	0	--	0	--	0
Totals	69	100.0	77	100.0	46	100.0	- 27

Table 3. Comparison of 2nd-half season harvests (11-20 September) in Subunit 15C and the remainder of Unit 15, 1984 and 1985.

Subunits	Bull harvest 11-20 September 1984	1985	Totals
15A + B	118	114	232
15C	79	46[a]	125
Totals	197	160	357

[a] Introduction of Lower Kenai Controlled Use Area; $P < 0.05$, X^2 test.

Table 4. North-to-south variation in the status of bull moose populations on the lower Kenai Peninsula, Subunit 15C, 1985.

Area	Total bull count[a]	Minimum bull density[b]	Bulls: 100 cows	Occurrence of bulls with antler spread ≥ 50 inches
Caribou Hills[c]	68	5.0	28	common
Deep Creek/headwaters of Anchor River[d]	70	3.0	11	uncommon
South Fork of Anchor River/Kachemak Bay[e]	3	0.3	2	rare

[a] 1985 count.

[b] Bulls/10 mi^2.

[c] Count area 15C-21.

[d] Count areas 15C-24 and -25.

[e] Count area 15C-26.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 16

GEOGRAPHICAL DESCRIPTION: West side of Cook Inlet

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose populations for Unit 16 remain healthy and stable. The 1984-85 population estimate of 10,000 (developed through aerial census and area stratification techniques) remains valid. Local subpopulations of moose in areas with good hunter access have been affected by recent harvest.

Population Composition

Composition surveys were conducted in November and December with 4 trend areas flown in 16A and 8 flown in 16B. Survey results are presented in Table 1.

Mortality

Four hundred ninety-six moose were reported killed by 2,199 hunters in Unit 16; the success rate was 23%. Forty-two moose were killed in 16B permit hunts (Hunt 981, 12 bulls and 14 cows; Hunt 982, 8 bulls and 8 cows) and 454 moose (369 bulls, 81 cows, and 4 unidentified sex) were killed in the Unit 16 general open hunting season. The harvest in Subunit 16A was 101 bulls. In Subunit 16B, the September harvest included 264 bulls and 80 cows. In the past 15 years, only 1975 and 1976 had a lower reported harvest. Permit hunters and 95% of all other hunters were state residents. There were no indications that significant winter mortality occurred in any areas during this report period.

Management Summary and Recommendations

The fall 1985 trend area data for Unit 16 are comparable to those obtained in recent years. In the Redoubt Bay area, where conservative regulations were adopted for the 1985 season and the harvest was reduced from 58 moose in 1984 to 25 in 1985,

there were small increases in the bull:cow and calf:cow ratios. The unit-wide bull:cow ratio of 37:100 and the calf:cow ratio of 25:100 are acceptable population parameters for current management goals.

Available data indicate accessible moose subpopulations are being exploited at a considerably greater rate than inaccessible subpopulations. Established trend survey areas largely occur in the lightly hunted areas and those data probably do not reflect the status of moose subpopulations in the more accessible and popular hunting areas. Comments from the public suggest there has been a significant reduction in moose abundance along major waterways, lakes, and the road system, and that hunting has been the major contributing factor. Because most of these areas have an extensive tree canopy, observing moose is more difficult than in trend areas established in alpine and subalpine habitat. Techniques that would provide more accurate survey data for forested areas would, at this time, be prohibitively expensive. Considering the presently available data, it appears that conservative regulations would benefit these moose subpopulations that are sustaining the majority of the harvest. The harvest of antlerless moose, although small in relationship to the unit's total moose population, may also be having an adverse impact on these local subpopulations. This situation has been aggravated by the implementation of winter hunts, directed at migratory subpopulations, during winters when major migrations did not occur. This situation has resulted in the resident subpopulation, that which sustains the bulk of the regular season harvest, also sustaining the majority of the winter season kill. Until data can be gathered to document the status and movement patterns for these subpopulations, antlerless moose seasons should only be opened during winters when migratory moose immigrate to accessible portions of the unit.

It appears that the low 1985 harvest reflects a reduced number of moose in the popular hunting areas. In some areas, moderate mortality during the 1984-85 winter also contributed to the reduced number of animals present. Additionally, fewer hunters hunted during the September season (2,132 in 1985 vs. 2,737 in 1984) and 3 of the permit hunts held the previous year were not authorized by the Board of Game in the 1985-86 regulatory year.

The September seasons should be restricted to bulls only and could run for the entire month in both subunits. Winter seasons should be permit hunts with the season opened only after snow conditions are sufficient to initiate immigration of nonlocal moose into accessible areas. Permits should be allocated to distribute the kill among numerous subpopulations.

PREPARED BY:

James B. Faro
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

Table 1. Moose sex and age ratios in Game Management Unit 16, 1985.

Count area	Males:100 females	Calves:100 females	Twins:100 females w/calves	Moose/ hour	Sample size	Count time (hours)
Subunit 16A						
Upper Peters Dutch	28	20	0	30	59	2.0
Lower Peters Dutch	37	38	4	55	133	2.4
SW Dutch	29	35	0	37	85	2.3
SW Peters	43	31	0	83	165	2.0
Subunit 16A						
Totals					442	8.7
Means	36	32	1	51		
Subunit 16B						
Lone Ridge	59	31	15	47	183	3.9
Redoubt Bay	22	20	21	30	214	7.2
Sunflower Basin	43	20	0	107	172	1.6
Upper Camp Cr.	40	21	0	102	61	.6
Mt. Susitna	30	32	24	59	107	1.8
Willow Mt.	36	18	0	91	68	.7
Mt. Yenlo	38	21	0	97	224	2.3
McArthur	34	18	10	72	94	1.3
Subunit 16B						
Totals					1,123	19.4
Means	37	23	10	58		
Unit 16						
Totals					1,565	28.1
Means	37	25	7	56		

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 16B

GEOGRAPHICAL DESCRIPTION: Kalgin Island

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Sport hunting and natural mortality have reduced the moose population on Kalgin Island to a density of approximately 1 animal/mi^2.

Population Composition

Ten moose were observed under difficult aerial survey conditions on 22 November. The composition of that sample was 2 bulls, 6 cows, and 2 calves.

Mortality

Nineteen moose were harvested during the 5-day, late-August season (10 bulls and 9 cows). Only 1 moose was older than 3 years of age. Late snows in April covered ground forage on which the island's moose normally rely and probably caused some mortality. Because of the low population density, the chances of finding "winter kill" carcasses was low and no natural mortality was documented.

Management Summary and Recommendations

The existing over-winter population density of moose on the island should be maintained to allow further recovery of vegetation. Observations made during the past year indicate that nontypical forage species such as alders, ferns, and lichens remain important to the resident population. Other forage species (e.g., blueberry and salmonberry) that showed heavy use in the past, are now only lightly utilized and exhibiting good growth. Should deep snows persist through the winter, much of the existing ground level forage would be unavailable and a significant mortality could occur. Moose numbers should be allowed to increase only after there has been recovery of

preferred browse species (such as young birch) to the point that there would be suitable forage available at moderate snow depths.

It is difficult to hunt on Kalgin Island because the dense vegetation conceals moose from hunters. Past harvest levels resulted from very high densities of hunters. In attempting to avoid hunters, moose would move and become vulnerable to other hunters. This high hunter density occurred because permit hunts have a reputation for being "easy hunts," and season dates were set to avoid conflicts with other moose seasons. However, as the density of moose has been lowered from an estimated 7/mi^2 to 1/mi^2, hunter success has also decreased. In 1985, 241 hunters reported hunting on the island but had a success rate of only 8%, which compared with 37% success for 218 hunters in 1981. Because of the expense associated with hunt logistics, and the poor hunter success, the season on Kalgin Island will not be as attractive for hunting as it formerly was. Fewer hunters are expected to hunt the area in 1986, regardless of the season or bag limits adopted. The hunting fatality that occurred this past season will tend to further discourage interest by hunters.

If reductions in harvest due to lower public participation do occur, moose numbers on the island are likely to increase. An increasing moose population will negatively affect the improvements in available browse that have occurred under recent lower population levels. To improve available food sources, liberal hunting opportunities should be maintained and the public should be encouraged to harvest the annual recruitment. Past seasons have shown that even with a high density of hunters, the vegetation is so dense that some moose can survive in spite of intense hunter effort. Because there appears to be no danger of extirpating the island's moose population by sport hunting, long open seasons can be established. Permit reporting requirements can be used to follow the harvest and, if necessary, an emergency closure issued.

PREPARED BY:

James B. Faro
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 17

GEOGRAPHICAL DESCRIPTION: Northern Bristol Bay

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Long-term local residents report the moose population in Unit 17 slowly declined for many years and stabilized at a low density during the late 1970's. Observations in the early 1970's indicate moose were relatively scarce throughout much of the unit except in portions of Subunit 17B, particularly the upper Nushagak River drainages. The severe winter of 1974-75, along with a reportedly high rate of wolf predation, depressed those populations further. This declining trend was apparent throughout the unit through the early 1980's.

In Subunits 17B and 17C, moose populations are now generally increasing. Several factors have contributed to reversing the long-time declining trend:

1. In 1979, the December season in the Iowithla and Sunshine drainages in Subunit 17C was closed.

2. Mild winters occurred in 1978-84.

3. Moose calf survival was exceptionally high in 1983 and 1984.

4. The rapidly expanding Mulchatna Caribou Herd provided unit residents with a readily available alternative meat source.

Populations in 17A, however, remain severely depressed due to high levels of poaching in the Togiak drainage. Altogether, 9 moose were observed in 17A during 12 hours of surveys by Togiak Refuge personnel from January through March 1986.

Population Composition

Due to poor snow conditions only 1 moose trend area (Mosquito Creek) was surveyed during this reporting period. Survey results are not comparable to those of previous years due to disparity in snow conditions and, therefore, will not be included in this report.

Mortality

A total of 584 hunters reported killing 152 moose (146 males and 6 of unknown sex) in Unit 17. Forty-two moose were taken during the registration hunt, 88 during the September season, 10 in December, and 5 in January. The month of kill for 7 moose remains unknown. Nonresidents took 37 moose (24% of the reported harvest), unit residents took 66 (43%), and other state residents took 49 (32%).

During the registration hunt most successful hunters (78%) used boats as their primary method of access. Aircraft were used predominantly during the regular season by successful hunters (73%). Observations during the hunting season indicate that use of all-terrain vehicles (ATV's) by guides/outfitters as a secondary means of transport is increasing in many portions of Subunit 17B.

Antler size information indicates younger-age-class males are more vulnerable during the August season and older males are taken predominantly during mid- to late September. Bulls with an antler spread greater than 50 inches composed 50% of the reported harvest.

In Subunit 17A, 23 moose were allegedly poached by Togiak villagers during this reporting period.

Management Summary and Recommendations

Hunting pressure increased again dramatically during this reporting period throughout the upper portions of Subunit 17B. Competition between unit residents and nonresidents along the upper Nushagak and lower Mulchatna Rivers is creating some conflicts; in December 1985 the Nushagak Advisory Committee proposed closing this area to nonresident moose hunters.

Use of ATV's by guides and outfitters as a secondary means of transportation for their fly-in hunters is increasing, and scars of ATV trails are proliferating along the Tikchik, Koktuli, Stuyahok, and Mulchatna River areas. Numerous rivers and lakes provide access to most of this area, as do several gravel ridges accessible to small aircraft with large tires. If the use of ATV's is found to have a detrimental effect on

these moose populations, restriction of their use will be recommended.

Survey conditions were generally very poor during this reporting period and efforts to conduct a census estimate of the upper Mulchatna River area were cancelled. Very few moose population data are available for the portions of the area where hunting pressure is increasing dramatically. A census of this area should be the 1st priority for winter 1986-87.

Trend counts have been largely unsuccessful in Unit 17 due to poor snow conditions and generally low moose population densities over large geographic areas. More emphasis should be placed on periodic census estimates of portions of the unit to acquire necessary population data for management.

PREPARED BY:

Kenton P. Taylor
Game Biologist III

SUBMITTED BY:

William P. Taylor
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 18

GEOGRAPHICAL DESCRIPTION: Yukon-Kuskokwim Delta

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Prior to 1950, moose were rarely seen on the Yukon-Kuskokwim Delta. During subsequent years moose numbers increased, particularly in the Yukon drainage upriver from Ohogamiut and Russian Mission. Moose are certainly more common now than 40 years ago, but their densities are still very low in relation to habitat availability. Moose densities in the Yukon drainage downriver from Marshall and in the entire Kuskokwim drainage are extremely low, and are generally less than 1 moose per 20 mi^2. I believe the Unit 18 moose population numbers approximately 500 moose in the Yukon drainage and 100 in the Kuskokwim drainage. Most local residents do not consider moose numbers to be unduly low, and are not alarmed by the low densities. Although extensive habitat is available for moose expansion, heavy hunting pressure together with other mortality factors effectively limits population growth.

Population Composition

Fall composition surveys were not conducted in Unit 18 due to inadequate snow cover. Winter surveys were conducted in the drainages of the Reindeer, Chuilnak, and Andreafsky Rivers, and along the Yukon River from Ohogamiut to Russian Mission. Further winter surveys were suspended due to sparse snow cover. Moose were scattered in the surrounding hills throughout the winter and were not concentrated in riparian wintering areas. During 12.3 hours of aerial survey, only 20 moose were sighted. Calves composed 44% of the sample. No moose were observed in the Kako, Chuilnak, and Andreafsky River drainages, and less moose than normal were counted in the Reindeer and Yukon River surveys (Table 1). I believe lower numbers of moose were observed because of their scattered distribution, and that no population decline occurred.

Mortality

Hunting was the most important source of moose mortality in Unit 18. During the 1985-86 open season, 221 hunters reported a harvest of 52 moose. The 1985-86 harvest was lower than reported in prior years, and substantially lower than the 1981 record harvest of 82 moose (Table 2). Forty-three moose were reported taken during the fall season, 8 during the winter season, and 1 was unknown. As in past years, the bulk of the harvest (35 moose) was reported from the Yukon drainage. Most of the moose were harvested upriver from St. Marys on the Yukon River and Tuluksak on the Kuskokwim River. Moose are taken throughout the year in Unit 18, and the out-of-season harvest probably equaled or exceeded the legal harvest. I estimate that the total unit-wide harvest was about 100 moose during 1985-86.

During September 1986, ADF&G staff and personnel from the U.S. Fish and Wildlife Service operated a check station near the mouth of Twelve-mile and Paimiut Slough to assess hunting pressure on the Yukon River. Due to a preponderance of wet, rainy weather, hunting activity and harvest were reduced considerably compared with prior years. Many hunters commented that moose were more difficult to find than normal due to delayed rutting activity. Hunting pressure was more dispersed as well, reflecting the greater difficulty of hunting moose. Poor weather conditions unit-wide were probably responsible for the lower fall harvest.

The winter hunting season (1-10 February) occurred 4 weeks later than in past years. Interest in the bulls-only winter season was high and many hunters participated. Since most bulls shed their antlers prior to February, staff believed many cows would likely be harvested. A lack of snow and poor travel conditions prevented many individuals from successfully killing a moose and relatively few moose were harvested. As reported earlier, moose were widely dispersed throughout their summer-fall range during the winter, and were not concentrated on their traditional wintering areas along the major rivers. Although staff heard that some cows were shot, the few moose we examined in the field were bulls.

As reported in past years, most of the harvest was taken by local Unit 18 residents. Only 4% of the reported harvest was taken by nonlocal hunters. Complaints of competition from nonlocal hunters are received every year, particularly from residents of upriver Yukon villages. In many cases, these "nonlocal" hunters are Unit 18 residents from elsewhere in the unit. Since nonlocal hunters often use aircraft for transportation, they are highly visible to ground-based hunters using boats, creating the impression they are more numerous than they actually are.

As reported last year, boats were the mode of transportation used most frequently by successful hunters (66%). Other modes of transportation used by hunters were snowmachines (18%), three- or four-wheelers (6%), and highway vehicles (2%). Eight percent did not report their transportation method. The relative percentage of hunters using snowmachines has increased substantially, from none being used in 1983-84 to 11% in 1984-85 and 18% in 1985-86. The popularity of the February season was undoubtedly responsible for the reported increase in snowmachine use.

Relatively little is known about other sources of mortality in Unit 18. Because snow depths were well below normal throughout the winter, overwinter mortality was probably not significant. Water levels were lower than normal during the spring of 1986, and calf losses from spring flooding were probably minimal as well. During the prior spring, flooding was extensive in the Yukon drainage and the mortality rate among newborn calves was reported to be high. Harassment by mosquitos was unusually severe during the summer of 1985, and we received numerous reports of emaciated moose seen in the Holy Cross and Kalskag area. Insect harassment is probably not significant as a direct cause of mortality. Severe harassment, however, could impact the ability of moose to gain weight and could indirectly affect overwinter survival. During 1985-86, we saw little evidence that wolves had an impact on moose numbers to a significant degree. Wolves are rare or nonexistent throughout Unit 18 due to limited prey availability. Although grizzly bears are common, they are found predominantly in the Andreafsky and Kilbuck Mountains. Since neither area supports significant numbers of moose, bears probably did not kill a large number of moose. However, even limited bear predation in conjunction with heavy hunting pressure could prevent low-density moose populations from growing and expanding into new range. Such would be especially true if bears concentrated their efforts on calves. During the spring of 1985, the snowpack was unusually late in melting, and several instances of bears running down moose in deep snow were documented in the Kilbuck and Andreafsky Mountains. During the spring of 1986, most of the snow was gone prior to mid-April and bear predation on adult moose was probably low. Although bear predation may affect moose numbers in some years, I do not believe bears are the primary factor keeping moose numbers low.

Management Summary and Recommendations

Since conditions for snowmachine travel during 1985-86 were poor, the illegal harvest of moose was probably less this year than what is normally observed. Although some incidents of moose hunting during the closed season were reported, the quantity of such reports was certainly less than during the prior

winter. In most years, the out-of-season harvest of moose--both cows and bulls--is one of the most serious management problems in Unit 18. A combination of extremely low moose densities and a high density of people and villages along the major rivers effectively prevents moose from colonizing new areas and increasing in number. The problem is aggravated by a poorly developed cash economy, a lack of alternate resources, and occasional bear predation. Approximately three-fourths of the Yukon drainage and all of the Kuskokwim drainage in Unit 18 are not utilized by moose to any significant degree. Both drainages contain large quantities of quality riparian habitat. Survey data indicate that moose in Unit 18 are highly productive and could expand into available habitat if given the opportunity. Efforts by Department personnel to inform the public of the need for compliance with seasons and bag limits should continue. Enforcement, particularly during late winter, should be increased.

Staff should closely monitor the winter distribution of moose prior to the February season as well as during the hunting season itself. Interest in the winter hunting season was high this year, and many hunters participated. When moose are not concentrated on their riparian winter range, vulnerability to harvest is lower. However, during a winter characterized by deep snow, many more moose will winter in these riparian areas and will be more vulnerable to hunters. Under such circumstances, harvests could be excessive, particularly if many cows are taken. In the future, regulations should stipulate that the hunt will be conducted only when moose distribution and snow conditions are suitable. Such a regulation would undoubtedly be unpopular with the hunting public, but may be necessary to adequately protect the resource.

Compliance with the harvest ticket requirement has improved considerably in the past 5 years, but there is still much room for improvement. Many hunters are still unaware that they need to return their harvest report after the closure of the season. Efforts to establish license vendors and to publicize the need for licenses and harvest tickets should continue.

The impact of grizzly bear predation on low-density moose populations needs to be better evaluated. In many areas of Unit 18, grizzly bears are more numerous than moose. Although bears in such areas may take only a few moose, predation may be high enough to adversely affect a low-density moose population, particularly in heavily hunted areas. The combined mortality from hunting and predation may be sufficient to keep the population from growing.

The moose population in Unit 18 appears to be highly migratory, and the nature of these movements is still not well understood.

Because moose are heavily hunted throughout the unit, moose movement patterns may be different from those observed elsewhere in the state. A radiotelemetry study would provide a better understanding of Unit 18 moose populations and would help us better manage the resource.

PREPARED BY:

Steven Machida
Game Biologist III

SUBMITTED BY:

Steven Machida
Survey-Inventory Coordinator

Table 1. Unit 18 winter composition counts, 1983-86.

Area	Year	Number of adults	Number of calves	Percent calves	n
Yukon River (Ohogamiut to Russian Mission)	1983	6	1	14	7
	1984	15	7	32	22
	1985	33	21	39	54
	1986	6	5	45	11
Reindeer River	1983	1	0	--	1
	1984	12	5	29	17
	1985[a]				
	1986	5	4	44	9

[a] No survey conducted.

Table 2. Unit 18 moose harvest by major drainage, 1981-85.

Major drainage	Year				
	1981-82	1982-83	1983-84	1984-85	1985-86
Yukon	47	32	40	39	35
Kuskokwim	26	20	21	20	9
Remainder of unit[a]	9	3	2	4	8
Total harvest	82	55	63	63	52

[a] Includes harvest from unknown locations.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 19

GEOGRAPHICAL DESCRIPTION: Upper and middle Kuskokwim River drainages

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Snow accumulations reached record levels during winter 1984-85. Subsequent calf production or survival was poor. Calf:cow ratios observed during fall 1985 surveys were the lowest on record. Although snow conditions were most severe in Subunit 19D, calf survival was also reduced in Subunits 19A, 19B, and 19C where snow conditions were more moderate. Calf survival and recruitment in Subunits 19C and 19D have been low for several consecutive years. Although recruitment has been higher in Subunits 19A and 19B, moose populations appear to have declined in all subunits.

Population Composition

Fall sex composition counts were not conducted in Subunit 19A due to the lack of snow. A late winter survey indicated that calves composed 11% of the herd. This contrasts with previous years in which calves composed 22% to 26% of the herd.

The fall bull:cow ratio in Subunit 19B dropped to 56 bulls:100 cows and there were only 17 calves:100 cows.

In the heavily hunted population near Farewell in Subunit 19C, the bull:cow ratio was 59:100 and the calf:cow ratio dropped to 13 calves:100 cows. In a lightly hunted population to the east, the bull:cow ratio was high (126 bulls:100 cows), but calf survival was also low (10 calves:100 cows) in this area.

Subunit 19D continued to have lower bull:cow ratios than elsewhere in Unit 19. Forty-four bulls per 100 cows were observed during fall 1985. As in the other subunits, the 16 calves per 100 cows was the lowest recorded for the subunit.

Movements

Radio collars were placed on 19 bull moose during February 1983 to determine movements and the potential impact on hunting. Nine moose were collared in the Upper Kuskokwim Controlled Use Area, particularly the North Fork, and 10 were collared in the foothills of the Alaska Range near Farewell. Two moose (1 on the North Fork and 1 near Farewell) slipped their collars off within 2 months.

After 3 years, certain movement patterns have become apparent. In the Upper Kuskokwim Controlled Use Area, 2 bulls remained close to heavily hunted rivers most of the year. Both bulls were shot within 2 hunting seasons.

One of these bulls apparently remained in or near dense spruce timber along the Kuskokwim River about 20 miles east of McGrath through most of the 1st hunting season but was shot near the river on opening day the 2nd season.

The other bull wintered both years on the upper reaches of the East Fork and moved along the East Fork to the junction with the North Fork during summer and fall. It was seen by hunters from Nikolai several times during the 1st fall season after its capture. As requested, they did not shoot it. (That season most hunters were able to take a moose while hunting on the North or East Forks). The next fall the bull was shot by a hunter from Nikolai near the end of the fall season--a season in which several hunters reported seeing few moose.

A short-yearling male captured on the middle North Fork moved to the upper East Fork and lower Tonzona River area during the 1st summer, where it remained at least 1 year before the radio malfunctioned. It did not return to the middle North Fork area where it was captured during the 16 months that the radio worked.

Two bulls returned each winter to areas near their capture sites. One other bull returned in 1984-85, a year with deep snow accumulations, but remained closer to its summer range during the other winters. The other 2 bulls moved at least 30 miles from their capture sites and have not returned. One of these bulls has wintered along the foothills of the Alaska Range, twice near upper Pingston Creek and once in the Bear Creek burn near Farewell. This bull is the only moose from the flats that has wintered in the foothills.

In addition to the 2 bulls shot by hunters, a 13-year-old bull died in March 1985 in an area of very deep snow accumulation. It is uncertain if it was a winter kill or if it was killed by wolves.

All the moose collared near Farewell in the Bear Creek burn wintered in the foothills of the Alaska Range, primarily within the Bear Creek burn. There were 3 basic movement patterns. Most spent the period from May to mid-August in the upper Kuskokwim Controlled Use Area near the lower Pitka Fork and returned to the foothills during the hunting season. One moose moved in the opposite direction and spent summers in the mountains and winters on the flats. Two moose were resident and moved very little.

Four of the 9 bulls with working radios were shot by hunters in the foothills near Farewell: 1 on opening day of the 1st hunting season, 2 during the 2nd year, and 1 the 3rd season. A 6-year-old resident bull was killed by wolves near Farewell during the 3rd winter.

Mortality

Hunters reported taking 432 moose (419 bulls, 13 cows), down 24% from last year's record harvest of 567. Although there were fewer hunters (880 in 1985 compared with 1,019 in 1984), hunter success also dropped from 56% to 49%. The pattern of fewer hunters taking fewer moose occurred in all subunits, but to a lesser extent in Subunits 19C and 19D.

Hunting conditions during fall 1985 were in marked contrast to the nearly ideal conditions in 1984. It rained during most of late August and September, and flying conditions were often marginal. Rivers were high and few gravel bars were exposed. Moose normally found in exposed areas were hidden by brush and timber. The weather was warm and vegetation along rivers retained leaves later than normal. The onset of the rut apparently was delayed until after 25 September. The late rut, combined with heavy mortality of yearlings in late spring and early summer, meant fewer bull moose were available to hunters, especially in Subunit 19A.

In Subunit 19A the season closed 25 September, just as most bulls were entering the rut and becoming more vulnerable to hunters. Also, few yearling bulls were available. Consequently, hunter success dropped to 40%. Three hundred twelve hunters reported taking 126 moose. Ninety-seven percent of the harvest occurred during fall. Thirteen cows were reported taken during the February season. Boats during fall and snow machines during winter were the principal means of transportation. Most hunters were from villages in Subunit 19A (32%) or Unit 18 (58%). Although nearly one-fourth of the hunters reported hunting on the Aniak River, their success was low (23%). The lower Holitna and Hoholitna continued to be areas where success was relatively good (52% and 69%, respectively). Although reporting by residents of Subunit 19A and Unit 18 has

improved, particularly among Unit 18 residents, a sizable portion of the harvest was unreported. It is likely the actual harvest in Subunit 19A was closer to 275 than the reported 126.

In Subunit 19B, 228 hunters reported taking 115 moose, down from the record 154 moose taken by 278 hunters last year. This is still higher than the prior 5-year average of 103 moose taken by 196 hunters. Nearly all hunters were from nonrural areas of Alaska (52%) or were nonresidents (43%). Most hunters used aircraft for transportation. In Subunit 19B, lakes, gravel bars, and primitive airstrips were all used by air taxi operators transporting hunters. Hunting pressure is more widely distributed than in Subunits 19A and 19D where boats are the principal means of transportation and most hunting occurs along narrow river corridors. Wider dispersal of hunters and the use of aircraft in Subunit 19B tend to spread the harvest throughout the season; this is in contrast to Subunits 19A and 19D where the onset of the rut greatly affects success of hunters using boats for transportation. Over three-fourths of the hunting pressure in Subunit 19B occurred along the upper Stony River drainages and the Sparrevohn Hills, where hunter success ranged from 29% to 64%.

In Subunit 19C, 144 hunters reported taking 79 bulls, down slightly from the prior 5-year average of 88 bulls taken by 146 hunters. As in Subunit 19B, most hunters were residents from southcentral Alaska (55%) or nonresidents (37%). Nearly all hunters use aircraft to reach their hunting areas. Wheel-equipped aircraft are used almost exclusively, as there are few large lakes in Subunit 19C. Much of Subunit 19C is relatively inaccessible. Consequently, hunting pressure is concentrated in certain areas within Subunit 19C. The Farewell burn continued to be the most hunted and productive area for moose hunters in Subunit 19C.

Hunting success in Subunit 19D has remained fairly constant (56% to 60%) during the past 6 seasons. During the report period, 112 bulls were reported taken by 196 hunters, although it is estimated the harvest was closer to 225 moose. Seventy-two percent of the hunters were from rural areas; 56% were residents of Subunit 19D. Over three-fourths of the hunters used boats for transportation and hunted narrow corridors along the major drainages. Because of the heavy yearling mortality during late spring and early summer 1985, few yearlings were available to hunters and success during the early season was low. In contrast, over 77% of the harvest occurred during the last 10 days of the September season when mature bulls moved to river valleys at the onset of the rut. The main areas hunted in Subunit 19D were valleys of the Takotna River, the North Fork, and the Kuskokwim 30 miles above and below McGrath.

Management Summary and Recommendations

Moose populations throughout Unit 19 showed little recruitment; most calves produced in 1984 and 1985 did not survive. Severe winter conditions in 1984-85 and continued high predation rates were primarily responsible for the poor recruitment. Moose are of vital importance to residents of Units 18 and 19. Residents of these units hunt almost exclusively in Subunits 19A and 19D. Management programs in these 2 subunits should be designed for maximum production of moose. Predator populations, particularly in Subunit 19D, should be reduced by adopting liberal seasons and methods and means of taking bears and wolves.

Nearly all hunting in Subunits 19B and 19C is done by recreational hunters who are often on multispecies hunts. The management goal in this area should be to provide a more balanced predator and prey population. Calf production has been low for several years, particularly in Subunit 19C. Some liberalization of predator seasons and methods and means may be necessary to maintain stable prey populations.

Because of poor recruitment, the harvest of cows in Subunit 19A is no longer biologically appropriate and should be discontinued.

PREPARED BY:

Robert E. Pegau
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 20A

GEOGRAPHICAL DESCRIPTION: Tanana Flats, Central Alaska Range

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

An estimated 23,000 moose inhabited Subunit 20A in the early 1960's. The population declined to approximately 2,800 moose by 1975. Concurrent with a reduction in wolf numbers from 1976 through 1982, the moose population increased to an estimated 8,100 by 1984.

Presently, survey data suggest population growth has slowed. A rapidly increasing population in which only bulls are hunted may be characterized by declining bull:cow ratios, as growth of the female segment outpaces growth of the hunted bull segment. That pattern characterized the increase in the 20A moose population until 1983. Since 1983, overall bull:cow ratios have stabilized. In addition, observed densities derived from composition surveys increased until 1982, then stabilized, also suggesting slower growth. The present management goal for 20A is 12,000 moose, a level thought to be consistent with current range conditions.

Population Composition

During 1985, 42 bulls:100 cows were observed in Subunit 20A; this ratio is not significantly different from the previous 5-year mean of 43:100. Values obtained in 1983 and 1984 were 36 and 32 bulls:100 cows, respectively. Calf:cow ratios were 32:100 in 1985, compared with 36 and 33 during the previous 2 years (Table 1).

The proportion of calves in the fall population has remained nearly constant since 1981; calves made up 18% of the population in November 1985. Thirteen percent of the population were yearlings. That cohort made up 21% of the population as calves in November 1984.

Between 1982 and 1984, bull:cow ratios in the northern Tanana Flats declined by 50%. Additional data in the Bear Creek area were not collected in 1985, and it is not known if that trend continued.

Two trend areas were flown in the foothills of the Alaska Range. In the western foothills near Rex Dome, a 44% decline in bull:cow ratios was primarily the result of low yearling bull recruitment. That decline, however, was offset by a 30% increase in bull:cow ratios in the central foothills. In both areas calves composed approximately 20% of the herd during both years.

The Moody Creek trend area in the mountains of southwestern 20A was surveyed during 1984 and 1985, and the limited data suggest numbers are stable. Observed bull:cow and calf:cow ratios were higher in 1985 than in 1984.

Mortality

During 1985, 1,215 hunters reported taking 360 bull moose in Subunit 20A. The 1984 harvest was 390. Overall hunter success during 1985 was 30%. Success rates, by residency of hunter, are given in Table 2.

Fifty-nine percent of the harvest came from the Tanana Flats, 5% from the Yanert River drainage, and 36% from the foothills and mountains of the Alaska Range (Table 3). Boats and airplanes were the most common methods of transportation, accommodating 60% of the reporting hunters. Slightly more hunters used boats, but success rates were slightly higher for hunters using aircraft. Only 9% of the total hunters (6% of the successful hunters) used three-wheelers.

Assuming all yearling bulls have antler spreads of less than 30 inches, and given the inaccuracy of hunters' reporting of antler sizes, yearling bulls made up from 12% to 26% of the harvest. Assuming a population of 8,000 moose, 24% of the bull segment was harvested, and yearling recruitment of bulls was approximately 29%. Those estimates were based on 1984 Tanana Flats composition data, 1985 foothills data, and the combined census data from 1982 and 1984. Therefore, they are rough estimates, but suggest overall harvest levels were below annual recruitment and the proportion of yearling bulls in the harvest was less than their frequency of occurrence in the population.

Distribution of the harvest among medium and large bulls was fairly consistent with their respective frequencies in the population. Large bulls (antler spread 50 inches or greater) made up 30% of the harvest, medium bulls (antler spread 35-50 inches) 40%. Composition data indicate small, medium, and

large bulls made up 27%, 32%, and 40% of the population, respectively.

Management Summary and Conclusions

Wolf control efforts between 1976 and 1982 stimulated moose population growth in Subunit 20A; moose numbers have more than doubled since 1978. The most rapid rate of growth occurred between 1978 and 1982. Since 1982, population growth has slowed and wolf numbers are approaching pre-control levels. Presently there are an estimated 8,000-9,000 moose in Subunit 20A. The management objective is 12,000.

Until 1985, harvests steadily increased in 20A, but the reported harvest in 1985 was 8% below that reported in 1984. In the foothills of the Alaska Range, current harvest levels are below estimated rates of yearling bull recruitment and are sustainable. However, as the population increases, bull:cow ratios may decline as the female segment of the population grows faster than the bull segment. Bull harvest may need to be reduced to maintain adequate bull:cow ratios.

On the Tanana Flats, bull:cow ratios declined by 50% between 1982 and 1984, but densities estimated from composition surveys increased by 26%. Those increasing densities, combined with movements of moose off the Tanana Flats after the hunting season, confound interpretation of harvest effects on bull:cow ratios. Nevertheless, bull:cow ratios on the flats appear unacceptably low. If 1986 composition data confirm low bull:cow ratios, a shortened season will be recommended to reduce harvest.

In previous years, concern has been expressed regarding habitat suitability on the Tanana Flats. No habitat data were collected in 1985. During the next reporting period efforts will be made to assess forage availability and utilization.

Calf:cow ratios, bull:cow ratios, and yearling recruitment declined substantially near Windy Creek in the western foothills. That area includes the known range of several wolf packs, and hunting pressure is high. Composition surveys in the Windy Creek trend area will be a priority during 1986. Regulation changes designed to increase bull:cow ratios will be proposed if those surveys show continued low recruitment and bull:cow ratios.

PREPARED BY:

Mark E. McNay
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Subunit 20A moose sex and age composition, by trend area, 1985.

Location	Bulls: 100 cows	Calves: 100 cows	Percent yearlings	Yearling bull percent of total bulls
Japan Hills	60	38	17	29
Windy Creek	23	30	3	11
Moody Creek	32	22	17	41
Total 20A	42	32	13	27

Table 2. Subunit 20A moose hunter success by residency, 1985.

Residency	No. successful hunters	Total hunters	Percent success
Unit residents	265	960	28
Other Alaskan residents	304	1,096	28
Nonresidents	40	67	60
Unspecified	16	52	--

Table 3. Subunit 20A moose harvest, number of hunters, and percent success, by drainage, 1985.

Drainage	Harvest	No. of hunters	Percent success
Tanana River and unknown	8	75	11
Nenana River	44	172	26
Totatlanika River	31	151	21
Tatlanika River	6	23	26
Wood River	52	152	34
Tanana Flats	149	421	35
Little Delta River	24	71	34
Delta Creek	20	46	43
Delta River	7	30	23
Yanert River	19	74	26
Total	360	1,215	30

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 20B

GEOGRAPHICAL DESCRIPTION: Fairbanks and central Tanana Valley

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The number of moose in Subunit 20B has grown to about 6,600, but population status and trend vary throughout the subunit. In western 20B, moose numbers are increasing and should continue to increase if the present 50:1 moose:wolf ratio is maintained. In central 20B (Chena and upper Chatanika drainages), growth has slowed and recruitment has been declining since 1982. In eastern 20B (Salcha drainage), moose numbers have stabilized well below historic levels. The current predator: prey ratio could result in a further decline in moose numbers in eastern 20B.

During 1985, Subunit 20B was stratified, and trend area surveys were increased in number and size compared with those of previous years. (Stratification is the process of delineating areas that have markedly different moose densities.) Strata designations were primarily determined by the number of moose observed during quick overflights, but frequency of moose tracks and type of habitat also influenced the determinations. One percent of the area was classified as "very high" density, 6% as "high" density, 17% as "medium" density, 54% as "low" density, 17% as "very low" density, and 5% as "nonmoose habitat."

The "very high" areas were upland shrub-dominated burns where moose seasonally congregate. The "very low" areas were old-growth black spruce/sphagnum moss communities which are of little value to moose.

An estimate of moose numbers was derived by pooling trend area data (Table 1) from each strata and extrapolating the resulting mean densities to unsurveyed portions. Approximately 10% of the total stratification area was intensively surveyed from Super Cub aircraft to establish these densities. However,

because sampling was not random, the precision of the estimate cannot be statistically evaluated. Densities calculated for the very high, high, medium, and low strata were 5.7, 2.0, 1.4, and 0.6 moose/mi^2, respectively. These values include a 1.15 correction factor for moose missed during the trend area surveys. Density for the very low strata was subjectively set at 0.04 moose/mi^2 to provide a value very near zero, but not quite zero. No very low areas were intensively surveyed.

Based on this extrapolation, 7% (500 moose), 17% (1,168), 31% (2,139), and 44% (2,762) of the population were distributed among the "very high," "high," "medium," and "low" strata, respectively, during November 1985. The total estimate of 6,630 moose equates to an average density of 0.73 moose/mi^2 for the 9,100 mi^2 subunit.

Population Composition

The Ninetyeight Creek trend area and 2 new trend areas (Flat Creek and North Fork) were surveyed in the Salcha River drainage during November 1985 (Table 2). Sample sizes of 299, 81, and 200 moose, respectively, were obtained from these areas. Calf survival to 6 months was good (34-37 calves:100 cows) at Ninetyeight Creek and North Fork, but poor at Flat Creek (18 calves:100 cows). Recruitment was fair (13-14 yearling bulls:100 cows) at Flat Creek and North Fork, and poor (7 yearling bulls:100 cows) at Ninetyeight Creek. The overall bull:cow ratios were fair to good (38-62:100), except at Ninetyeight Creek (18:100) where hunting pressure is greatest.

Calf:cow ratios at Ninetyeight Creek have varied from 23-43:100 since 1974, with the highest values occurring in 1981 and 1982. Yearling bull:cow ratios over the same time period have gone from 7-8:100 in 1974-75 to 15-23:100 in 1981-82 and 5-7:100 in 1984-85. Under restrictive hunting regulations in the late 1970's, the overall bull:cow ratio increased to 48:100 in 1982 compared with 23-31:100 for the 1974-75 period. The hunting season was lengthened in the early 1980's and the bull:cow ratio has been declining since.

Three existing trend areas (Sorrels, Colorado, and Salmonfoot Creeks) in the central portion of Subunit 20B were expanded for survey in November 1985 (Table 2). Sample sizes of 107, 132, and 85 moose were obtained for these areas, respectively. Calf survival to 6 months was generally good (29-54 calves:100 cows). Recruitment was poor (5-8 yearling bulls:100 cows at Sorrels Creek and Colorado Creek) to fair (14 yearling bulls:100 cows at Salmonfoot Creek). The overall bull:cow ratios were also poor (14:100 at Colorado Creek) to fair (33-35:100 at Sorrels and Salmonfoot Creeks).

Calf:cow ratios at Sorrels Creek have varied from 32 to 53:100 since 1974, with the highest values occurring in 1981 and 1985. Yearling bull:cow ratios over the same time period increased steadily from 1:100 in 1974 to 27:100 in 1984. The 1985 ratio is the lowest since 1977. The bulls:100 cows ratio was in the upper 40's and lower 50's until 1985.

Calf:cow ratios at Colorado Creek were 47-53:100 from 1977 through 1982, except for 1980. The ratio has been steadily declining since 1981. The present level matches the ratio observed in 1975 before wolf control on the calving grounds in Subunit 20A began to benefit migratory moose that use the Colorado Creek area. Predation rates have increased following cessation of wolf control in both Subunit 20A and the central portion of Subunit 20B in 1982. Yearling bull:cow ratios also increased (15-36:100) during most of the years when calf:cow ratios were high. The yearling bull:cow ratio dropped to 9:100 in 1983 and to 8:100 in 1985. The overall bull:cow ratio has declined drastically from the 45:100 recorded in 1983, reflecting the effect of continued high bulls-only harvest in years when recruitment waned. The Colorado Creek trend area is located in the most heavily hunted portion of central 20B.

Calf:cow ratios at Salmonfoot Creek increased substantially from values recorded in 1975 and 1978 (10-11:100) to 46:100 in 1980. The ratio has steadily decreased since that time to the present 31:100. Yearling bull:cow ratios have fluctuated from 14:100 to 22:100 since 1980, but remain above mid-1970 values of 9-10:100. Increased bulls-only hunting pressure in the Chena drainage is reflected in the overall bull:cow ratio, which has declined to 35:100 since the high of 77:100 recorded in 1980, following several years of shortened seasons.

In the western portion of the subunit, trend areas at Manley and on Minto Flats were surveyed and several new areas were established (Table 2). Sample sizes of 123, 66, 278, and 152 were obtained for the Manley area, the West Fork of the Tolovana, Minto Flats, and Washington Creek, respectively. Calf survival to 6 months of age was good (36-43 calves:100 cows) everywhere except near Manley, where only 23 calves:100 cows were observed. At Manley, a very high yearling bull:cow ratio was recorded, but the value is so high that the data are suspect. A low moose:wolf ratio existed in this area prior to the survey, so high survival among young moose is unlikely. Survey bias or differential distribution of moose probably affected the survey. Elsewhere in western 20B, where wolf control was effective during winter 1984-85, recruitment was good (15-18 yearling bulls:100 cows). Hunting pressure is light in most of western 20B because of limited access to some portions, and a restrictive permit hunt on Minto Flats. Subsequently, overall bull:cow ratios were high (44-109:100), except near Fairbanks (33:100 in Washington Creek).

Annual survey data are available for only a small area on the northeast side of Minto Flats, but the effects of wolf control are clearly reflected. Calf survival to 6 months increased to 36-45 calves:100 cows following removal of a portion of the wolf population from this area in winter 1982-83. Since wolf removal, calf survival has remained above 45 calves:100 cows. The increase in recruitment of long-yearling bulls is even more dramatic. The yearling bull:cow ratios went from zero in 1982 to 21:100 in 1985.

Mortality

Predation by wolves, grizzly bears, and black bears on both calf and adult moose is the major mortality factor in all but the highly developed urban areas. Wolves are the primary predator influencing moose population status and trend in most portions of Subunit 20B. Temporary manipulation of the moose: wolf ratio in the central and western portions of Subunit 20B has resulted in noticeable increases in moose density. The moose populations in areas where wolf control has not been implemented have either declined or been held at constant levels.

Although snow depths during late winter 1984-85 were unusually deep in the eastern portion of the subunit, few reports were received of winter-killed moose and no significant changes were observed in the recruitment rates. Apparently, moose found adequate forage to sustain themselves despite unusually deep snow. Snow depths were below normal during winter 1985-86.

Moose in Subunit 20B are generally believed to be in good condition. Quality habitat is abundant and underutilized. Leg bones were collected from 7 wolf-killed moose on Minto Flats. These moose included 4 yearling bulls, 2 adult cows, and 1 unidentified adult. Only one of these samples suggested poor condition. Bone marrow analysis revealed that 1 yearling bull was in extremely poor condition.

Moose mortality attributable to hunters was within planned harvest levels. Hunters took an estimated 3.5%, 6.5%, and 3.6% of the population in the western, central, and eastern portions of the subunit, respectively. However, low bull:cow ratios along the Chena Hot Springs Road and the lower Salcha drainages indicate that hunting is having a greater impact in these areas. The harvest is restricted to bull moose only.

The Fish and Wildlife Protection Division reported a minimum of 18 moose were poached during this reporting period. Accidental road kills accounted for 74 moose, an increase from 52 the previous year. Most of the mortality due to known poaching and vehicle collisions occurred in the central portion of Subunit

20B. When these figures are added to the harvest by hunters, the minimum total mortality attributable to human activities in that portion of the subunit approaches 10% of the moose population.

According to harvest tickets, 304 bull moose were harvested by 2,146 hunters for a success rate of 14%. The harvest, number of hunters, and success rate were almost identical to those of the previous year. Eighteen hunters used their Minto Management Area permits and harvested 6 moose. Sixty permits were issued for this hunt, with a harvest quota of 15. Twelve moose were harvested with bow and arrow from the Fairbanks Management Area. Distribution of the harvest is shown in Table 3. The successful hunter spent an average of 5.8 days in the field.

Based on antler measurements supplied by reporting hunters, yearling bulls represented 38% of the harvest. Bull moose with antler spread measurements of 30 inches or less are considered yearlings. An additional 42% of the antlers measured 31-49 inches and 19% measured 50 inches or greater.

Management Summary and Recommendations

Moose density continued to be lowest in the western portion of Subunit 20B, but 2 consecutive winters of successful wolf control efforts by Department staff have accelerated the population increase initiated by public aerial shooting and Department trapping and aerial shooting in the early 1980's. Earlier efforts benefited only the eastern portion of Minto Flats. The program was successfully extended to the western side of Minto Flats and the Manley area in late winter 1986. By fall 1986 there should be approximately 50 moose per wolf in western 20B. This ratio should be maintained to ensure a minimal 10% annual growth rate in the moose population. The management plan for the area calls for increasing the population to 4,000 moose (1 moose/mi^2) by the early 1990's. Trend area surveys should continue on Minto Flats and north of Manley to monitor progress of the moose management program.

Recruitment has steadily declined in the central portion of Subunit 20B since cessation of wolf control activities in late winter 1983. Wolf packs have greatly increased in size in several areas and overall wolf numbers are now probably at pre-control levels. Recruitment of bull moose is now insufficient to sustain present harvest levels in the highly accessible Chena River drainage. Moreover, continued growth of the population is doubtful if recruitment declines further. Wolf numbers may have to be reduced again in the near future to ensure continued growth of the moose population. Although depressed over prior years, bull:cow ratios in this portion of the subunit are adequate for reproductive purposes and existing bulls-only harvests are not limiting population growth.

Moose management efforts should be extended to the Salcha River drainage in 1986. Wolf surveys and observations since 1978 indicate an abundance of wolves in the drainage. Calls are received each year from disgruntled hunters who see or hear wolves while attempting to bag a moose and, during the winter, cabin owners and recreationists frequently call to report finding wolf-killed moose. Yearling recruitment has been low and wolf predation alone is believed sufficient to keep the population from increasing. The number of wolves should be temporarily reduced to achieve the 50 moose:wolf ratio.

The harvest of bull moose appears to have stabilized at approximately 300 annually under the present hunting regulations. Overall, only about 5% of the estimated number of moose present in the subunit are being harvested annually, which is well within acceptable levels. The overall bull:cow ratio is 40:100, which is also acceptable. However, some moose are inaccessible to hunters and the harvest is actually accruing from a relatively small portion of the subunit. Bull moose in some accessible portions of the subunit are being harvested at a rate that exceeds recruitment. Bull:cow ratios in these areas are undesirably low and declining. The general hunting season dates for the portions of Subunit 20B outside the Minto Management Area and the Fairbanks Management Area should be reduced to 1-15 September from the present 1-20 September to reduce the take of bulls. To be effective, the season reduction should be at the end of the season. An acceptable alternative might be to convert the last 5 days of the present season to hunting by bow and arrow only.

The accidental road-killed moose problem needs to be addressed. The majority of the accidents occur among animals migrating between the Chena River drainage and the Tanana Flats. Increases in the moose population and the numbers of vehicles using the roads have both contributed to the increase in numbers of road-killed moose. Moose crossing signs should be posted along the Chena Hot Springs Road and the Richardson Highway.

In addition, each year migrating moose become entangled in the inadequate and unmaintained wire fence along the Richardson Highway between Fairbanks and North Pole. This fencing should either be removed or improved to standards necessary to prevent moose access to the highway. However, at present the flood control spillway would be the only remaining crossing point for moose if fencing were improved. This may not be sufficient to allow historical movements of moose. Public comment should be solicited to determine whether the public prefers a reduction in moose numbers to reduce moose-vehicle accidents or whether the road design should be altered to provide passage of moose without endangering motorists.

PREPARED BY:

Edward B. Crain
Game Technician III

Dale A. Haggstrom
Game Biologist II

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Summary of moose population densities, obtained from trend area surveys in Subunit 20B and an adjacent portion of Subunit 25C, November 1985.

Strata designation	Area (mi^2) surveyed	Percent of strata	Moose observed	Mean density (x 1.15[a])
Very high	87.7	100	435	5.73
High	309.7	51	548	2.03
Medium	464.5	27	552	1.36
Low	161.0	3	96	0.56
Total	1,022.9		1,631	

[a] Correction factor for moose that were missed during the trend area surveys.

Table 2. Sex and age composition of moose surveyed in Subunit 20B, fall 1985.

Portion of subunit	Total bulls: 100 cows	Small bulls: 100 cows	Percent small bulls	Calves: 100 cows	Calves: 100 cows ≥2 yr	Percent calves	Sample size
East	30	10.2	6.2	34	38	21	580
Central	28	11.6	6.9	41	46	24	377
West	57	18.6	9.6	37	46	19	658
Subunit 20B total	40	13.7	7.7	37	43	21	1,615

Table 3. Distribution of bull moose harvest in Subunit 20B, 1985.

Area	Number of moose	Percent of total
Chatanika River	41	13
Chena River	100	33
Eielson area	21	7
Goldstream Creek	22	7
Manley area	12	4
Bonanza Creek, Nenana	6	2
Salcha River	63	21
Tatalina River	3	1
Tolovana River	35	12
Unknown	1	--
Total	304	100

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 20C

GEOGRAPHICAL DESCRIPTION: Kantishna, Cosna, and west side of the Nenana River

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose numbers are stable and at low densities in Subunit 20C. The population density in 80% of nearly 4,000 mi^2 stratified in the Kantishna River drainage during 1984 was estimated at approximately 0.05 moose/mi^2. Composition surveys conducted during 1985 in 2 of the highest density areas yielded only 1.10 moose/mi^2.

Population Composition

Trend areas were established northeast of Minchumina and in the lower Kantishna River during 1985. Survey conditions in the Minchumina area were marginal at the time of the survey. A higher percentage of the moose were probably missed or misclassified than during past surveys. Conditions were good in the lower Kantishna area, but less than half the intended survey area was completed. Thus, the sample size was small.

Indicated calf survival to 6 and 18 months of age was different between the 2 areas (Table 1). Thirty-eight calves:100 cows and 17 yearling bulls:100 cows were observed in the Minchumina area, compared with 24 calves:100 cows and 6 yearling bulls:100 cows in the lower Kantishna area. Survey error due to the conditions at Minchumina may have accounted for some of the difference. However, predation rates could be different for moose counted in these 2 areas. A large pack of wolves is known to frequent the lower Kantishna River. Wolf distribution and abundance are not known for the hills northeast of Minchumina. The bull:cow ratio in both areas was high, averaging 86 bulls:100 cows.

A helicopter was used for composition surveys in the eastern portion of Denali Park. Only 28 bulls:100 cows and 10

calves:100 cows were observed. Similar results were obtained in the same area in 1984.

Mortality

Hunters reported killing 82 bulls in Subunit 20C during 1985, a 25% reduction in harvest from 1984. Success for the 302 reporting hunters was 27%. Eighty-four percent of the reported harvest was taken by Unit 20 residents. Hunters residing outside Alaska accounted for only 4% of the harvest (Table 2).

The Kantishna River, Nenana River, and Lake Minchumina areas received the greatest hunting pressure. These areas accounted for 38%, 16%, and 16% of the total harvest, respectively (Table 3). Yearlings composed 21-34% of the harvest, assuming yearling bulls have antler spreads of less than 30 inches.

Boats were the most popular method of transportation, but more moose were taken by fly-in hunters. Only 10% of the hunters reported using three-wheelers or other off-road vehicles; success rates for off-road vehicle users was low (20%).

Management Summary and Conclusions

Moose densities are low in Subunit 20C and do not appear to be increasing. Habitat is presently not a limiting factor. Calf production and survival in the Lower Kantishna and Lake Minchumina areas appear adequate for population growth; however, numbers are stable.

Although localized harvests may be near maximum sustainable levels, the high bull:cow ratios reflect the relatively small impact hunting has had overall. Poaching of cows is not thought to be significant in Subunit 20C because of low human population and restricted access. Predation may be restraining population growth, but data on predation rates or predator:prey ratios are not available.

Short bulls-only seasons should be maintained in Subunit 20C to provide opportunity for population growth. Additional moose composition and trend data should be collected over a larger area. Studies to identify wolf movements in and adjacent to Denali Park are in progress and, hopefully, will provide information on the impact of predation.

PREPARED BY:

Mark E. McNay
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Subunit 20C moose sex and age composition, 1985.

Trend area	Bulls: 100 cows	Calves: 100 cows	Percent calves	Yearling bull % of total bulls	Sample size
Lower Kantishna	65	24	13	9	32
Minchumina	92	38	17	19	120
Total Unit 20C (excluding Denali)	86	35	16	17	152
Denali Park (eastern portion)	28	10	7	--	190

Table 2. Subunit 20C moose harvest and hunter success by residency, 1985.

Residency	Harvest	Total hunters	Percent success
Unit 20C residents	66	247	27
Other Alaska residents	11	38	29
Nonresidents	3	8	38
Unspecified	2	9	--
Total	82	302	27

Table 3. Distribution of Subunit 20C moose harvest, 1985.

Location	Harvest
Tanana River	6
Chitanana River	2
Cosna River	1
Zitziana River	2
Kantishna River	31
Nenana River	13
Savage River:Upper Teklanika River	8
Lower Teklanika River	5
Lake Minchumina	13
Unknown	1
Total 20C	82

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 20D

GEOGRAPHICAL DESCRIPTION: Central Tanana Valley

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The moose population in Subunit 20D is estimated to number approximately 3,200. The population north of the Tanana River is estimated to number 1,300 moose, based on 1984 and 1985 data. Moose density east of the Goodpaster River drainage and north of the Tanana appears to be approximately 3 times greater than density observed in the Goodpaster and Shaw Creek drainages. South of the Tanana River, there are an estimated 1,900 moose. In the portion of Subunit 20D south of the Tanana and west of the Gerstle River, there are an estimated 1,500 moose. The moose management plan for this area calls for 1,600-2,400 moose.

Overall, the Subunit 20D moose population is probably growing slowly. However, population increases appear to be confined to the portion south of the Tanana River. North of the Tanana the number of resident moose is apparently declining.

Population Composition

Department staff flew sex and age composition surveys in the portion of Subunit 20D north of the Tanana River in 1985, and U.S. Army personnel flew a moose survey in the vicinity of Donnelly Dome south of the Tanana River. ADF&G survey results are summarized in Table 1. To obtain more accurate data, search effort was increased to a minimum of 4 min/mi^2 in 1985. Consequently, these data are not directly comparable to data from previous years.

Movements and Distribution

Seventeen radio transmitter collars have been placed on moose in Subunit 20D since 1983. Among these are 4 collars which were placed on moose in the lower Goodpaster River drainage in mid-September 1985.

Data from moose collared in the portion of Subunit 20D south of the Tanana River indicate a population of moose composed of migratory and resident segments. Migratory moose tend to move north to the Tanana River floodplain. In contrast, moose collared on the Goodpaster Flats have moved very little, although seasonal altitudinal movements occur.

Mortality

Hunters reported harvesting 131 moose in Subunit 20D in 1985. The harvest is generally increasing. The previous record high harvest was 120 moose recorded in 1982. The present boundaries of Subunit 20D were adopted in 1981, hence harvest data prior to 1981 are not directly comparable to data presented here. In Subunit 20D south of the Tanana River and west of the Johnson River, 49 bulls were harvested. This is the largest harvest in this area since 1970. In the portion of Subunit 20D north of the Tanana, 71 bulls were harvested. This is the largest harvest in this area since 1981. Most moose taken in this area came from the Goodpaster and Shaw Creek drainages.

North of the Tanana River most (65%) successful hunters used boats for access. Other successful hunters used highway vehicles (17%), aircraft (8%), off-road vehicles (6%), and motorbikes (5%). Most boat access is along the Goodpaster River, but hunters also used the Tanana River, George Creek, Volkmar River, Shaw Creek, and Healy River.

South of the Tanana River, most hunters walked to hunting areas from the highway. West of Johnson River, where access is not restricted by the Macomb Plateau Controlled Use Area, an increasing number of successful hunters (30% in 1985) used three-wheelers. Aircraft, boats, and horses are little-used by hunters south of the Tanana River. Off-road vehicle use continued to account for approximately one-third of the successful hunters' transportation.

More than two-thirds of the moose taken had antler spreads of 40 inches or less. Most moose with antlers that size are 2 years of age or younger. This suggests a young and growing population in the portion of Subunit 20D where most of the harvest occurs. Nearly all of the moose harvested on the Goodpaster River had antler spreads of less than 40 inches. Survey data indicate that resident moose in the Goodpaster drainage are older than the migratory segment of the Goodpaster population. Goodpaster resident moose are older-age animals; therefore, most moose taken in this area probably reside south of the Tanana River during winter.

Other recorded moose mortality included 31 road kills: 3 taken in the closed area, 2 killed accidentally by humans, and 1

poached. Additional instances of poaching are known to occur. Substantial numbers of moose also fall prey to wolves and, to a lesser extent, bears. Wolf predation is believed to be the primary limiting factor where moose populations are declining in Subunit 20D.

Management Summary and Recommendations

The most pressing moose management concern in Subunit 20D is the Goodpaster-Shaw Creek resident population. Although survey data are not totally comparable from year to year, there is little doubt that the resident population has suffered a long-term decline. Unless action is taken to reverse this decline, the population will likely decline to even lower levels from which recovery will be very slow. There are currently about 10 moose per wolf in this area. A relationship of this magnitude usually results in a decline in moose numbers, regardless of other factors affecting moose mortality. I recommend a wolf predation control program to temporarily alter the moose:wolf ratio to about 50:1.

Population growth appears to be rapid in the southwest portion of the subunit. Road kills and complaints from gardeners have increased dramatically. A population estimate survey should be scheduled in 1986, or 1987 at the latest, to ascertain the current size of the population. If the population goal set by the moose management plan has been achieved, steps should be taken to stabilize the population.

PREPARED BY:

David M. Johnson
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Sex and age composition of the Subunit 20D moose population, 1985.

Area[a]	Bulls: 100 cows	Percent yearling bulls	Calves: 100 cows	Calves: 100 cows ≥2yrs	Twins: 100 cows w/calves	Percent calves	Total sample
20D Northeast	94	17	25	25	0	11	274
20D Northwest	57	13	26	30	0	14	133
20D North combined	81	15	25	30	0	12	407

[a] Subunit 20D is divided into North and South by the Tanana River and northeast and northwest by the Goodpaster drainage.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 20E

GEOGRAPHICAL DESCRIPTION: Fortymile, Charley, and Ladue River drainages

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

In 1981, Subunit 20E contained 1,400-2,000 moose, an estimate based upon an intensive quadrat sampling effort and an extrapolation based upon an extensive stratification of the area. This estimate is believed to be conservative. The current population is far below the interim management objective of 6,000-10,000 moose. Annual survey data collected since 1981 do not indicate a clear trend. It is believed, however, that wolf population reductions in 1981-83 halted a long-term moose population decline in portions of southern Subunit 20E. Certain subpopulations may still be declining where predator:prey ratios heavily favor predators. Because wolf numbers approached pre-wolf-control levels in spring 1986, no increases in moose numbers are expected. The calculated density of 0.2 moose/mi^2 is one of the lowest in Alaska and is only about 15% of the estimated density in the mid-1960's.

Population Composition

During the period 28 October-18 November 1985, 17.8 hours were expended classifying 516 moose, for an observation rate of 29 moose/hour. An additional 97 moose observed during research trend counts were added to the sample for composition calculation purposes. Survey conditions were very good during fall 1985.

As in past years, a high bull:cow ratio (86:100) is evident in Subunit 20E. Conservative harvests of bulls have apparently not lowered ratios significantly in any survey areas.

Calf survival to 5 months was poor with only 16 calves:100 cows (19:100 cows 2 years or older) observed. It is noteworthy that observed calf survival in the Mosquito Flats was 53 calves:100

cows, the highest calf survival ever recorded in the area, and by far the highest survival observed anywhere in Subunit 20E during fall 1985. Numbers of wolves were low in the flats during 1985. To facilitate capture of grizzly bears, nearly 10 tons of bait were dropped into this area in late May-early June 1985. This easily accessible bait is believed to have fed bears that otherwise would have preyed more heavily on newborn moose calves.

Observed yearling recruitment for all survey areas combined was 14%. There were 15 yearling bulls:100 cows overall. As in recent years, yearling recruitment was greater in the eastern portion of the subunit and in northern areas draining into the Yukon River.

Mortality

Predation by wolves and grizzly bears on both calf and adult moose is the major mortality factor in Subunit 20E. Based upon a sample of collared adults, the observed natural adult moose mortality rate was 8%. The observed calf mortality rate, from parturition to 1 year of age, was 85% based upon survival of collared calves.

According to harvest reports, hunting pressure in the subunit increased 49% during fall 1985. Two hundred twenty-six hunters reported; 49 were successful (22%). The implementation of Tier II subsistence hunts for moose and caribou in other areas shifted additional hunting effort to Subunit 20E. In addition, the establishment of a later moose season in the Yukon River portion of the subunit increased compliance with reporting procedures by providing a season comparable to that in effect for the north bank of the Yukon River (Subunit 25B). All bulls were taken by state residents; nonresidents were not permitted to hunt moose in the subunit during the 1985 season. The harvest probably represents approximately 2.5% of the estimated population.

Seventeen of the 49 bull moose reported taken came from the northern portion of the subunit (the area that drains into the Yukon River). The reported harvest is an increase over previous years, but probably reflects the increase in compliance with reporting requirements. The actual harvest probably did not increase.

In the remainder of the subunit, 32 bulls were reported taken. The 1985 harvest is comparable to the 31 and 29 bulls taken in 1983 and 1984, respectively. Only 17 bulls were reported harvested in 1982.

The harvest was well distributed along the Taylor Highway and Yukon River corridors. Twelve bulls were taken in the Yukon

River drainage, 8 in the West Fork, 8 in the Mosquito Fork, 7 in the main Fortymile, 4 in the South Fork, 3 in the Charley, 2 in the Middle Fork, 2 in the Ladue, and 1 in the Seventymile.

Twelve (25%) of the bulls taken in the subunit had antler spreads measuring less than 36 inches. These moose were yearlings, and perhaps 2-year-olds in a few cases. Eighteen (38%) had antlers from 36 to 49 inches wide, representing mostly 2- to 4-year-olds. Another 18 (38%) had antler spreads of at least 50 inches and were considered mature bulls.

Seven (44%) of the bulls taken in the northern Yukon River area had antler spreads of 30 inches or less and were probably yearlings. In the remainder of the subunit, 5 (16%) were judged to be yearlings.

Of the 49 successful hunters, 14 (29%) used highway vehicles for access, 13 (27%) used boats, 10 (20%) used off-road vehicles, 5 (10%) used three- or four-wheelers, 5 (10%) used aircraft, and 1 (2%) walked from home.

Habitat Conditions

Observed browse use in most of Subunit 20E is less than 5%, which indicates a grossly understocked range. The availability of high-quality riparian, subalpine, and seral habitat types far exceeds the needs of the current low-density moose population. Implementation of the Alaska Interagency Fire Management Plan several years ago assures a near-natural fire regime throughout a majority of the subunit to meet future habitat needs of moose.

Management Summary and Recommendations

Neither goals in the strategic management plan of providing for maximum opportunity to hunt moose and an optimum harvest of moose, nor the population management objective of 6,000-10,000 moose, is currently being met in Subunit 20E. At an estimated population of 1,400-2,000 (density of 0.2 moose/mi^2) and no clear trend evident, little progress is currently being made toward achieving either objective. Furthermore, failure to achieve a higher moose population is resulting in failure to achieve objectives for wolf management in this area. Wolves in Subunit 20E are partly dependent upon moose abundance for their well being.

To achieve moose management objectives, both wolf and grizzly bear predation must be reduced, and moose harvests must remain conservative and limited to bulls only.

Supplemental feeding of grizzly bears during and shortly following moose calving is recommended in important calving areas.

Based upon observations during spring 1985, this technique may result in greatly enhanced moose calf survival at reasonable cost. Liberal grizzly bear hunting regulations should be maintained throughout the subunit.

To increase yearling recruitment and reduce adult moose mortality, wolf numbers should be reduced to achieve and maintain a ratio of 40-50 moose:wolf until the moose population approaches the conservative population management objective of 6,000.

No changes in moose season length or bag limit are currently recommended, but the elimination of nonresident hunting opportunity in the subunit should be reconsidered in view of limited funds available for necessary management.

PREPARED BY:

David G. Kelleyhouse
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 20F

GEOGRAPHICAL DESCRIPTION: Central Yukon, Hess Creek, and Tozitna River drainages

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

During 1985 an 860.6 mi^2 block of southwestern Subunit 20F was divided into 87 sample units and stratified. Moose densities in 60% of the sample units were classified as low, in 27% as medium, and in 13% as high. Low-density strata are estimated to contain less than 0.3 moose/mi^2, medium-density strata 0.3-0.8 moose/mi^2, and high-density strata 0.8-3.0 moose/mi^2.

Data are insufficient to support a confident estimate of trend; however, there have been no discernible changes in moose population densities in Subunit 20F in recent years.

Mortality

Reported harvest has been consistently low since 1981 when the subunit was established (harvest, $\bar{x}$ = 21; total hunters, $\bar{x}$ = 95). During the 1985 season, 81 hunters reported taking 21 moose. Only 1 moose was reported taken during the November season. Sixty-eight percent of the reporting hunters hunted the Tozitna River, Hess Creek, or other Yukon River drainages, but 50% of the reported harvest came from the drainages of the Tanana River in the southern portion of the subunit. Reported hunter success was 63% in the Tanana drainages, and only 17% in the remainder of the subunit.

Subunit 20F residents took 16 moose; other Alaska residents, 2 moose; and nonresidents, 3 moose. Of reporting hunters, 85% were unit residents and only 2% were non-Alaska residents. Most hunters gained access by boat (39%) or highway vehicle (33%); 62% of the successful hunters used boats.

Management Summary and Recommendations

Moose densities are low, but numbers appear stable in most of Subunit 20F. Suitable habitat occurs primarily in riparian or

subalpine areas. Most of the subunit is covered by black spruce or mature birch-aspen stands that provide little available browse. However, at the current low moose density, habitat is not a limiting factor. Rates of predation and other sources of mortality are unknown, but are apparently sufficient to preclude population growth. Unreported harvest may be substantial.

Previous attempts at establishing fall composition trend areas in Subunit 20F have been unsuccessful because of the low moose density. However, stratification data from 1985 suggest meaningful trend areas could be established in the southwestern corner of the subunit. Short, bulls-only seasons will be maintained in the subunit until population growth is documented.

PREPARED BY:

Mark E. McNay
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNITS: 21A and 21E

GEOGRAPHICAL DESCRIPTION: Upper Nowitna River, Innoko River, and Yukon River between Paimiut and Blackburn Rivers

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Most of the lowlands in the western half of Subunits 21A and 21E were flooded from late May through June 1985. Combined with the poor condition of cows after the record snow accumulations, calf survival was the lowest ever recorded in either subunit. There were several unconfirmed reports of dead or dying moose along sloughs and rivers in Subunit 21E during summer 1985. It is likely that most of the 1984 and 1985 cohorts were lost and that the population in both subunits has declined.

Population Composition

During fall surveys along the central Innoko River in Subunit 21A, there were 3 calves per 100 cows. Although there were 11 small bulls, normally considered yearlings, per 100 cows, it was likely that several 2-year-old bulls had poor antler development because of the previous winter conditions and were classified with the yearlings. Overall, the bull:cow ratio was 47:100.

In Subunit 21E there were 9 calves and 8 yearlings per 100 cows during fall. During a late-winter survey in the Paradise Controlled Use Area, calves composed only 2% of the herd.

Mortality

In Subunit 21A, 178 hunters reported taking 120 bulls; all but 2 were taken during the September season. The harvest during September was relatively uniform throughout the month. Eighty-three percent of the hunters were from nonrural Alaska, primarily from southcentral Alaska (47%). Twenty-four percent

of the hunters were nonresidents. Aircraft was the principal means of transportation (77%). Nineteen percent of the hunters, mostly residents of Subunit 21E and Unit 18, used boats. Hunters using aircraft hunt the same areas as hunters using boats, the lower Iditarod and Innoko from the Iditarod to the North Fork. Both boat-equipped and aircraft-equipped hunters hunt the Iditarod drainage and the Innoko drainage from its confluence with the Iditarod River upstream to the mouth of the North Fork of the Innoko. During the 1985 season there was increased pressure in the North Fork area.

In Subunit 21E, 108 moose (100 bulls, 8 cows) were reported taken by 155 hunters. Hunter success dropped from 83% last year to 70% during this report period. This decrease probably reflects the difference in conditions during the hunting seasons, as well as the lack of yearling bulls normally available along the lower Innoko and Yukon Rivers. Over 90% of the hunters in Subunit 21E were from rural areas, primarily Unit 18 (56%) and Subunit 21E (27%). Reporting by residents of the 4 villages in Subunit 21E continued to be low (Holy Cross 28, Grayling 9, Anvik 5, Shageluk 1). It is estimated they took 200-250 moose.

Management Summary and Recommendations

Recruitment to moose populations in Subunits 21A and 21E has been very low for 2 years, and the populations have declined. Most hunting in Subunit 21A is recreational, although some subsistence use occurs in the western portion. Most hunting is specifically for moose. Black bear are the only other big game species commonly occurring in the areas normally hunted for moose.

In contrast, in Subunit 21E nearly all hunting is for subsistence as residents in Subunit 21E and adjacent areas of Unit 18 are highly dependent on moose to meet their food requirements.

The objective of management programs in Subunits 21A and 21E should be to maximize the production of moose.

The cow season should be discontinued in Subunit 20E, even though only 8 cow moose were reported taken in the 1st legal season held in several years. Because of the heavy mortality within the 1984 and 1985 cohorts, cow seasons are no longer biologically justified.

PREPARED BY:

Robert E. Pegau
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 21B

GEOGRAPHICAL DESCRIPTION: Lower Nowitna River, Yukon River between Melozitna and Tozitna Rivers

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The moose population in the Subunit 21B portion of the Nowitna drainage numbered approximately 2,300 in 1980. The population is thought to have slightly decreased since then. Deep snow, increased wolf predation, and extensive flooding during the 1985 calving season have probably accelerated the decline.

A portion of Subunit 21B was included in a moose stratification survey conducted near Tanana during December 1985. The 1,413.5 mi^2 survey was a cooperative effort between the Tanana Indian Reorganization Act Council and the Department. The Illinois Creek-Gold Hill area north of the Yukon River was a mosaic of spruce, alpine, burned, and disturbed habitat. Although not directly measured, average moose density appeared to range from 0.8 to 1.2 moose/mi^2. Accordingly, the area may contain 155-229 moose. Average moose density in the Boney Creek Flats (south of the Yukon River) probably was about 0.7-1.0 moose/mi^2. Eighty-five to 125 moose probably occur in this area.

Population Composition

All trend area surveys (Table 1) in Subunit 21B during 1985 were conducted by U.S. Fish and Wildlife Service staff. Severe declines in the bull:cow ratio, the number of yearlings, and the calf:cow ratio were indicated (Table 2). Recruitment (expressed as the percentage of long yearlings to adults) from the 1984 cohort was only 8%, which is not large enough to sustain the population.

Mortality

The reported harvest of 68 bull moose from Subunit 21B was one of the lowest on record. The decrease was due to high water in

the entire subunit during September 1985. Six moose were taken on the Ruby-Poorman Road, 37 from the Nowitna River, and 22 from the rest of the subunit. A hunter check station was not operated at the mouth of the Nowitna River due to budget constraints.

Management Summary and Recommendations

The potential for a substantial decline in the moose population of the lower Nowitna River is great. A moose population census should be conducted to ascertain if the suspected decline is occurring. If a decline has occurred, management actions must be undertaken to reverse the trend.

Operation of the hunter check station on the lower Nowitna River should be resumed and moose teeth collected for aging to learn about the age of moose being harvested from this population.

PREPARED BY:

Timothy O. Osborne
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Moose trend area surveys in Subunit 21B, November 1985.

Areas	Bulls: 100 cows	Percent yearling bulls	Calves: 100 cows ≥2 yrs	Percent calves	Density moose/ mi^2	Area (mi^2)	Sample size
Deep Creek	34	8	0	0	1.0	39.5	39
Novi Mouth	20	3	10	7	1.3	68.3	111
Sulatna/Novi	25	3	2	1	2.0	37.9	75
Total	24	4	5	4	1.5	145.7	225

Table 2. Historical summary of moose trend area surveys in Subunit 21B.

Years[a]	Bulls: 100 cows	Percent yearling bulls	Calves: 100 cows ≥2 yrs	Percent calves	Density moose/ mi^2	Area (mi^2)	Sample size
1980	49	5	33	17	1.6	77.5	127
1982	52	12	30	13	1.5	140.5	215
1983	36	4	53	26	1.4	162.7	229
1985	24	4	5	4	1.5	145.7	225

[a] No surveys were made during 1981 and 1984.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 21C

GEOGRAPHICAL DESCRIPTION: Upper Dulbi River and Melozitna River drainage above Grayling Creek

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The moose population density in the Melozitna River drainage is low, but the population is thought to be stable. No surveys were conducted in the subunit during the reporting period.

Mortality

Hunters reported taking 25 bulls from the Melozitna River. None were reported from the Dulbi River. All hunters used aircraft for transportation. Only 1 successful hunter was a resident of Unit 21.

No data are available on natural mortality, but at least 3 wolf packs inhabit the Melozitna drainage. There are also numerous grizzly bears in the subunit.

Management Summary and Recommendations

Moose populations in Subunit 21C are low and natural mortality prevents the population from increasing. Although hunter interest is low, survey data are needed to aid management decisions. A stratification survey of the subunit should be conducted to ascertain distribution and relative abundance, and to determine areas in which to conduct future trend surveys.

PREPARED BY:

Timothy O. Osborne
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 21D

GEOGRAPHICAL DESCRIPTION: Middle Yukon, Eagle Island to Ruby, Koyukuk River below Dulbi Slough

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The moose population along the Koyukuk and Yukon Rivers is stable. Observed densities along the Yukon River ranged from 2.5 to 3.5 moose/mi^2. Densities along the Koyukuk River ranged from 2.8 moose/mi^2 in the lower portion of the drainage to 4-6 moose/mi^2 in the upper portion. Low densities (0.3 moose/mi^2 average) were observed in areas away from the riparian lowlands. The estimated moose population for Subunit 21D is 3,500.

Population Composition

In this subunit, bull:cow ratios are good and yearling bull percentages are high, but calf:cow ratios are low (Table 1). The survival rates declined by about 75% over previous years. Deep snow, late breakup, and extensive flooding in the lowland areas all contributed to the low numbers of calves. Along the Yukon River, 10-12 lone calves were reported. The calves stayed on the sandbars and then were not seen again. It was assumed the calves had been abandoned by their mothers. Among 7 radio-collared female moose 2 or more years of age, only 2 had calves.

The large number of yearling bulls is probably a result of survey error, because yearling moose, like calves, are usually disproportionately affected by hard winter conditions. In some cases the number of yearlings seen in 1985 was larger than the number of calves seen in 1984. Classification errors during surveys are likely at fault. Bull moose that survived the deep snow conditions may have produced smaller antlers due to late winter malnutrition and stress, which could have led to classification problems during November 1985 surveys.

Mortality

During the September 1985 hunting season, 141 bulls, 19 cows, and 2 moose of unknown sex were reported taken. About 95% of the reported harvest occurred during September.

One hundred ninety-five hunters stopped at the moose hunter check station 18 miles up the Koyukuk River. Seventy-four of the hunters resided outside the subunit; 4 were nonresidents. Antler measurements and incisor teeth were collected from 67 of the 70 moose checked through the station.

The 2nd season was closed by Emergency Order to conserve the moose population after drastic declines in calf production and survival were observed during November 1985 surveys. Illegal hunting occurred throughout the winter and an estimated 20 moose were taken.

Mortality due to predation is believed to be high because of the large numbers of wolves and bears in the area. However, no overwinter mortality occurred among 16 radio-collared moose and their calves. Three radio-collared moose died during the report period. One that was found dead in July 1985 had been scavenged by bears. It was suspected of having died from winter malnutrition which carried over into the spring. Two other bull moose were killed by hunters during the September season. The radio collars are not conspicuous and were not seen by the hunters until after the moose were shot.

Movements

Twenty moose were radio-collared in October 1984 in the Three Day Slough lowland area. At the start of the report period, 10 bulls and 9 cows were still alive. One bull died in July and 2 were killed in September. Three cows and 1 bull calf were collared in April 1986. The new moose were darted with 2.0 cc carfentanil citrate and 2.0 cc propylene glycol. The drug worked well. The average time lapse between injection and immobilization was 6 minutes, 50 seconds (range: 3 minutes to 10 minutes, 20 seconds). In June 1986, 12 cows and 8 bulls were carrying operable radio collars.

Radio-collared moose were tracked 7 times during the reporting period, mainly during summer and fall. The average movement of females, between tracking flights, was 6.5 miles with a range of from 0.1 to 33.2 miles. The bulls moved an average of 7.5 miles with a range of 0.1-62.5 miles.

No moose migration movements were recorded prior to 21 May 1985, except for 1 bull which wintered 20 miles northwest of Three Day Slough. However, in July 1985, 14 of the 19 moose

had moved 9-37 miles from the Three Day Slough area. On 29 August 1985, all but 3 moose were back in the Three Day Slough area. A bull which wintered 20 miles to the northwest in 1984 returned to the same wintering area.

In 1985, all the females stayed within the Three Day Slough lowlands until July. Both females that had calves were seen standing in water with their calves during the spring floods. There did not appear to be any pre-calving movements. By 16 May 1986, 5 of the 12 cows had moved out of the lowlands to areas 19.5-33.2 miles away.

In the previous S&I Report, I noted that 2 of the 10 radio-collared bulls had shed their antlers before the November 1984 survey period. The implication was that early antler shedding was biasing the bull:cow ratios observed during surveys. However, the early antler drop in 1984 probably was due to capture stress, since the same bulls retained their antlers through November 1985.

Management Summary and Recommendations

Moose populations along the riparian lowlands in Subunit 21D are high, stable, and adequate to support current seasons providing calf production and survival return to normal. The low bull:cow ratios in the Pilot Mountain Slough trend area may mean that bulls are being overharvested in that area. The area is subject to high hunting pressure from Galena residents.

The radio-collaring study in the Three Day Slough area indicates that most of the moose leave only briefly during the summer months. The high moose population densities observed along the river lowland areas do not occur in the upland areas. Consequently, harvests should not be increased.

PREPARED BY:

Timothy O. Osborne
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Moose trend area surveys in Subunit 21D, November 1985.

Location	Bulls: 100 cows	Percent yearling bulls	Calves: 100 cows ≥2 yrs	Percent calves	Density moose/mi^2	Area (mi^2)	Sample size
Three Day Slough	39	7	19	11	6.0	83.3	501
Squirrel Creek	78	16	16	6	3.5	52.6	185
Pilot Mt. Slough	27	8	10	7	2.5	36.0	90
Kaiyuk Slough	54	17	10	5	1.5	51.0	78

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 22

GEOGRAPHICAL DESCRIPTION: Seward Peninsula

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulation No. 26.

Population Status and Trend

Moose were absent on the Seward Peninsula prior to 1930, but moved into the area during the next 2 decades. Moose had expanded into all suitable habitat by the late 1960's, and numbers increased dramatically during the 1970's. Moose in the central Seward Peninsula may now be near or above winter range carrying capacity. Moose densities in the western and southeastern portions of Unit 22 are lower and appear to be stable or increasing only slightly, even though winter range is probably not a limiting factor. Predation and hunting are probably responsible for holding moose densities at lower than expected levels in these 2 areas. Since the last report, changes in Unit 22 moose population status have been minor.

Population Composition

To derive a unit-wide population estimate, every major drainage was surveyed in March 1985. During 56 hours of aerial survey, 2,727 moose were observed, and I estimate the population in Unit 22 numbered 3,260-4,150 moose (Grauvogel 1986). In March 1986, only Subunit 22D was intensively surveyed again. The number of moose observed in 1986 was 1,276 compared with 1,487 in 1985, a difference of 211 animals (Table 1). However, snow depth in 1986 was considerably less and moose were more widely distributed than during the previous year. Studies of radiocollared moose between 1981 and 1984 indicated that in winters with light snow cover, home range size was larger and early movement from winter range, or use of alternate winter ranges, was common (Grauvogel 1984). Therefore, I believe the difference in moose numbers observed in 1986 was due to inferior survey conditions and does not represent an actual decrease in moose density. Aerial surveys were also conducted in Subunits 22B and 22C during March 1986, but they were not as comprehensive as the 1985 surveys and are therefore not directly

comparable. Surveys were not conducted in Subunit 22E during March 1986.

The percentage of calves (short yearlings) observed in the March 1985 and 1986 surveys ranged from 7-35% (Table 2). In the early 1970's, short yearlings composed 20-25% of the population annually, but production has been slowly declining in some areas during the last decade. The decrease appears to be clinal with the highest recruitment in the western portion of Unit 22 and the lowest in the east. The lowest short yearling recruitment in 1986 was 7% in Subunit 22B, and it increased westward, attaining a high of 35% in Subunit 22C. The reason for lower recruitment in some areas is not clear, but Subunit 22B and the eastern half of Subunit 22D have the highest densities of bears and wolves. These areas also have had the highest moose densities for the longest time. Increased competition for winter forage may be a factor contributing to low recruitment in some areas, but some drainages with low moose density also have low recruitment. I believe predation is the principal contributing factor causing reduced recruitment.

Fall composition surveys have been conducted in all but 4 years during 1971-85 in Subunit 22D. The 2 principal trend-count areas are the Kuzitrin drainage, an area with good access and high harvest, and the Agiapuk drainage, an area with limited access and moderate harvest. The greatest density and highest harvest of moose occur in Subunit 22D. For these reasons, this area has the highest management priority and is the subunit with the most complete historical data. In the early 1970's, bull:cow ratios in the Kuzitrin were generally greater than 50:100, but declined to approximately 40:100 in recent years. The bull:cow ratio in the Kuzitrin during fall 1985 was 36:100 ($\underline{n}$ = 396) which is similar to previous years (Table 3). Hunting pressure is heavy in the Kuzitrin, and lower bull ratios are expected. However, considering the heavy harvest of bulls during the last decade, the present ratio is very favorable. Bull:cow ratios in the Agiapuk drainage have remained high and are either stable or have decreased only slightly. Fall bull:cow ratios in 1983 and 1984 were 80:100 and 89:100, respectively (Table 3).

A composition survey was conducted in the Unalakleet drainage for the 1st time during the fall of 1985. Moose density was very low and only 56 animals were observed during 5.2 hours of aerial survey. However, the bull:cow ratio of 93:100 was the highest on record in recent years. Calves composed only 5% of the population, and the ratio of calves:100 cows was only 13. This new information is additional evidence illustrating the low productivity characterizing the eastern portion of Unit 22.

Mortality

No comprehensive studies to determine natural mortality rates in Unit 22 have been conducted. Grauvogel (1984) reported that annual natural mortality rates among adult radio-collared moose in Subunit 22D were 4.5% for bulls and 8.4% for cows. Wolves were relatively uncommon in this subunit; brown bears were common. Because predator densities are higher in Subunits 22A and 22B, natural mortality rates in these areas probably exceeded those of Subunit 22D.

The major source of adult mortality throughout Unit 22 is hunting. Hunting seasons are among the longest in the state, ranging from 5 to 8 months. In the early 1960's, few local residents hunted moose. Moose were a species of casual interest but were not a meat animal that people pursued vigorously. As the moose population grew, people's attitudes changed, and now moose are eagerly sought by the hunting community. Demand for moose meat by the local public has increased several-fold. This interest has been reflected in an ever-increasing harvest. In 1972, the reported kill was 42 moose; 11 years later during the 1983-84 hunting season it had climbed to a record 405 (Table 4). The reported harvest during the most recent hunting season was 374 moose: 279 bulls, 92 females, and 3 unspecified. This harvest is the 3rd highest recorded and nearly equals the record harvest set during the 1983-84 season.

The number of hunters who obtained permits for antlerless moose is a good indicator of the tremendous interest in moose hunting. From September through March, 634 permits were issued: 69 to Alaska residents from outside the unit, 7 to nonresidents, and the remaining 558 to unit residents (Table 5). Permit applicants could either obtain a permit for Subunit 22B or 22D, or a combination permit for both subunits. Applicants wishing to hunt cows in Subunit 22E had to obtain a separate permit.

Hunters holding permits for antlerless moose reported a harvest of 195 moose: 93 in Subunit 22B, 2 in Subunit 22C, 78 in Subunit 22D, and 22 in Subunit 22E (Table 6). The composition of this harvest was 101 antlered bulls, 7 antlerless bulls, and 87 cows (Table 5). Data gathered from harvest tickets indicated a harvest of 92 cows, rather than the 87 reported by antlerless permit holders. After reviewing both files, I have concluded that more cows were probably taken than were reported by antlerless hunt permittees. Five hunters reported taking cows on their harvest report cards, but there are no records that these individuals received antlerless hunt permits. These hunters may have mistakenly indicated female moose on their harvest report cards, when in fact they took a bull, or the mistake may have occurred when these data were keypunched.

However, it is more likely that some hunters killed cows and were unaware that antlerless hunt permits were required.

Every year a substantial number of moose hunters fail to return their harvest report cards. Therefore, the moose harvest data gathered from harvest reports is a minimal number. The follow-up procedures used to prod delinquent holders of antlerless hunt permits are indicative of the extent of the nonreporting problem. Upon receipt of the antlerless permit, the signator agreed to voluntarily return the permit by a specified date even if the hunt was unsuccessful. In spite of written and oral instructions to return the completed permit along with the lower jaw within 5 days of taking a moose, only 318 of 634 permits were returned without reminder letters. Approximately 2 weeks after the permit expiration date, reminder letters were sent to those who were delinquent. From this mailing, we received 196 replies, and determined that 177 hunters were unsuccessful or did not hunt, and 19 hunters had killed a moose (10% success rate). We subsequently mailed a certified letter to the remaining 120 nonrespondents. This mailing produced 102 replies indicating that 48 hunters were unsuccessful, 45 hunters did not hunt, and 9 killed a moose (9% sucess rate). Using data from the 2 mailings, the success rate was determined to be 10% for nonrespondents. A similar mailing, sent in 1984-85 to antlerless hunt permit holders, also produced a calculated success rate of 10% for nonrespondents.

Hunters who obtained antlerless hunt permits were generally more cognizant of their reporting responsibilities than the average hunter, because they had more personal contact with Department employees. Thus, a success rate of 10% is probably minimal for all moose hunters who failed to turn in a harvest report. License vendor records indicate that at least 1,200 moose harvest reports were issued in Unit 22 during 1985-86. A computerized summary indicates that 876 harvest reports were returned by individuals who hunted in Unit 22. Since approximately 30% of the hunters who obtain harvest tickets do not hunt, I estimate that an additional 97 people did not hunt (1,200 minus 876 = 324 x 30%). This leaves approximately 227 hunters (324 minus 97) whose report status is unknown. Assuming a minimum success rate of 10%, I estimate that an additional 22 moose were killed but not reported (227 x 10%).

Hunters from rural villages are another source of unreported moose mortality. When village population numbers are compared with the number of moose harvest reports issued by local vendors, it appears unlikely that every person who hunted moose obtained a harvest ticket. I estimate that unlicensed hunters killed an additional 10-30 moose in Unit 22. Therefore, the total number of moose killed in Unit 22 from 1 August through 31 March is estimated at 405-425.

Snowmachines (30%), boats (26%), and highway vehicles (23%) were the principal means of transportation and accounted for 79% of the harvest. Off-road vehicles (4%), three-wheelers (5%), and aircraft (5%) were used for transportation by only 14% of the hunters taking moose. The transportation method was not identified in 7% of the reports.

The harvest chronology was similar to the pattern in previous years, but new trends are emerging. Harvests in some subunits are shifting to the latter part of the season. People who hunted on the road system in Subunit 22D took 57% of the annual harvest during August and September, primarily in September. Usually one-half or more of the annual harvest occurs during this period in the other subunits as well. Yet, in Subunit 22B only 37% of the moose were killed in August and September, while 44% were taken in December and January. Since Subunit 22B is an area close to Nome and has a January hunting season, it is becoming increasingly popular as a place for a late-season moose hunt. The harvest in subunits without a road system (22A and 22E) was distributed more uniformly over time, with the exception of a heavier harvest late in the season. In Subunit 22E, 36% of the moose were taken in January through March. Long days in late winter and excellent snowmachine conditions were incentives to take moose late in the season, particularly when a family was unsuccessful in August and September.

Management Summary and Recommendations

Moose did not occur on the Seward Peninsula 50 years ago. The present population was probably established by immigrants that moved into the area from the east or north in the 1940's or the 1950's. During the past 15 years, aerial surveys have documented substantial population growth.

Although moose have spread throughout the Seward Peninsula, the most dramatic population growth has occurred in the central peninsula in Subunits 22B and 22D. Moose numbers may have approached range carrying capacity in some drainages by the late 1970's. The population growth rate has slowed in most areas, due largely to increasing annual harvests, but competition for winter forage may also be a contributing factor. At present, the Kuzitrin and Agiapuk drainages are the most heavily used, yet overwinter survival has remained high. However, recruitment has declined, and blood values indicate that some moose may be physiologically stressed in late winter (Grauvogel 1984).

Although annual harvest in many areas has approached annual recruitment, aerial surveys have not indicated any significant population decline. In fact, moose numbers have increased or remained stable in most areas.

Moose population composition surveys have revealed a gradual decline in bull:cow ratios in heavily hunted areas, but relatively stable and high bull:cow ratios in lightly hunted areas. Available information indicates that Unit 22 moose populations are stable and doing well.

In the past, hunters who applied for an antlerless hunt permit were required to report on 2 documents: 1) their moose harvest report card; and 2) their antlerless hunt permit card. This system was confusing to the public. Individuals who reported on 1 card often thought they had met their reporting obligation, and many did not send in the 2nd card even after several reminder letters. Other hunters often reported the same moose on both report cards. Correcting these errors was a time-consuming and frustrating task for the staff. To reduce reporting mistakes, a new procedure for issuing antlerless permits has been implemented on a trial basis during 1985-86. Hunters applying for antlerless permits WERE NOT issued a separate permit report card. Instead, they were instructed to report all moose hunting activities on their moose harvest report card. Hunters signed an overlay agreeing to these hunt conditions. To differentiate antlerless hunt permit holders from other moose hunters, an orange sticker was secured to the back of hunting licenses and also to the front of moose harvest report cards. Hunters who completed moose report cards mailed them to Anchorage, as in the past. Cards with an orange sticker could be readily identified as reports from Unit 22 antlerless permit holders. These cards were forwarded to Nome for initial processing and tabulation. As in any new system, minor problems were experienced, but it worked surprisingly well, especially from the public's viewpoint. It was easier for hunters to report their activities on a single card, and they had less paperwork to account for. In addition, this system accomplished its objective: reporting errors were reduced. A modified version of these procedures shows promise for implementation on a statewide basis.

This hunting season was the 1st time highway vehicles were not reported as the principal means of transportation. Hunter competition on the road system from August through early October has increased steadily, and harvests along the road system have been high. However, moose are not as abundant near the well-traveled roads as 5-10 years ago. An increasing number of hunters who are unsuccessful in the fall are hunting in late winter using snowmachines. As a means of transportation, snowmachines are highly efficient for taking moose. Moose are usually on their winter range after the 1st major snowfall and are more vulnerable to hunting. Increased use of snowmachines, and harvests in late winter should be carefully monitored.

The following are other management problems that need to be addressed in Unit 22:

1. Moose density in Subunit 22A is low. Predation and hunting mortality are high in relation to annual recruitment. Curing this chronic situation will require active Department involvement and cooperation from local residents. A census in Subunit 22A was planned for March 1986, but it was cancelled due to unsuitable snow conditions. A census in 22A should remain a high priority.

2. Hunting pressure and annual harvests have been increasing. Annual harvest approached or equaled annual recruitment in many drainages. Since most of Unit 22 has open terrain, moose are very susceptible to overharvest. The Department must continue to carefully monitor moose population status and annual harvest. An extensive population assessment was conducted throughout most of Unit 22 during spring 1985. Such an assessment should be conducted every 2-4 years. These surveys should be done during winters in which snowfall is average or above.

3. Although local hunters are usually very cooperative, nonreporting and some illegal harvest continue to occur. Without accurate harvest reporting, it will become increasingly difficult to ensure sustained-yield management. Public education programs and a visible enforcement effort must be maintained in order to increase compliance with regulations.

4. In some areas in Subunit 22B, calves have declined from 25% of the population in the early 1970's to as low as 7% during recent years. The reason for this decline is not clear. Predation may be the primary cause, but other factors may also be significant. The Department must determine why recruitment has declined and what actions are necessary to reverse the trend.

5. Moose densities on winter ranges in Subunits 22B, 22D, and 22E are high, and production of willow browse has probably declined during recent years due to heavy browsing. The following should be determined in the near future: 1) the browsing impact moose have had on willows, and 2) optimum moose density on winter range.

Literature Cited

Grauvogel, C. A. 1984. Seward Peninsula moose population identity study. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Final Rep. Proj. W-22-2. Job 1.29R. Juneau. 93pp.

_____. 1986. Seward Peninsula moose survey-inventory progress report. Pages 112-121 in B. Townsend, ed. Annual report of survey-inventory activities. Part VIII. Moose. Vol. XVI. Alaska Dep. Fish and Game. Fed. Aid in Wildl. Rest. Proj. W-22-4. Job 1.0. Juneau. 143pp.

PREPARED BY:

Carl A. Grauvogel
Game Biologist III

SUBMITTED BY:

Steven Machida
Survey-Inventory Coordinator

Table 1. Comparison of Subunit 22D spring moose surveys, 1985 and 1986.

Date	Adults without calves	Adults with 1 calf	Adults with 2 calves	Total adults	Total calves	Percent calves	Total sample	Count time (hours)
March 1985	915	226	40	1,181	306	21	1,487	13.1
March 1986	881	169	19	1,069	207	16	1,276	11.9

Table 2. Unit 22 aerial surveys showing higher recruitment from east to west, spring 1985 and 1986.

Areas (from east to west)	Adults with no calves	Adults with 1 calf	Adults with 2 calves	Total adults	Total calves	Percent calves	Total sample	Count time (hours)
22B Fish River	193	13	1	207	15	7	222	3.6
22D Kuzitrin Basin	729	125	12	866	149	15	1,015	7.8
22D Am. R./Agiapuk Basin	152	44	7	203	58	22	261	3.7
22C[a]	59	24	14	97	52	35	149	7.4
22E[a]	104	40	6	150	52	26	202	6.2

[a] Survey conducted in 1985. Surveys in other subunits were done in 1986.

Table 3. Fall moose population composition from the Agiapuk and Kuzitrin drainages 1971, 1973-76, and 1979-85.

	Agiapuk drainage				Kuzitrin drainage			
Year	Bulls: 100 cows	Yrlg bulls: 100 cows	Calf % of herd	n	Bulls: 100 cows	Yrlg bulls: 100 cows	% Calves in herd	n
1971	--	--	--	--	38	19	39	83
1973	91	22	20	76	50	17	23	82
1974	178	57	17	30	52	22	28	427
1975	86	14	24	17	35	12	32	34
1976	62	27	22	205	56	24	24	230
1979	65	21	22	320	31	9	30	418
1980	61	23	22	101	30	7	26	243
1981	59	18	26	142	71	16	26	226
1982	66	17	19	196	33	11	19	437
1983	80	27	19	181	41	11	21	373
1984	89	37	24	67	41	13	19	354
1985	--	--	--	--	36	12	16	396

Table 4. Unit 22 historical moose harvest, 1969-85.

Regulatory year	Males	Females	Unknown sex	Total harvest	Hunters[a]	Percent success
1969	69	1	2	72	182	40
1970	70	0	1	71	139	51
1971	59	--	1	60	168	36
1972	44	0	0	44	99	44
1973	103	32	1	136	317	43
1974	149	72	1	222	479	46
1975	136	0	2	138	389	35
1976	186	51	3	240	611	39
1977	151	88	5	244	457	53
1978	198	97	2	297	596	50
1979	193	75	2	270	760	36
1980	156	71	1	228	492	46
1981	225	72	1	298	696	43
1982	244	100	0	344	904	38
1983	291	82	32	405	1,292	31
1984	298	91	6	395	1,086	36
1985	279	92	3	374	876	43

[a] Minimum known number of hunters.

Table 5. Unit 22 antlerless permit data by subunit, 1985-86.

Permit area	Permits issued[a]	Did not hunt/ did not report	Unsuccessful hunters	Successful hunters	Antlered bulls	Antlerless bulls	Cows
22B[a]	85	14	29	42	19	1	22
22D[a]	120	31	47	42	21	0	21
22B-D[a]	379	87	202	90	52	4	34
22E[b]	50	18	11	21	9	2	10
Totals	634	150	289	195	101	7	87

[a] Hunters had an option to obtain a permit in either Subunit 22B or 22D, or a combination permit for both subunits.

[b] A separate permit was required by anyone who hunted antlerless moose in 22E.

Table 6. Unit 22 moose harvest by hunters who obtained antlerless hunt permits, 1985-86.

Subunit	Bulls	Cows	Total
22B	53	40	93
22C	2	0	2
22D	41	37	78
22E	12	10	22
Total	108	87	195

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 23

GEOGRAPHICAL DESCRIPTION: Kotzebue Sound

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

The moose population in Unit 23 appears to be stable although some local populations show signs of increase (i.e., Noatak and Kobuk River drainages). The absolute number of moose in the unit is unknown, but Quimby and James (1985) reported that a unit-wide estimate of 5,000 was probably conservative and the population in 1984 may have been as high as 7,000. However, heavily browsed winter forage in some drainages may cause future population declines in localized areas. To date, declines resulting from overbrowsing have not been noted.

Population Composition

Fall surveys utilizing the Moose Demography Aerial Survey Technique (MDAST) (Gasaway et al., unpubl. data) were conducted in the Selawik and Squirrel River drainages during October and November 1985. MDAST differs from standard survey techniques in that intensive surveys of small areas are used to calibrate estimates derived from less intensive surveys of much larger areas. Stratification of the study area into high- and low-density strata markedly improves sampling efficiency. Estimates of population size and density as well as composition can be made with greater precision than with standard survey techniques. A composition survey using standard techniques was conducted in the Buckland River drainage during November 1985. Late winter trend counts were conducted in the Noatak River drainage during March 1986, and in the lower Kobuk and Selawik River drainages during April 1986. A modified version of MDAST was used for a late-winter survey in the Buckland River drainage during March 1986.

A fall survey using MDAST was implemented cooperatively with the Bureau of Land Management in the 1,602 mi^2 Squirrel River drainage during 18-24 November 1985 (Larsen et al., unpubl.

data) (Table 1). Observers counted 537 moose (491 adults and 46 calves) during initial stratification flights. Later, 116 adults and 15 calves were counted during the intensive survey flights and I estimated that the Squirrel River drainage contained 609 moose at a density of 0.38 moose/mi^2. Ratios of 57 bulls:100 cows and 13 calves:100 cows were calculated from the data, with calves composing 9% of the population. The largest moose aggregations occurred in river valleys with gradual-sloped terrain and in dense stands of spruce.

A fall survey, also using MDAST, was conducted cooperatively with the U. S. Fish and Wildlife Service (USFWS) on a 4,360 mi^2 area in and adjacent to the Selawik National Wildlife Refuge during 28 October-1 November 1985 (Larsen et al. 1986) (Table 1). I estimated the population size in the survey area was 1,864 moose and the density 0.43 moose/mi^2. This estimate is similar to the 1984 estimate of 1,799 moose made by Spindler and Hall (1985). The highest densities in the 1985 survey occurred in alpine terrain and in the lowlands of the Tagagawik River, which burned in 1977. Aggregations of up to 35 moose were observed as late as 1 November.

Ratios of 57 bulls:100 cows and 19 calves:100 cows were calculated from the 1985 data. In 1984, Spindler and Hall (1985) derived ratios of 43 bulls:100 cows and 32 calves:100 cows for the same area. Calves composed 11% of the 1985 sample and 18% in 1984. To determine whether these data suggest a downward trend in calf production, composition surveys are planned for fall 1986.

An aerial composition survey using standard techniques was conducted on 15 November 1985 in the Buckland River drainage. The area surveyed was approximately 224 mi^2 in size. The terrain is primarily east-facing and gradual-sloped; the area is characterized by numerous small gullies containing patches of willow and spruce stands. During 4.5 hours of aerial survey, I counted 178 moose (60 bulls, 92 cows, and 26 calves). The estimated density was 0.79 moose/mi^2 and calves composed 15% of the sample.

A late-winter trend count was conducted during 7-8 March 1986 in a portion of the Noatak drainage 250 mi^2 in size (Table 2). Observers counted 425 moose (340 adults, 85 calves) during 10 hours of aerial survey and estimated a density of 1.70 moose/mi^2. Calves composed 20% of the sample. Calf productivity was slightly higher than the 17% estimate derived from a survey of the middle Noatak River drainage during March 1985 (James and Cannon, unpubl. data). Most moose were observed along the Eli River and relatively few animals were seen west and south of the Noatak River.

A second winter trend survey was conducted with the cooperation of the USFWS along the west side of the Tagagawik River in the Selawik River drainage during 21-22 April 1986 (Table 2). The area surveyed included 194 mi² of riparian, mountainous, and open tundra habitat. Observers counted 243 moose (212 adults, 31 calves) during 7.7 hours of flying and density was estimated at 1.25 moose/mi². Calves constituted 13% of the sample. In spring 1984, USFWS staff counted 146 moose in a 91-mi² area adjacent to the Tagagawik River (Spindler and Hall 1985). In 1985 and 1986, USFWS staff counted 207 and 149 moose, respectively, in the same area. The observed calf percentage was 14% in 1984, 16% in 1985, and 10% in 1986.

A 3rd winter trend survey was conducted on 23 April 1986 in an 87-mi² portion of the lower Kobuk River drainage (Table 2). The area surveyed was bordered by the villages of Noorvik and Kiana to the west and east, respectively, the Kiana Hills to the north, and the Kobuk River to the south. I counted 84 moose (65 adults, 19 calves) in 6 hours of flying, and density was estimated at 0.97 moose/mi². Calves constituted 23% of the sample.

I counted 19 moose (14 adults, 5 calves) in a late winter survey along a 40-mile stretch of the south fork of the Buckland River during March 1986. This survey resulted in a minimum density estimate of 0.48 moose/mile of river. Calves composed 16% of the moose observed, up from 9% reported in 1984 (Quimby and James 1985).

A 4th winter trend survey using a modified version of MDAST was conducted in a 1,282-mi² portion of the Buckland River drainage during 6, 7, and 10 March 1986 (Larsen et al., unpubl. data) (Table 2). Portions of the Buckland drainage surveyed in November were included in the spring MDAST survey. Because the modified technique did not use intensive survey flights following the initial stratification flights, the population estimate was less precise and represents a minimum figure. Observers counted 110 moose (94 adults, 16 calves) in the survey area and the estimated density was 0.09 moose/mi². The density observed in the prior fall survey was much higher than observed in the winter survey. Because the modified technique is less precise than MDAST, it is probable that many moose were missed. In addition, because the Buckland drainage is predominantly open with low-lying vegetation covered by snow during the winter, most of the area represents poor-quality winter range for moose. Moose probably migrate to more suitable wintering areas such as the neighboring Kiwalik River drainage.

Mortality

Hunters reported a harvest of 124 moose in Unit 23 during the 1985-86 season. Alaska residents from communities outside of

Unit 23 reported a harvest of 53 moose, down from 58 in 1983-84 and 62 in 1984-85. Nonresidents took 31 moose, up from 13 in 1983-84 and down from 49 in 1984-85. Kotzebue residents reported taking 14 moose, and residents from all other communities in Unit 23 reported 24 moose. An additional 2 moose were taken by hunters of unknown residency. As in prior years, the reported harvest by Unit 23 residents is probably much lower than the actual harvest. Quimby and James (1985) estimated that the reported harvest by Unit 23 residents was only 14-24% of the actual harvest. Using this percentage range as an estimator, Unit 23 residents harvested 158-271 moose. This estimate is substantially lower than the 1983-84 estimate of 335-521 and the 1984-85 estimate of 359-554.

The reported harvest of 124 moose was composed of 112 males and 12 females. Sixty percent (74 moose) of the harvest came from the Noatak drainage (Table 3). Overall, 52% of the 170 resident hunters were successful while 64% of nonresident hunters were successful.

Antler sizes of bulls harvested in Unit 23 during the 1985-86 season ranged from 8-70.5 inches ($\bar{x}$ = 47.9 inches, SD = 14.4, n = 108). The majority (56%) of the bulls had antler spreads greater than or equal to 50 inches (Table 4).

Five methods of transportation were identified by reporting hunters: airplanes, boats, three-wheelers, snowmachines, and a horse. Airplanes were used most by both successful (63%) and unsuccessful (64%) hunters. Thirty of 58 boat users (52%) successfully harvested moose, and 5 of 8 hunters using snowmachines (63%) were successful. All 4 hunters using three-wheelers harvested moose, and the 1 hunter who reported using a horse for transportation was also successful. The method of transportation was not reported by 6 successful hunters (5%).

Very little is known about other sources of moose mortality in Unit 23. I observed 2 short-yearling carcasses in the Noatak drainage during March and April 1986. One of the short yearlings, a female, apparently had been with an adult cow and a sibling. The moose had been recently shot and abandoned. The other short-yearling carcass was observed from the air, lying on the ice adjacent to a sand bar in the Kelly River, with its left side eaten. I was not able to determine the sex of the animal or the cause of death. In May 1986, on the Kelly River, I examined the carcass of a 3-year-old bull moose which had been shot in the head. I believe it was killed for trapping bait.

Management Summary and Recommendations

Nonreporting of harvest by Unit 23 residents continues to be a major problem for moose and other species. Local residents do

not understand the need for the current regulatory and management system, and often do not report their harvest of moose. Therefore, harvest data are not as accurate as they could be. Although the estimated number of moose taken in Unit 23 is well below the maximum sustained yield, the problem of nonreporting will become more critical if harvest levels increase. Efforts by Department personnel to inform local residents of the need for reporting harvest should continue.

Willow browse in the Noatak River drainage appears to be used heavily, and moose numbers may soon exceed the carrying capacity. Future declines in localized areas are possible and the population should be reduced in number. However, during the winter of 1985-86, there were no reports of moose deaths caused by starvation and staff did not observe any emaciated moose. I recommend that the bag limit and/or season length in the Noatak drainage be liberalized.

Literature Cited

Larsen, D. N., M. A. Spindler, and D. D. James. 1986. Moose population estimate, trend, and distribution survey on Selawik National Wildlife Refuge, Game Management Unit 23, 1985. Selawik NWR Prog. Rep. 86-1. U.S. Fish and Wildl. Serv. Kotzebue, Alaska. 15pp.

Spindler, M. A., and K. F. Hall. 1985. Moose and caribou population estimates, trend and distribution surveys on Selawik National Wildlife Refuge 1984. Selawik NWR Prog. Rep. 85-1. U.S. Fish and Wildl. Serv. Kotzebue, Alaska. 14pp.

Quimby, R. L., and D. D. James. 1985. Unit 23 moose survey-inventory progress report. Pages 124-135 in A. Seward, ed. Annual report of survey-inventory activities. Part VIII. Moose. Vol. XV. Alaska Dep. Fish and Game. Fed. Aid. in Wildl. Rest. Prog. Rep. Proj. W-22-3. Job 1.0. Juneau. 164pp.

PREPARED BY:

Douglas N. Larsen
Game Biologist II

SUBMITTED BY:

Steven Machida
Survey-Inventory Coordinator

Table 1. Unit 23 aerial surveys utilizing the Moose Demography Aerial Survey Technique (MDAST) during fall 1985.

Date	Drainage	Count area (mi^2)	Bulls: 100 cows	Calves: 100 cows	Percent calves	Density/mi^2	Population estimate n
Oct 1985	Selawik	4,360	57	19	11	0.43	1864
Nov 1985	Squirrel	1,602	57	13	9	0.38	609

Table 2. Winter trend count surveys in Unit 23, March-April 1986.

Date	Drainage	Adults	Calves	Percent calves	Total	Count area (mi^2)	Density/mi^2
Mar 1986	Noatak	340	85	20	425	250	1.70
Apr 1986	Tagagawik	212	31	13	243	194	1.25
Apr 1986	Kobuk	65	19	23	84	87	0.97
Mar 1986[a]	Buckland	94	16	15	110	1,282	0.09

[a] Survey utilized a modified MDAST technique.

Table 3. Location and number of moose reported killed by hunters in GMU 23, 1985-86.

Drainage	Males	Females	Total	% Hunter success
Noatak River	68	6	74	60
Kobuk River	19	4	23	36
Selawik River	18	1	19	86
Buckland River	4	1	5	45
Unknown	3	0	3	--
Total	112	12	124	56

Table 4. Antler sizes of bull moose reported killed by hunters in GMU 23, 1985-86.

Unknown	Under 20 in	20-29.9 in	30-39.9 in	40-49.9 in	50-59.9 in	Over 60 in
4	3	12	15	15	37	26
(4%)	(3%)	(11%)	(13%)	(13%)	(33%)	(23%)

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 24

GEOGRAPHICAL DESCRIPTION: Koyukuk River above Dulbi River

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

High moose population densities can be found on the Koyukuk River lowlands in the southern one-third of Unit 24. Density averages 3.6 moose/mi^2. The population appears stable.

The middle one-third of the unit, including the Kanuti Controlled Use Area and Kanuti National Wildlife Refuge, has low densities (0.3 moose/mi^2). The trend is undocumented, but the population is thought to be decreasing.

In the northern one-third of the unit, which includes Gates of the Arctic National Park and Preserve, densities are moderate and range from 1.0 to 1.6 moose/mi^2. Moose numbers in this area are increasing.

A moose stratification survey was conducted on the Kanuti National Wildlife Refuge during October 1985. The 2,481 mi^2 survey was a cooperative project with the U.S. Fish and Wildlife Service. Prior to the survey, the area was divided into sample units averaging 12.8 mi^2. During the survey each sample unit was flown and assigned to 1 of 3 strata based on the number of moose observed, frequency of moose tracks, and predominant habitat type. Most of the area was classified as "low density" (Table 1).

The stratification process is part of the population estimation survey technique that has been used in some portions of interior Alaska. In this case, no sampling was undertaken after the stratification. Thus, a statistically supported estimate could not be generated. However, a relationship has been noted between the number of moose observed during stratification and the final estimate wherever population estimation surveys have been undertaken. By applying a correction factor of 2.5-3.7, a general idea of how many moose may occupy a stratified area can

be obtained. Two hundred sixty-four moose were observed during this stratification effort. Thus, the population may number 659-977 moose.

Population Composition

Sixteen high-density sample units in the Kanuti Controlled Use Area were intensively surveyed. Two hundred thirty-five moose were classified, which is approximately one-third of the moose thought to occur within the refuge. The results (Table 2) indicate low calf numbers, good yearling survival, and high bull:cow ratios. Deep snow, late breakup, and extensive flooding all contributed to the low calf numbers. The high recruitment rate is probably erroneous because the percentage of yearlings in 1985 was higher than the percentage of calves in 1984. Yearling moose, like calves, are usually disproportionately affected by harsh winter conditions. Bull moose that survived the deep snow conditions may have produced smaller antlers due to late winter malnutrition and stress. This could lead to age classification errors during subsequent surveys. The bull:cow ratio, while good, could be misleading because the area is subject to illegal either-sex hunting throughout the year.

No surveys were conducted near the Dalton Highway or in the northern one-third of the unit. In the southern one-third of the unit, surveys were conducted in 3 trend areas (Table 2). The results indicate poor calf survival, high yearling survival, and normal bull:cow ratios for the area. The reasons for the yearling and calf results are probably the same as mentioned for the Kanuti area.

Habitat

During April 1986 moose browse evaluation transects were conducted on the Kanuti Refuge in areas where the highest moose densities were observed during November 1985. Areas sampled were willow communities along upland creeks, a birch-aspen ridge, and riparian willow bars. The species composition along upland creeks was 93-99% diamond leaf willow of which 30-37% showed moderate to high use. Most browse species on the birch-aspen ridge were not utilized. Feltleaf willow occurred in 100% of the riparian willow bar samples. Sixty-seven percent had moderate to high use. My general impression of the Kanuti area, supported by the transect data, is that available browse is not being heavily utilized and browse is not limiting the moose population.

Mortality

Hunting seasons in Unit 24 are diverse and reflect various moose densities and consumptive use patterns throughout the

area. The reported harvest was 114 moose. Hunters reported taking 109 during the fall season and 2 in December. Date of kill was not reported for 3 moose. I estimate an additional 60 moose were harvested out of season and not reported.

The Dalton Highway continued to attract hunters. Twenty-eight successful and 71 unsuccessful hunters used the road for access or hunted within 15 miles of the road. The number of moose taken along the road declined slightly, after yearly increases since the road opened to the public in 1981. However, the number of hunters using the road has increased. The number of unsuccessful hunters has doubled in the past year.

The Koyukuk Controlled Use Area was closed by Emergency Order during the March season to reduce the harvest. The closure was necessary to compensate for an estimated 75% loss of calves born in 1985.

Management Summary and Recommendations

The moose stratification of the Kanuti area was useful in determining variations in moose density and provided information for a population estimate. Moose mortality in this portion of the unit should be decreased to allow an expansion of the population. Browse availability surveys indicate that food is plentiful and underutilized. The Koyukuk Controlled Use Area should be maintained to keep the moose harvest at its present level until the population increases. Hunting pressure in the Dalton Highway area needs to be monitored and more trend areas should be established.

PREPARED BY:

Timothy O. Osborne
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Moose stratification results from Kanuti National Wildlife Refuge, October 1985.

Relative density	Moose seen	Strata area (mi^2)	Percent of total survey area
Low	38	1,960	79
Medium	52	222	9
High	174	299	12
Total	264	2,481	100

Table 2. Moose composition surveys in Subunit 21D, November 1985.

Location	Bull: 100 cows	Percent yearling bulls	Calves: 100 cows ≥2 yrs	Percent calves	Density moose/ mi^2	Area (mi^2)	Sample size
Kanuti NWR	99	14	30	9	1.2	196.0	235
Dulbi Slough	19	7	11	8	3.1	54.2	170
Huslia River	45	11	13	7	3.9	64.6	254
Treat Island	35	9	20	11	3.8	67.4	257

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 25

GEOGRAPHICAL DESCRIPTION: Yukon Flats; Chandalar, Porcupine and Black River drainages; Birch and Beaver Creeks

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose surveys were completed only in the upper Beaver Creek drainage in Subunit 25C and in the western portion of Subunit 25D. The effort in Subunit 25C was made in cooperation with the Bureau of Land Management within the White Mountains National Recreation Area. The survey included estimation of population size and establishment of 1 trend area. In Subunit 25D (west), the work was done in cooperation with the U.S. Fish and Wildlife Service and included the surveying of 5 trend areas.

Population size was estimated in upper Beaver Creek by first stratifying a 714 mi^2 area into 10-20 mi^2 blocks of very high, high, medium, low, and very low moose density, and by then intensively surveying selected blocks from each stratum to estimate the number of moose present. Strata designations were primarily determined by the number of moose observed during quick overflights in a Cessna 185 aircraft. However, frequency of moose tracks and type of habitat also influenced the determinations. Blocks that were intensively surveyed were not selected randomly and, therefore, precision of the population estimate could not be statistically evaluated.

The moose population during late October was estimated to be about 500, with an average density of 0.7/mi^2. Densities calculated for the very high, high, medium, and low strata were 5.7, 2.0, 1.4, and 0.6 moose/mi^2, respectively. Density for the very low strata was subjectively set at 0.04 moose/mi^2, because none of these blocks were intensively surveyed.

The present population trend in upper Beaver Creek is unknown. However, periodic surveys from 1978 to 1982 suggest a decline because calf survival to fall has been chronically poor.

In Subunit 25D (west), comparison of data obtained in 1985 with data from 1983, for 3 established trend areas, indicates a stable population. Two areas increased by 0.30 and 0.23 moose/mi^2, and 1 area decreased by 0.12 moose/mi^2. All these values are within the range of variability normally attributed to procedural error in trend surveys and, therefore, they do not indicate a change in population size.

Historical data and observations from the remainder of Unit 25 indicate moose density is low (0.1-0.5 moose/mi^2) and populations are generally stable.

Population Composition

Ninety-nine moose were counted in 1 trend area in upper Beaver Creek during late October. Ratios were: 84 bulls:100 cows, 33 yearling bulls:100 cows, and 18 calves:100 cows. Yearlings and calves composed 32% and 9% of the population, respectively.

These data indicate calf survival was poor, and yearling survival was excellent. Also, the high bull:cow ratio suggests the local population is sustaining the light harvest of bulls that is occurring. Historically, yearling survival has been much lower, suggesting that this year's data may be biased and should be cautiously interpreted.

In Subunit 25D (west), 108 animals were observed in 5 different trend areas during November. Ratios were: 98 bulls:100 cows, 35 yearling bulls:100 cows, and 53 calves:100 cows. Yearlings and calves composed 28% and 21% of the population, respectively.

These data indicate calf and yearling survival were both excellent. The high survival to fall among calves is typical for this area. However, the yearling survival was abnormally high. Historically, yearlings have averaged only 13% of the fall population.

Movements

Twelve moose (2 bulls and 10 cows) were radio-collared in upper Beaver Creek in March 1985 in a cooperative effort with the Bureau of Land Management. The objective was to ascertain seasonal use of the area. Preliminary findings indicate that both resident and migratory moose exist in the population. Eight radio-collared moose (1 bull and 7 cows) remained year-round in the Beaver Creek drainage, although movement did occur seasonally from the riparian habitat along Beaver Creek to the uplands along its tributaries. One bull and 3 cows temporarily left the drainage during summers 1985 and 1986. The bull summered in the Little Chena drainage approximately 15 miles south

of the area where it was collared. The 3 cows traveled approximately 50 miles south to the Goldstream drainage and the Chena flats to calve and spend the summer.

Mortality

Reliable mortality information is not available for most of Unit 25. At least half the total hunter harvest is illegal and, therefore, is not reported through the harvest ticket system. Other sources of mortality are also largely unquantified.

Harvest ticket returns for Unit 25 indicate 138 (43%) of the 318 reporting hunters killed a moose. Most animals (60) were taken by Alaskans who were not local residents (Table 1). Subunit 25D had the largest harvest (46), Subunit 25A was second (31), and Subunits 25B and 25C were third, with 29 moose taken in each.

The greatest numbers of hunters were in Subunits 25C (101) and 25D (101) (Table 2). Subunit 25C is accessible to nonlocal hunters from the road system; Subunit 25D contains most of the villages in Unit 25 (7 of 8) and is accessible by boat. Success rates in these 2 subunits were 27% and 46%, respectively. The rate for Subunit 25C was the lowest in Unit 25. The low rate was probably due to a combination of low moose population density, a relatively large number of hunters, and low hunter effort.

Subunit 25A had the lowest number of hunters (55); however, it had the highest success rate (56%) and the greatest hunter effort (6.9 days per hunter). Access to this subunit is mostly by aircraft, and, therefore, hunters spend more time in the field and are either guided or are well experienced.

The magnitude and characteristics of the reported harvest did not change significantly compared with previous years. The only modifications of regulations were the change from registration permits to Tier II subsistence permits for the hunt in Subunit 25D (west), and a slight change in season timing in Subunit 25B.

None of the moose radio-collared in upper Beaver Creek in Subunit 25C have died, suggesting that adult mortality in this population is low. However, preliminary analysis of observations of collared cows indicates that substantial mortality is occurring among newborn calves. This agrees with survey results that show calf survival is poor.

Seasonal movement of some moose from the Beaver Creek drainage to the Chatanika, Goldstream, and Chena drainages exposes these

migratory moose to different predation, hunting, poaching, and accident rates than those experienced by nonmigratory moose in the population. Although the sample of collared moose is small, some comparison of mortality rates between these segments may eventually be possible.

Additional mortality information was obtained in Subunit 25D (west) by monitoring 38 radio-collared moose and by expending extra effort to get accurate harvest information. The radio-collared animals were mostly (25) calf-cow pairs collared during November 1985 as part of a cooperative project with the U.S. Fish and Wildlife Service. The improvement in harvest information was obtained by conducting limited aerial searches for evidence of illegal kills and by questioning local residents about harvest.

Mortality was much lower than expected among the radio-collared moose. No adults were lost and only 2 of 15 calves died. The 2 calves were killed by wolves, 1 each in January and March. Past survey data suggest that 1-3 adults and 7-10 calves would normally be lost to wolves.

Increased survival may have been due to the abnormally shallow snow depths and mild winter temperatures that reduce vulnerability to predation. Wolf numbers probably did not decrease. Observations of tracks and individual packs indicated no change in the population. Moreover, a trapper assistance program, implemented to increase wolf harvest, did not achieve its objective. A harvest of 20 wolves was desired. Only 8 were taken, and those were removed from packs that did not prey on the radio-collared moose.

Hunters harvested 30-40 moose in Subunit 25D (west), or approximately 5% of the fall population. This total includes the legal harvest and my estimate of the illegal kill.

It appears unlikely that habitat quality or bear predation are significantly affecting moose survival. High rates of calf production among radio-collared animals indicate an abundant food supply. The excellent survival of calves until fall, as quantified by both telemetry studies and surveys, implies that bears are not a problem to moose in this area.

Management Summary and Recommendations

Moose density is low in most of Unit 25, and populations are probably stable. The magnitude and characteristics of the legal harvest show little change from last year. The illegal kill of moose includes cows and is probably greater than the legal harvest.

Some moose from the upper portion of the Beaver Creek drainage of Subunit 25C were found to move to drainages along the road system near Fairbanks in Subunit 20B to spend the summer. However, most of the moose studied moved very little. Mortality rates among migratory moose may be quite different from those for resident animals. Management practices in adjacent drainages could influence survival rates observed in the upper Beaver Creek population. Likewise, resident moose, because of their limited seasonal movements, are very susceptible to land management and moose management strategies employed locally.

Adult mortality in upper Beaver Creek is apparently low. However, calf survival to fall is poor, and therefore, the population is probably not increasing. Additional moose should be collared to increase the sample size for meaningful evaluation of movement and mortality data. The trend area should be enlarged to ascertain whether the unusually high yearling bull:cow ratio is an artifact of seasonal distribution of moose.

Subunit 25D (west) continues to be a major problem area because density is critically low. Apparent good survival to the yearling age class of the 1984 and 1985 cohorts may indicate an improvement. However, more data must be collected to clarify the management situation. An additional 15 calf-cow pairs should be radio-collared, and a modified census should be conducted to estimate population size. Also, attempts to increase wolf harvest through the trapper education program should be continued.

A management plan should be formulated for Subunit 25D (east). This will require additional surveys to evaluate the role of wolf predation. Public meetings and questionnaires should be used to establish moose population and user objectives.

PREPARED BY:

Roy A. Nowlin
Game Biologist III

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator

Table 1. Residency of successful hunters and total harvest of moose in Unit 25, 1985-86 season.

Subunit	Local resident[a]	Nonlocal Alaska resident	Nonresident	Unspecified	Total
25A	2	12	17	0	31
25B	10	12	2	5	29
25C	2	27	0	0	29
25D (west)	20	0	0	0	20
25D (east)	15	8	2	1	26
Unspecified	2	1	0	0	3
Totals	51	60	21	6	138

[a] Resident of Unit 25.

Table 2. Number of moose hunters, days of hunter effort, percent success, and most important transport means in Unit 25, 1985-86 season.

Subunit	Total hunters	Hunter effort[a]	Percent success	Transport	Percent
25A	55	6.9	56	Aircraft	67[b]
25B	53	5.9	54	Boat	58
25C	101	4.4	27	Highway vehicle	38
25D (west)	41	5.6	49	--	--
25D (East)	60	4.9	43	Boat	72

[a] Average days hunted.
[b] Percentage of total hunters in each subunit.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNIT: 26A

GEOGRAPHICAL DESCRIPTION: Western Arctic Slope

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Over the past 3 decades, moose have become well established in most of the favorable habitat of Alaska's Arctic Slope. Animals occasionally range as far north as the arctic coast in summer, but wintering moose are confined primarily to the inland riparian systems. Highest wintering densities occur on the central Colville River and its tributaries.

Late-winter surveys were flown over all of Unit 26 in 1970, 1977, and 1984. About 1,500 moose were observed in 1970 and 1977; the 1984 surveys revealed an increase to 2,329 moose unit-wide. In Subunit 26A, 1,429 moose were observed in the 1984 late-winter counts. Of these, 1,418 were in the Colville River drainage, an increase of 161 moose (13%) since 1977. The 1984 survey results suggest a late-winter population of 1,429-1,786 moose in Subunit 26A.

Late-winter trend counts flown in the Colville River during 1970-86 are reported in Table 1. In 1986, 866 moose were counted and snow depths as well as survey conditions were excellent. This is the largest trend count to date. The 866 moose counted represent a 24% increase over the mean of the 11 previous counts since 1970 (partial 1983 count excluded from mean). Of the 866 moose observed in 1986, 22% were calves (short yearlings), compared with 19% in 1985. Trend data suggest that the Subunit 26A population is either stable or growing and that recruitment of short yearlings is satisfactory.

Population Composition

No fall composition surveys were flown during the reporting period; composition surveys are planned for 1986. The most recent surveys were flown in October 1983. Of 188 moose

observed, 122 were on the Anaktuvuk River. Composition ratios were 54 bulls:100 cows and 38 calves:100 cows. Calves composed 20% of the sample, and 19% of cows with calves had twins.

Mortality

Of 166 hunters who reported hunting in Unit 26 in 1985, 67% were successful (Table 2). The number of participating hunters has increased from 97 in 1984. Unit-wide harvest also increased significantly, from 73 in 1984 to 112 in 1985. In Subunit 26A, the reported harvest of 65 moose increased 30% compared with 1984 (Table 3). The number of hunters also increased from the previous year but the success rate declined to 66%, down from 76% in 1984. Inclement fall weather in 1985, including rain and flooding on the Colville River, may have caused this decline in success.

Most of the reporting hunters in Subunit 26A (76%) were Alaska residents during 1985 (Table 4). Hunters residing on the Arctic Slope accounted for 30% of the reported harvest, compared with 19% in 1984 and 9% in 1983. An additional 30% of the 1985 hunters came from Fairbanks and 16% were from elsewhere in Alaska. Of the 45 moose for which antler measurement was reported, 29 (64%) had an antler spread of at least 50 inches (Table 5). Eight (18%) were 60 inches or greater with the largest measuring 66-1/4 inches.

We estimate that an additional 20 moose were killed in the subunit but not reported. According to Subsistence Division records, seven of these were taken by Nuiqsut residents. The total estimated harvest for Subunit 26A is thus 85 moose. This harvest represents approximately 5-6% of the moose inhabiting the subunit.

Management Summary and Recommendation

Hunters probably removed no more than 6% of the moose population in Subunit 26A during the reporting period. No maximum allowable harvest has been identified for moose in Subunit 26A. We need to do this as soon as possible. Any such estimate must consider the special nature of a population that has recently expanded onto the Arctic Slope and is at the northern limit of range for moose in Alaska.

The number of people hunting in Unit 26 increased 71% from the previous year. In Subunit 26A, the number of reporting hunters increased 50%, from 66 to 99. Harvest also increased from the 1984 season; 53% unitwide and 30% in Subunit 26A. We assume these increases in hunting pressure and harvest are indicative of long-term trends on the Arctic Slope although the rates of increase will certainly vary from year to year.

It is important to develop a moose management plan for both Unit 26 and Subunit 26A. This plan should recognize the unique characteristics of arctic moose populations and the needs of moose hunters in these areas. Particular attention should be given to identifying and preserving the characteristics of moose hunting that are unique to the Arctic Slope. In developing such a plan, it is vital to solicit meaningful public participation, especially from residents of the subunit.

Maintaining an adequate level of wildlife law enforcement is a problem in Subunit 26A. Logistics, weather, limited availability of Fish and Wildlife Protection Officers and the air-based mobility of the moose hunters themselves are all contributing factors. Despite these problems, we were especially pleased with the quality and quantity of law enforcement on the Colville River during 1985. The Department of Public Safety was able to visibly patrol the most heavily used areas and also maintained a covert presence. Coordination with Department of Public Safety officers and ADF&G staff was very satisfactory.

I would like to thank S. Pedersen and N. Shishido who were collecting subsistence-use information in Nuiqsut during the report period. They were able to summarize and make available the 1st reliable information on unreported moose harvest in this community without revealing interview confidences or jeopardizing their working relationship with the community. The interdivisional coordination and cooperation provided by these colleagues was excellent.

SUBMITTED BY:

John N. Trent
Game Biologist III

PREPARED BY:

Steven Machida
Survey-Inventory Coordinator

Table 1. Colville River trend counts: Anaktuvuk River, Chandler River, and Colville River between Anaktuvuk and Killik Rivers, 1970, 1974-81, and 1983-86.

Year	Total moose	Adults	Calves	% Calves in herd
1970	750	523	227	30
1974	544	458	86	16
1975	556	386	170	31
1976	650	494	156	24
1977	802	632	170	21
1978	767	623	144	19
1979	644	536	108	17
1980	841	676	165	20
1981	639	594	45	7
1983[a]	315	268	47	15
1984	756	590	166	22
1985	757	613	144	19
1986	866	678	188	22

[a] Partial count due to incomplete snow cover and wide dispersal of moose.

Table 2. Unit 26 moose hunter success, 1977-85.

Season	Harvest	Hunters	Success rate (%)
1977	36	48	75
1978	46	81	57
1979	90	108	83
1980	89	132	67
1981	99	145	68
1982	60	102	59
1983	51	76	67
1984	73	97	75
1985	112	166	67

Table 3. Unit 26A reported moose hunter success, 1982-85.

Year	Harvest	Sex			Hunters	Success rate (%)
		M	F	Unk		
1982	38	31	7	0	54	70
1983	37	30	7	0	50	74
1984	50	42	7	1	66	76
1985	65	50	15	0	99	66

Table 4. Residence of reporting Subunit 26A hunters, 1983 and 1984.

Year	North Slope		Fairbanks area		Elsewhere in Alaska		Outside Alaska		Totals
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
1983	4	(9)	18	(40)	7	(16)	16	(36)	45
1984	12	(19)	26	(41)	16	(25)	10	(16)	64
1985	29	(30)	29	(30)	16	(16)	24	(24)	98

Table 5. Antler spread (inches) of moose harvested in Subunit 26A, 1983 and 1984.

Year	20	20-29	30-39	40-49	50-59	60+	Totals
1983	0	1	9	4	9	3	26
1984	1	2	7	13	12	5	40
1985	0	3	5	8	21	8	45

MOOSE

SURVEY-INVENTORY PROGRESS REPORT

GAME MANAGEMENT UNITS: 26B and 26C

GEOGRAPHICAL DESCRIPTION: Central and eastern Arctic Slope

PERIOD COVERED: 1 July 1985-30 June 1986

Season and Bag Limit

See Hunting Regulations No. 26.

Population Status and Trend

Moose surveys were conducted by U.S. Fish and Wildlife Service personnel in the Kavik River drainage in Subunit 26B and in the Canning and Kongakut drainages in Subunit 26C during October 1985. No spring counts were made in 1986. One hundred ninety-four moose were observed in the Kongakut drainage in October 1985 compared with the previous high count of 239 in November 1984. The 201 moose in the Canning drainage were comparable to the previous high of 208 in April 1985, and the number of moose in the Kavik drainage (79) was down from the 96 observed in April 1985. Weather and sighting conditions probably account for most of the variation between the fall 1985 counts and previous high counts. Deep snow concentrates moose in riparian willow stands and increases their visibility. Because little snow accumulated in October 1985, moose were probably overlooked during surveys. Since 1980, calves (short yearlings) have averaged about 15% of the moose population in Subunits 26B and 26C during spring. This level of recruitment is probably sufficient to result in a stable or slightly increasing population. Population counts generally support this conclusion. Minimum populations are probably 450 moose in Subunit 26C and 700 in 26B.

Population Composition

Composition in the 3 count areas was similar, except that the Kavik had slightly fewer yearling males and more calves than the Canning and Kongakut. The combined counts indicate a composition of 30.0% adult males, 7.4% yearling males, 45.4% cows, and 17.3% calves. There were 82 bulls:100 cows and 38 calves:100 cows. These ratios are indicative of a very lightly harvested population with moderate calf survival to fall.

Mortality

The 1985 reported harvest for Subunit 26B was 29 bulls and 9 cows. The harvest for Subunit 26C was 7 bulls and 1 cow. The harvest in 26C was similar to the 1984 harvest, but the take in 26B more than doubled. Most of the increased harvest in 26B was taken by hunters using the Dalton Highway for access. Much of the harvest along the road occurred late in the season, and a high proportion of females was shot (44% of the road area harvest). Comparison of road area harvest (18 total moose) with past counts of moose in the areas easily accessible by three-wheeler or snow machine from the Dalton Highway suggests that nearly 10% of the moose population accessible to the road was shot during 1985.

Alaska residents took 54% of the reported harvest in Subunit 26B and 38% in 26C. Harvest success was 68% in Subunit 26B and 80% in 26C. Mean antler spread for bulls taken in Subunit 26C was 56.3 inches. In Subunit 26B near the Dalton Highway, the mean antler spread of bulls harvested was 38.9 inches, compared with 59.0 inches for moose shot in remote areas away from the Highway. The high antler spread measurements for Subunit 26C and offroad portions of Subunit 26B indicate a trophy-directed harvest of a lightly exploited population. The smaller measurements, along with the high proportion of cows in the road area harvest probably indicate higher exploitation rates, but also reflect the more meat-oriented harvest of late-season road hunters, who presumably take the 1st moose they see.

Nothing is known about natural mortality of moose in the central and eastern arctic. However, the stable to slowly growing trend in moose populations suggests that mortality rates are sufficient to offset most recruitment.

Management Summary and Recommendations

Moose in remote areas of Subunits 26B and 26C are very lightly harvested. However, low yearling recruitment and stable or only slightly increasing populations indicate that higher harvests may not be sustainable. Moose seasons in the area have been determined on the assumption that access is difficult and that this limits the number of hunters. Because the Dalton Highway is officially open to business-related traffic only, it has not been considered a route of access for hunters. In reality, the Dalton Highway is heavily used by hunters. Caribou harvest along the road has doubled every year for the past 4 years and now approaches 700-800. The relatively small Atigun Valley is now the most heavily hunted area in the Brooks Range for sheep. Hunters have finally discovered they can successfully make day hunts for moose by snow machine from the Dalton Highway from October through December. Local game populations are not large enough to sustain higher harvests.

Therefore, it is recommended that the moose season in Subunit 26B be reduced in length to the period 1-30 September. Such a reduction would have no effect on the harvest by hunters using aircraft (who hunt only during September), or on subsistence users (who traditionally hunt areas in Subunits 26A and 26C). If easy access along the Dalton Highway continues and use of three-wheelers cannot be controlled, it may be necessary to limit moose harvest to bulls only in 26B in the near future.

PREPARED BY:

Kenneth R. Whitten
Game Biologist II

SUBMITTED BY:

Jerry D. McGowan
Survey-Inventory Coordinator