ALASKA DEPARTMENT OF FISH AND GAME
JUNEAU, ALASKA

STATE OF ALASKA
Jay S. Hammond, Governor

DEPARTMENT OF FISH AND GAME
James W. Brooks, Commissioner

DIVISION OF GAME
Robert A. Rausch, Director

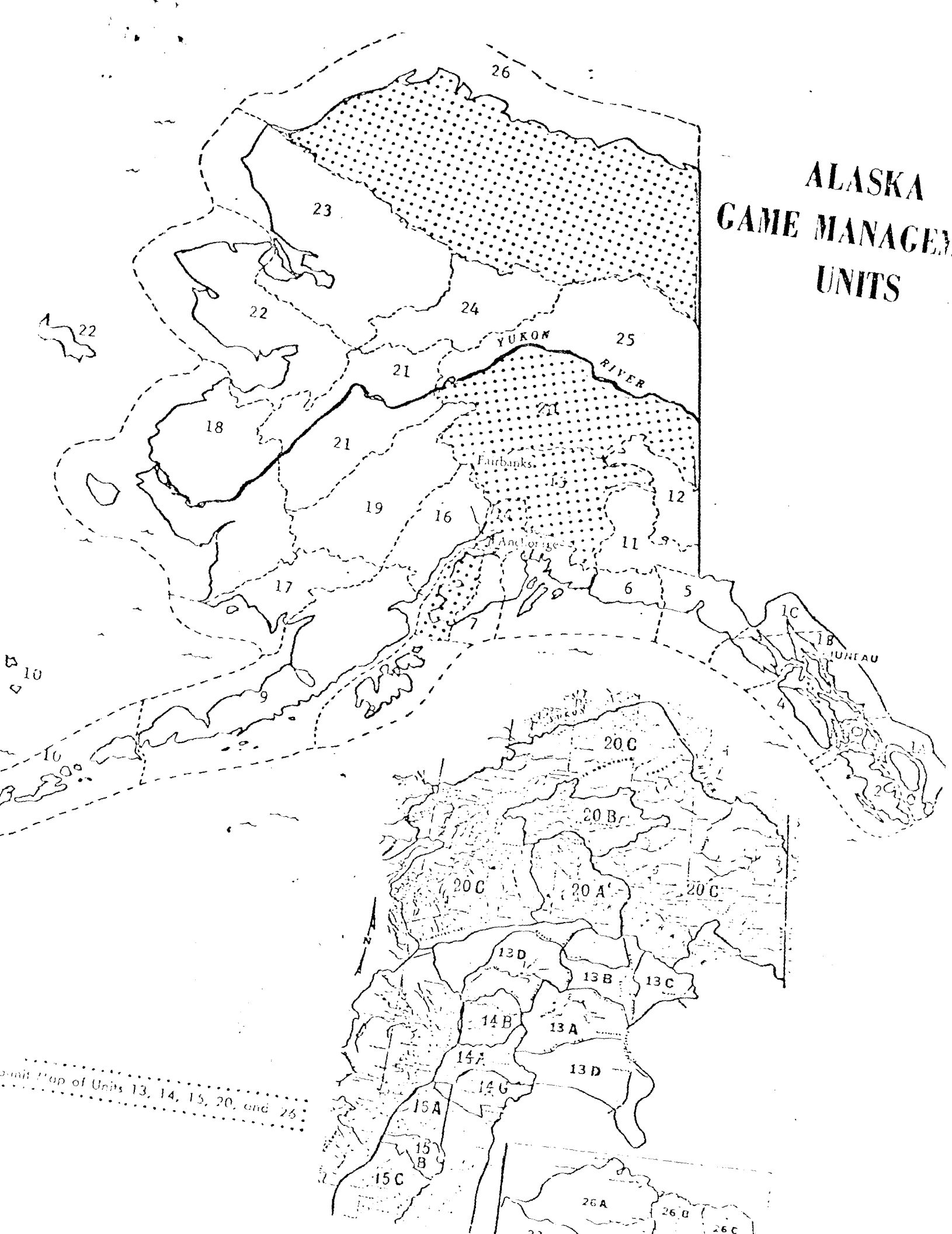
ANNUAL REPORT OF SURVEY-INVENTORY ACTIVITIES
PART II. MOOSE

Edited and compiled by
Donald E. McKnight, Research Chief

Volume VI
Federal Aid in Wildlife Restoration
Project W-17-7, Jobs No. 1 and 22

(Printed April 1976

ALASKA GAME MANAGEMENT UNITS



Insert Map of Units 13, 14, 15, 20, and 26

STATEWIDE HARVESTS AND POPULATION STATUS

Moose

Data derived from the harvest ticket program indicated that 5,638 moose were legally harvested in Alaska during the 1974-75 hunting season. This reported harvest, consisting of 4,349 males, 1,173 females and 116 moose of unreported sex, was considerably less than the previous 5-year average (7,314 moose/year). Unreported harvests in portions of the state where subsistence use of moose is great undoubtedly inflated total harvest figures by several thousand animals.

Harvests in most portions of the state were at low levels reflecting reduced hunting seasons and decreased availability of moose to hunters. Record setting 1973 harvests in Game Management Units 16 and 20 were followed by average or below average harvests in 1974. The 1974 harvest of 705 moose in Game Management Unit 9 was lower than the unit's record harvest in 1973 (839) but was still considerably above the 5-year average harvest for this unit (516 moose/year). Harvests from readily accessible herds in Southcentral Alaska, which were hard hit by successive severe winters in the early 1970's, remained much below average. Game Management Units 13 (Nelchina Basin), 14 (Matanuska Valley) and 15 (Western Kenai Peninusla), for example, produced only 794, 282 and 620 moose, respectively, in 1974. Harvests in Units 14 and 15 were the lowest recorded since the harvest ticket program was initiated in 1963. The Yakutat area (GMU 5), which once produced harvests of 200-300 moose per year, sustained a harvest of only 39 animals in 1974.

Poor calf survival in many areas of the state, particularly in Game Management Units 5, 13, 15 and 20, resulted in slow recovery of moose populations impacted by severe winters in the early 1970's. For some herds (Units 13 and 20A) continued declines seemed to be caused by excessive predation on newly born calves. On the Kenai Peninsula (Units 7 and 15) poor overwinter survival of calves compounded by predation appeared to be suppressing population growth. One bright spot in Alaska's moose situation was continued expansion of herds on the Seward Peninsula (Unit 22) and the Arctic Slope (Unit 26). Overall Alaska moose numbers were probably similar to those of 1973, and continued to be at their lowest levels for several decades.

D.E.M.

1974 Statewide Moose Harvest Data
(from harvest ticket returns)

Game Management Unit	Males	Females	Unreported Sex	Total
1	64	47	6	117
5	15	23	1	39
6	27	21	2	50
7	59	2	3	64
9	520	167	18	705
11	79	43	1	123
12	151	19	3	173
13	768	3	23	794
14	255	22	5	282
15	480	131	9	620
16	336	185	7	528
17	65	2	2	69
18	8	0	0	8
19	164	21	5	190
20	726	318	20	1064
21	176	25	3	204
22	149	72	1	222
23	77	24	3	104
24	68	6	3	77
25	86	25	0	111
26	49	8	0	57
Unknown	27	9	1	37
Total by Sex	4349	1173	116	
TOTAL HARVEST				5638

CONTENTS

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 1B - Southeast Mainland, Cape Fanshaw to Lemesurier Point

Seasons and Bag Limits

Subunit 1B except for Stikine River drainages	Sept. 15 - Oct. 15	One bull
Stikine River drainages	Sept. 15 - Sept. 30* Oct. 10 - Oct. 25	One moose; 30 antlerless moose may be taken by permit only; antlerless moose may be taken from Sept. 15 - Sept. 30 and bull moose only may be taken from Oct. 10 - Oct. 25.

*Seasons and bag limits were changed by field announcement on August 8, 1974 to read:

Stikine River drainages	Sept. 15 - Oct. 15	One bull

Harvest and Hunting Pressure

Although the Stikine River antlerless moose permit hunt was cancelled, 343 qualifying applications had been received in Wrangell prior to the cancellation.

Hunter harvest report data indicate 200 hunters hunted moose in Subunit 1B, 24 of whom (12%) were successful in taking one moose during the 1974 bulls-only season. Twenty moose (18 bulls, 1 cow and 1 unspecified) were taken in the Stikine River area and four bulls were taken in the Thomas Bay area.

Fish and Game personnel monitored the moose harvest on the Stikine River by periodically contacting hunters in the field and at most of 38 known campsites throughout the season. Based on these contacts and actual kill inspections it was estimated that 150 hunters killed 24 bulls 18 of which were taken during the first 2 weeks. As a result of high water during the last week of the season very few hunters were in the field. The water level on the Stikine River rose to a 10-year high on October 8 inundating the bottom lands and flooding out many campsites.

A Canadian guide working within 8 miles of the border reportedly took 17 moose.

Composition and Productivity

Aerial composition surveys were conducted in the Stikine River area between August 8, 1974 and April 3, 1975 (Appendix I).

The percentage of calves in the herd remained stable between counts conducted in November 1974 and March 1975, however, in April the calf percentage decreased to 11 percent from the 26 percent seen in March. The reduction primarily involved a lower number of cows with calves, from 25 to 8 in March and April, respectively. Since the number of adults without calves remained stable (22 in March and 54 in April) and only two mortalities were observed (one a wolf kill) during both surveys, it seems unlikely that significant mortality occurred only in one segment (cows with calves) of the population. This reduction is believed to be a result of overall conditions and timing of the survey rather than a loss of moose during this period.

Ages of 13 hunter-killed bulls were determined using the tooth wear and replacement method. The 1974 sample consisted of 54 percent yearlings and 46 percent 2-year-old or older bulls. Of 11 bulls in 1973, 54 percent were yearlings and 36 percent 2 year olds (note: 1973 sample aged by counting annual cementum rings of incisorform teeth).

For the purpose of documentation the ovarian analyses of 16 cow moose killed during the 1973 Stikine River antlerless permit hunt are included in this report (Appendix II). Only one ovary was available from six of these moose.

Copora lutea were present in four cows killed on September 21, September 29, September 15-30 and October 13. Ten additional cows had developing follicles. In 1972 one of the 15 sets of ovaries had corpora lutea present from a cow killed on September 30, four sets contained only one ovary for which analyses were inconclusive and all others had developing follicles.

Management Summary and Recommendations

Data collected prior to the 1974 Stikine River hunting season supported the continuation of an antlerless season in conjunction with a later bulls-only season. The cancellation of these seasons (due to public opposition) will make it difficult to evaluate the potential of this herd and the impact of either-sex hunting. Basically the opposition was against the antlerless season, contending that if cows were allowed to be harvested for a third year it would critically damage the female breeding stock.

Though the seasons are similar to 4 years ago with a 1-month (Sept. 15 -Oct 15) bulls-only season, public support for a periodic antlerless season is building. There is very little support for consecutive year antlerless seasons.

The effects of the 1974 bull harvest on the following year's calf production will be evaluated after the post-season surveys are conducted in 1975. The 1974 harvest of 24 bulls compares closely with the 22-year Stikine River average of 25.9 bulls per year.

PREPARED BY:

David Zimmerman
Game Biologist II

SUBMITTED BY:

Robert E. Pegau
Regional Research/Management Coordinator

APPENDIX I

Moose, Sex and Age Composition Aerial Count Summaries for the Regulatory year 1974-75, Stikine River, GMU 1B, Southeastern Alaska.

SURVEY DATE	TOTAL MM	FF W/O	FF W/1	FF W/2	TOTAL FF	ADULTS UNID. SEX	TOTAL CALVES	TOTAL SAMPLE	SURVEY TIME (HRS.:MINS.)
8-7-74	1	11	8	1	20		10	31	2:00
11-20,21 25-74	0	43	21	5	69	25	31	125	3:49
3-3-75			23	2	25	52	27	104	3:25
4-3-75			8	0	8	54	8	70	3:20

1974-75 Sex and Age Ratios - Stikine River, GMU 1B

SURVEY DATE	TWINS PER 100 FF W/CALVES	CALF % IN HERD	TOTAL SAMPLE	MOOSE PER HOUR
8-7-74	11.1	32.3	31	15.5
11-20,21, 25-74	19.2	24.8	125	27.2
3-3-75	8.0	26.0	104	36.5
4-3-75		11.4	70	21.0

PREPARED BY: DAVE ZIMMERMAN, GAME BIOLOGIST II

APPENDIX II

Ovarian Analysis of Moose from Stikine River, G.M.U. 1B
September 15 - October 13, 1973. Southeastern Alaska.

Accession #	Date of Kill	Cem. Age	Ovary	CL	CA	DF	Remarks
81917	9-15-73	2	#1	0	0	1	
			#2	0	0	1	
81918	9-15-73	UNK	#1	0	0	1	small ovary
			#2	0	0	1	small ovary
81919	9-15-73	2	#1	0	0	2	
			#2	0	0	1	
81922	9-16-73	6	#1	0	1	1	one ovary
81923	9-16-73	UNK	#1	0	0	0	one ovary & small
81925	9-20-73	14	#1	0	8	2	one ovary
81927	9-21-73	14	#1	2	5	0	one ovary
81928	9-21-73	9	#1	0	7	1	
			#2	0	6	1	
81930	9-21-73	12	#1	0	7	0	poor speciman
			#2	0	7	2	
81931	9-24-73	12	#1	0	3	2	
			#2	0	7	0	
81932	9-27-73	CALF	#1	0	0	2	
			#2	0	0	2	
81933	9-29-73	9	#1	2	7	0	C.L. developing
			#2	0	6	0	
81934	9-29-73	7	#1	0	6	0	one ovary
81935	9-15/30-73	7	#1	0	2	2	one ovary
81936	9-15/30-73	UNK	#1	1	5	0	
			#2	0	3	0	
81937	10-13-73	11	#1	1	6	0	
			#2	1	8	0	

CL = Corpora lutea, CA = Corpora albicantia, DF = Developing follicle.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 1C - Juneau

Seasons and Bag Limits

Subunit 1C, except Berners Bay drainages	*Sept. 15-Sept. 30 Oct. 10-Oct. 25	*One moose; 30 antlerless moose may be taken by permit only; antlerless moose only may be taken from Sept. 15-Sept. 30 and bull moose only may be taken from Oct. 10-Oct. 25.
*Season was changed by Commissioner's announcement	Sept. 15-Oct. 15	One bull
Berners Bay drainages	Sept. 15-Oct. 15	One moose; by permit only

Harvest and Hunting Pressure

The 1974 harvest of 33 moose was the lowest since 1963 (Appendix I) and included 10 bulls from the Taku River drainage and 9 bulls and 11 cows from Berners Bay and 3 bulls from the Chilkat Range. Hunter success for Berners Bay was 47.6 percent compared to 78.6 percent in 1973. For the remainder of Subunit 1C hunters had 14.8 percent success in 1974 compared to 21.6 percent in 1973.

Composition and Productivity

Sex and age composition surveys were conducted within the Taku and Berners Bay drainages in November and December (Appendix II). The total of 84 moose counted included 39 from the Taku drainage and 45 in the Berners Bay area. In 1973 the total count was 111 moose with 23 from the Taku drainage and 88 from the Berners Bay area. The Taku herd's bull:cow ratio of 6.7:100 was low, but similar to ratios recorded for this herd during the last 12 years. The ratio for Berners Bay was 17.2 bulls:100 cows compared to 13.8 bulls:100 cows in 1973. The calf:cow ratios in the Taku and Berners Bay herds in 1974 remained very similar to those of 1973.

No age data were available for the Taku herd. Eight of the 20 moose harvested at Berners Bay were aged by counting annual cementum lines (Appendix III). Ages of two harvested cows were 6 and 10 years. The mean age for cows (8.0 years) can not be compared to past years because of the small sample size. The mean age for bulls was 1.2 years, a decrease from 1973 but similar to past years. From 1963 through 1971 the Berners Bay herd was regulated by a bulls-only season.

Management Summary and Conclusions

The Berners Bay herd originated from transplants of 21 calves in 1958 and 1960. Potential moose habitat was, and remains, limited. The population increased rapidly and bull hunting was first allowed in 1963.

By 1969, it was apparent that the sex ratio was becoming distorted with too few bulls to assure good reproduction. Limited either-sex harvests have been allowed since 1971.

The Taku River herd has been regulated by a one-month hunting season for bulls only with annual harvests ranging from 10 to 30 animals. It is evident that hunters are now capable of harvesting most of the bulls on the Alaskan side plus affecting a noticeable drop in the number of bulls in the adjacent Canadian portion. Productivity will probably drop if hunters continue to harvest only bull moose in the Taku drainage.

Three different aerial surveys of the Berners Bay herd (two airplane and one helicopter) were conducted on December 6, 1974, January 14 and February 29, 1975 giving counts of 45, 50 and 48 animals, respectively. A count of 50 animals would represent a herd reduction of 39 percent from previous counts (average=82 animals) under similar conditions in 1971, 1972 and 1973. Several wolf sightings were reported for the winter of 1974-75 in Berners Bay. Brown bear numbers are high and human/bear encounters are numerous. Snow depths of three to four feet were measured in two locations on Berners River and one location on the Lace River in Berners Bay on February 28, 1975. The season should be closed until the observed population reaches 80 animals.

The Taku and Chilkat Range moose herds (Subunit 1C excepting Berners Bay) are still managed by a bulls-only harvest. The Chilkat Range moose herd consists of only 10 to 20 animals, ranging from the Sullivan River to St. James Bay, of which no significant hervest has been recorded. The Taku herd, like the Stikine River herd further south, has an interchange of some moose between Canada and Alaska. About 10 to 30 bulls are taken each year from the Taku herd; this bulls-only harvest for a long period has resulted in low bull:cow and calf:cow ratios, and most animals taken are less than two years old. Either-sex hunting would balance sex ratios and probably result in increased productivity.

PREPARED BY:

David A. Johnson
Game Biologist III

SUBMITTED BY:

Robert E. Pegau
Regional Research/Management Coordinator

APPENDIX I

Moose Harvest and Hunting Pressure-Unit 1C-Berners Bay

Year	Male	Female	Total	Hunters	Success Percentage
1963	3	-	3	-	-
1964	6	-	6	-	-
1965	11	-	11	-	-
1966	10	-	10	61	16.4
1967	18	-	18	-	-
1968	21	-	21	-	-
1969	14	-	14	-	-
1970	10	-	10	-	-
1971*	3	20	23	28	82.1
1972*	5	17	22	35	62.9
1973*	15	18	33	42	78.6
1974*	9	11	20	42	47.6

*Harvest as reported by permittees.

Moose Harvest-Unit 1C-Remainder of Unit 1C

Year	Male	Hunters	Success Percentage
1959	19	-	-
1960	27	-	-
1961	24	-	-
1962	34	-	-
1963	15	-	-
1964	35	101	34.7
1965	25	-	-
1966	29	69	42.0
1967	30	73	41.1
1968	14	-	-
1969	17	-	-
1970	14	-	-
1971	19	-	-
1972	26	-	-
1973	30	139	21.6
1974	13	88	14.8
1974*	10	-	-

*Taku kill separated out

Prepared by: David A. Johnson Game Biologist III, Warren Ballard, Game Biologist II

APPENDIX II

Moose sex and age ratios

BERNERS BAY

Total	Total MM per 100 FF	Small MM per 100 FF	Small MM per 100 Large MM	Small MM % in Herd	Small MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/Calf	Calf % in Herd	Animals per Hour	Total Sample
1960	-	-	-	-	-	-	-	50.0	-	8
1961	-	-	-	-	-	-	-	6.3	-	17
1962	200.0	-	-	-	-	33.3	-	10.0	13.0	20
1963	-	-	-	-	-	-	60.0	32.0	-	25
1964*										
1965	-	-	-	-	-	-		35.1	19.2	37
1966*										
1967*										
1968	23.5	20.6	700.0	10.4	56.0	73.5	38.9	37.3	25.8	67
1969	9.6	0.0	0.0	0.0	0.0	19.2	11.1	14.9	83.8	67
1970	4.7	1.6	50.0	1.3	22.2	14.1	28.6	11.8	24.5	76
1971	7.1	2.4	50.0	1.5	9.1	52.4	5.0	32.8	26.8	67
1972	20.0	14.5	266.6	8.8	64.0	45.5	27.8	27.5	33.7	91
1973	13.8	5.2	60.0	3.4	27.3	37.9	10.5	25.0	33.8	88
1974	17.2	13.8	400.0	8.9	72.7	37.9	0.0	24.4	23.7	45

*Insufficient data in 1964, 1966 and 1967

TAKU RIVER

Year	Total MM per 100 FF	Small MM per 100 FF	Small MM per 100 Large MM	Small MM % in Herd	Small MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/Calf	Calf % in Herd	Animals per Hour	Total Sample
1961	-	-	-	-	-	-	-	-	-	38
1962	2.9	-	-	-	-	17.1	-	14.3	-	42
1963	-	-	-	-	-	-	-	8.5	23.6	59
1964-68*										
1969	10.0	0.0	0.0	0.0	0.0	55.0	21.4	32.8	41.9	67
1970	6.3	0.0	0.0	0.0	0.0	50.0	23.1	32.0	20.0	50**
1971*										
1972	8.8	3.5	66.6	2.2	13.3	52.6	20.8	32.6	30.0	92
1973	5.5	5.5	N/A	4.3	50.0	22.2	0.0	17.4	7.1	23
1974	6.7	3.3	100.0	2.6	28.6	23.3	0.0	17.9	13.1	39

*Insufficient data ** 1/3 of area not surveyed

Prepared by: David A. Johnson, Game Biologist III and Warren Ballard, Game Biologist II

Moose - GMU - Juneau

APPENDIX III

1971, 1972 and 1973 Cementum Age Data, Unit 1C - Berners Bay

Age Structure Given in Percentages
Calves Not Included in Mean Ages

	Males					Females			
Age	1971	1972	1973	1974	Age	1971	1972	1973	1974
C	33.3	-	-	33.3	C	-	-	-	-
1	33.3	80.0	23.1	33.3	1	13.3	33.3	13.3	-
2	33.3	20.0	23.1	16.7	2	33.3	8.3	26.7	-
3	-	-	15.4	16.7	3	13.3	41.7	6.7	-
4	-	-	15.4	-	4	6.7	16.7	6.7	-
5	-	-	15.4	-	5	6.7	-	13.3	-
6	-	-	7.7	-	6	6.7	-	13.3	50.0
7	-	-	-	-	7	6.7	-	20.0	-
8	-	-	-	-	8	6.7	-	-	-
9	-	-	-	-	9	-	-	-	-
10	-	-	-	-	10	-	-	-	50.0
11	-	-	-	-	11	-	-	-	-
12	-	-	-	-	12	6.7	-	-	-
Mean	1.5	1.2	3.0	1.2		4.0	2.4	4.0	8.0
Sample Size	3	5	13	6		15	12	15	2

Prepared by: David A. Johnson, Game Biologist III,
Warren Ballard, Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 1D - Haines

Seasons and Bag Limits

Sept. 15 until closed by Commissioner's announcement.	One moose; by registration hunt.

Harvest and Hunting Pressure

The harvest of 62 moose in 1974, as determined from harvest ticket data, was the smallest since 1960 (Appendix I). Males comprised 34 percent, females 60 percent and unknown 6 percent of the harvest. Hunter success was 18 percent in 1974 compared to 23 percent in 1973 and 28 percent in 1972. The 1974 season lasted 5 days compared to 30-day seasons in previous years.

Composition and Productivity

Sex and age composition surveys were conducted in December 1974 (Appendix II). The total 206 moose observed was similar to total counts for 1971 through 1973 but 37 percent less than the 329 moose average for surveys made from 1965 through 1968 with count times varying from 2.1 to 6.2 hours. The bull:cow ratio (22:100) was an increase over ratios recorded for the last 5 years. This could be the result of a proportionately smaller harvest of bulls this year compared to the past 13 years. Production and survival showed a marked increase; the ratio of small males/100 cows was the highest recorded since 1966 and the ratio of calves:100 cows (30.4:100) was greater than average ratios recorded for the last three years.

The age structure was determined from 69 percent of the cows and 67 percent of the bulls harvested in 1974 (Appendix III). The majority of the animals killed were in the one-year-old age class, similar to harvests of 1972 and 1973.

Management Summary and Conclusions

Based on harvest statistics, there was an increase in the mean age of females taken from the Haines herd during 1974. Either-sex hunting has been allowed in Subunit 1D since 1964. Approximately 100 moose have been taken each year, except 1974, with males comprising a higher proportion of the harvests.

Population size appears to be lower than it was during the late 1960's. Bull:cow ratios were higher for 1974 and calf survival increased. All indications point to a more balanced herd. A harvest of 50 moose of either sex managed by hunter registration should be continued for the 1975 season.

PREPARED BY:

David A. Johnson and Warren Ballard
Game Biologist III Game Biologist II

SUBMITTED BY:

Robert E. Pegau
Regional Research/Manageme

Moose - GMU 1D - Haines

APPENDIX I

Moose Harvest

Year	Male	Female	Sex Unknown	Total	Hunters	Percent Success
1959	39	-	-	39	-	-
1960	45	-	-	45	150	30.0
1961	63	-	-	63	124	50.8
1962	66	-	-	66	-	-
1963	81	-	-	81	-	-
1964	79	65	2	146	272	53.7
1965	66	34	1	101	-	-
1966	92	60	-	152	261	58.2
1967	90	47	-	137	-	-
1968	82	61	2	145	-	-
1969	52	24	2	78	-	-
1969*	62	41	-	103	-	-
1970	48	48	-	96	-	-
1971	67	30	-	97	318	30.5
1971*	NA	43	-	NA	-	-
1972	46	45	1	92	325	28.3
1973	69	46	-	115	501	23.0
1974	21	37	4	62	343	18.1
1974*	18	40	-	58	454	12.8
1974**	22	42	1	65	NA	NA

*Haines check station data.

** Combined data of check station and harvest ticket.

Prepared by: David A. Johnson, Game Biologist III

Warren Ballard, Game Biologist II

Moose - GMU 1D - Haines

APPENDIX II

Moose Sex and Age Ratios - Haines - Unit 1D

Year	Total MM per 100 FF	Small MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/Calf	Calf % in Herd	Moose per Hour	Total Sample
1962	5.9	-	-	-	-	29.1	-	21.5	-	181
1963	-	-	-	-	-	-	-	18.7	-	193
1964*										
1965	41.2	15.5	60.5	6.6	63.0	49.3	19.2	20.9	116	349
1966	33.3	15.9	91.7	7.5	46.3	68.8	21.8	32.2	140	295
1967	28.9	12.7	78.6	7.4	58.7	43.4	8.9	25.2	106	298
1968	19.4	9.9	104.2	6.7	69.4	28.5	8.1	19.2	85	374
1969	25.3	0.0	0.0	0.0	0.0	34.1	10.7	21.4	69	145
1970*										
1971	15.9	8.8	125.0	6.5	88.2	20.0	9.7	14.7	47	231
1972	18.5	4.5	32.0	3.0	28.6	31.5	10.0	20.9	42	267
1973	15.9	4.8	42.9	4.7	40.0	23.8	10.3	17.0	60	264
1974	22.2	13.3	150.0	8.7	87.8	30.4	7.9	19.9	33	206

* Not sufficient data.

Prepared by: David A. Johnson, Game Biologist III and Warren Ballard, Game Biologist II,

Moose - GMU 1D - Haines

APPENDIX III

1970, 1971, 1972 and 1973 Cementum Age Data

Age Structure Given in Percentages
Calves Not Included in Mean Ages

	Males						Females				
Age	1970	1971	1972	1973	1974	Age	1970	1971	1972	1973	1974
Calf	4.2	-	-	10.5	12.5	Calf	-	10.0	4.5	16.1	10.3
1	20.8	36.4	87.5	31.8	37.5	1	16.7	15.0	36.4	29.0	20.7
2	29.2	45.5	12.5	10.5	31.3	2	27.8	25.0	27.3	-	10.3
3	12.5	9.1	-	15.8	12.5	3	22.2	10.0	13.6	16.1	10.3
4	16.7	-	-	5.3	-	4	5.6	10.0	9.1	6.5	3.5
5	4.2	-	-	10.5	-	5	11.1	5.0	-	9.7	3.5
6	-	-	-	-	-	6	5.6	5.0	4.5	16.1	10.3
7	4.2	-	-	-	-	7	-	5.0	-	-	6.9
8	4.2	-	-	10.5	-	8	-	-	-	3.2	-
9	4.2	9.1	-	5.3	6.2	9	5.6	10.0	-	-	-
10	-	-	-	-	-	10	-	-	-	-	6.9
11	-	-	-	-	-	11	-	-	4.5	-	3.5
12	-	-	-	-	-	12	-	-	-	3.2	-
13	-	-	-	-	-	13	-	-	-	-	-
14	-	-	-	-	-	14	-	10.0	-	-	10.3
15	-	-	-	-	-	15	5.6	-	-	-	-
16	-	-	-	-	-	16	-	-	-	-	-
17	-	-	-	-	-	17	-	-	-	-	3.5
Mode	2	2	1	1	1		2	2	1	1	1
Mean	3.2	2.4	1.1	3.1	1.9		3.8	4.3	2.2	3.1	5.2
Sample Size	24	11	8	19	16		.8	20	22	31	29

Prepared by: David A. Johnson, Game Biologist III

Warren Ballard, Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 5 - Yakutat

Seasons and Bag Limits

That portion of Unit 5 lying north of Nunatak and Russell Fiord from east Nunatak Glacier and including the area west of Yakutat Bay.	Oct. 15 until closed by Commissioner's announcement.	One moose; by registration hunt.
Remainder of Unit 5	No open season	

Harvest and Hunting Pressure

In 1974 only the Malaspina Forelands and Russel Fiord areas were open for moose hunting. The harvest of 39 animals, according to harvest tickets, was the lowest on record since either-sex hunting was initiated (Appendix I). The harvest trend has been downward since 1969. Males constituted 38 percent (15) of the total harvest in 1974 and a kill of 23 cows was reported. The total harvest was 59.4 percent less than in 1973 (96) for the same open areas.

According to check station data a total of 136 hunters registered for the 47 day hunt (closed Nov. 30 by Commissioner's announcement) in which 100 hunters actually entered the field. The breakdown of residency and success for these 100 hunters follows: Juneau, 66 hunters taking 21 moose; Yakutat, 24 hunters taking 14 moose; Sitka, 4 hunters taking 2 moose; Ketchikan, 3 hunters taking 2 moose and nonresidents, 3 hunters taking 2 moose. Hunter success was 41.0 percent according to check station data and 42.4 percent success by harvest ticket data. All hunters checked in at the end of the hunt.

Composition and Productivity

Sex and age composition surveys were conducted within established count areas in November 1974 and March 1975 (Appendices II and III). Generally, sample sizes were similar to previous surveys made since fall 1972 indicating no significant change in herd size. The Yakutat Forelands sample size of 131 moose was lower than a similar count of 278 moose in 1973. Surveys for the Malaspina Forelands have not been comparable, thus sample sizes will not demonstrate subtle population trends. The Yakutat Forelands ratio of 26.6 bulls:100 cows was the highest since 1970. The Malaspina Forelands ratio of 32.4 bulls:100 cows was similar to the 1973 ratio of 32.8 bulls:100 cows. Production increased in both areas with 36.7 calves:100 cows on the Yakutat Forelands and 39.4 calves:100 cows on the Malaspina Forelands.

The winters of 1973-74 and 1974-75 were moderate in comparison to the winters of 1971-72 and 1972-73 which were very severe. Accumulated snow depth was over 30 inches for 68 days during winter 1972-73 and for 156 days during winter 1971-72. Coinciding with the severe winters of 1971-72 and 1972-73 were low calf and bull survival (revealed by the 1972 and 1973 fall sex and age composition data).

Age structure was determined from 90.2 percent of the moose harvested (Appendix IV). The Malaspina Forelands herd showed a broad age distribution with the majority in the two to eight-year-old age classes for both sexes indicating a healthy herd.

Management Summary and Conclusions

Moose first emigrated to the Yakutat Forelands from Canada during the 1930's and early 1940's. The population grew slowly at first and then increased rapidly until it peaked in the early 1960's. Since then, the population has shown a downward trend toward the actual carrying capacity of the range. Fall sex and age composition surveys indicate that poor calf survival is one of the responsible factors. The severe winters of 1971-72 and 1972-73 also had an impact on the herd. Moose browse photo-repeat stations on the Yakutat Forelands were reexamined and they revealed that most browse plant species have recovered from the over-utilization which was recorded during a similar survey in 1970.

The Malaspina Forelands moose population is relatively recent with the first moose being reported in the late 1950's. The population increased rapidly and appears to have approached the carrying capacity of its range. During the winter of 1971-72 most of the calf crop was lost.

The Yakutat Forelands population is now below the carrying capacity of its range but herd composition seems to be improving with an increase in the ratio of bulls and calves:100 cows. This area will have no hunting season for the fall of 1975, which should allow herd size to increase.

The Malaspina Forelands moose herd is utilizing much of its available habitat, weather is less severe than on the Yakutat Forelands and wolf predation is nonexistent. The Russell Fiord moose herd is small, about 100 animals, and has not been utilized. The Malaspina Forelands and Russell Fiord herds will be combined under one hunting season regulation in which 25 bulls may be harvested during the fall of 1975.

PREPARED BY:

David A. Johnson
Game Biologist III

SUBMITTED BY:

Robert E. Pegau
Regional Research/Management Coordinator

APPENDIX I

Moose Harvest and Hunting Pressure - GMU 5 - Yakutat

YEAR	BULLS	COWS	UNID.	TOTAL	HUNTERS	% SUCCESS
1959	-	-	-	55	-	-
1960	87	2	-	89	150	59.3
1961	-	-	-	-	-	-
1962	175	75	-	250	263	95.0
1963	189	111	2	302	-	-
1964	153	111	-	264	408	64.7
1965	153	125	4	282	-	-
1966	116	90	6	212	315	67.3
1967	154	108	1	263	426	61.7
1968	177	133	3	313	-	-
1969	163	161	-	324	514	63.0
1970	141	140	7	288	476	60.5
1971	104	124	2	230	472	48.7
1972	76	85	1	162	389	41.6
1973	94	51	2	147	387	38.0
1974*	15	23	1	39	92	42.4
1974**	16	25	0	41	100	41.0

* Malaspina Forelands and Russell Fiord area only, harvest ticket data.
**Malaspina Forelands and Russell Fiord area only, check station data.

Prepared by: David A. Johnson, Game Biologist III and Warren Ballard, Game Biologist II

APPENDIX II

Moose Sex and Age Ratios - GMU 5 - Yakutat Forelands

Year	Total MM per 100 FF	Small MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/Calf	Calf % in Herd	Moose per Hour	Total Sample
1959	111.0	50.7	84.1	20.8	308.3	32.9	-	15.6	71	178
1960*	79.8	9.1	-	4.4	-	28.2	16.7	13.6	-	206
1961-64*	-	-	-	-	-	-	-	-	-	-
1965	52.5	10.3	24.4	5.8	79.5	25.9	5.4	14.5	40	537
1966	42.3	6.2	17.1	3.9	75.0	16.5	7.9	10.4	-	924
1967	30.9	8.0	35.0	5.2	73.7	21.7	9.4	14.2	107	667
1968	52.6	13.0	32.8	5.1	66.1	39.3	6.2	15.4	88	784
1969	21.3	3.2	17.5	2.4	49.1	12.9	9.6	9.6	38	593
1970**	31.3	9.2	41.7	5.2	41.7	44.2	20.7	24.8	26	290
1971**	19.3	6.3	48.3	4.2	41.2	30.5	20.4	20.4	43	334
1972**	14.7	.7	5.3	.6	15.4	9.6	8.3	7.7	30	169
1972***	-	-	-	-	-	-	-	7.1	30	382
1973	14.4	5.6	63.2	4.3	75.0	14.9	3.2	11.5	22	278
1974+	26.6	8.9	50.0	5.3	48.3	36.7	3.8	22.1	25	131
1975 Spring	-	-	-	-	-	-	-	17.6	34	330

* Insufficient data.
** Only half of area surveyed.
*** No sex differentiation made.
\+ No snow.

Prepared by: David A. Johnson, Game Biologist III and Warren Ballard, Game Biologist II,

APPENDIX III
Moose Sex and Age Composition

MALASPINA FORELANDS

	Total MM per 100 FF	Small MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF W/Calf	Calf % in Herd	Moose per Hour	Total Sampl
1961*	-	-	-	-	-	-	-	-	24	40
1969**	95.0	3.3	3.6	1.5	28.6	23.3	0.0	10.7	32	131
1970Spring***	-	-	-	-	-	-	-	32.7	36	297
1970**	81.0	32.2	66.1	14.1	141.8	45.5	38.5	19.9	38	276
1971	77.5	11.7	17.8	5.5	66.7	34.1	26.7	16.5	64	236
1972	54.0	1.0	1.9	0.6	66.7	3.0	0.0	1.9	24	157
1973Spring***	-	-	-	-	-	-	-	7.6	9	119
1973	32.8	4.5	15.8	2.7	29.3	30.6	11.8	18.7	26	219
1974Spring***	-	-	-	-	-	-	-	11.3	26	159
1974	32.4	8.5	35.5	4.9	42.9	39.4	33.3	23.0	25	122
1975Spring***	-	-	-	-	-	-	-	20.4	27	186

*Sitkagi to Bancas Point
**Area was not completely surveyed
***No sex differentiation made

RUSSELL FIORD

Year	Total MM per 100 FF	Small MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF W/Calf	Calf % in Herd	Moose per Hour	Total Sample
1972	35.3	5.9	20.0	3.2	25.0	47.1	0.0	25.8	103.3	31
1973Spring	-	-	-	-	-	-	-	32.0	68.5	50
1973	24.2	6.1	33.3	2.9	14.8	81.2	35.0	39.7	68.0	68
1974Spring	-	-	-	-	-	-	-	9.1	88.0	44
1974	30.0	15.0	100.0	7.7	46.2	65.0	44.4	33.3	41.1	39
1975Spring	-	-	-	-	-	-	-	-	25.6	40

*Too windy to get age. Hubbard Glacier portion of area not covered.

Prepared by: David A. Johnson, Game Biologist III and W. Ballard, Game Biologist II

APPENDIX IV

1972 and 1973 Cementum Age Data - GMU 5 - Malaspina Forelands

Age Structure Given in Percentages
Calves Not Included in Mean Ages

	Males				Females		
Age	1972	1973	1974	Age	1972	1973	1974
Calf	-	-	7.1	Calf	-	6.7	8.7
1	33.3	-	7.1	1	18.7	-	13.0
2	16.7	15.8	14.3	2	12.5	13.3	13.0
3	25.0	10.5	28.6	3	25.0	20.0	4.3
4	8.3	26.3	7.1	4	12.5	26.7	-
5	8.3	15.8	7.1	5	12.5	13.3	4.3
6	-	21.1	-	6	-	6.7	17.4
7	-	5.3	14.3	7	-	6.7	8.7
8	-	5.3	-	8	-	-	13.0
9	8.3	-	7.1	9	6.3	6.7	8.7
10	-	-	-	10	6.3	-	-
11	-	-	-	11	-	-	8.7
12	-	-	7.1	12	-	-	-
13	-	-	-	13	6.3	-	-
Mode	3	4	3		3	4	6
Mean	2.9	4.5	4.4		4.3	4.1	5.2
Smpl. Size	12	19	14		16	15	23

Prepared by: David A. Johnson, Game Biologist III and Warren Ballard, Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 6 - East of Copper River (Martin River Area)

Season and Bag Limits

August 20 - November 30	One moose by permit; conditions and number of permits will be described by Commissioner's announcement.

The conditions of this permit hunt were: (1) any person could obtain a permit at the Cordova Fish and Game office from August 1 throughout the season; (2) the harvest was restricted to approximately 20 bulls and (3) successful hunters were required to report their kill within 5 days.

Harvest and Hunting Pressure

The 1974 moose harvest east of the Copper River was 18 bulls. Two bulls were taken from the islands in the lower Copper River which were suspected to be from the moose herd west of the Copper River, and one bull was taken east of Bering River (Appendix I).

A total of 258 persons registered to hunt east of the Copper River. This is an increase in the number registered (213 in 1973), but may not reflect actual hunting pressure. The law prohibiting the taking of big game the same day airborne restricted hunting pressure east of the Copper River. Only two of the 18 moose were taken with the aid of aircraft. The Copper River Highway was not open until the latter part of the season. Methods of transportation by successful hunters were: aircraft 2, auto 3, boat 3 and airboat 10.

Composition and Productivity

Monthly moose surveys were flown in the Martin River count area as part of a collared moose study (Appendix II). Two spring flights indicated calf survival through the winter of 1973-74 was excellent. The April and May calf or short yearling percentages (19.5 & 15.3) compared favorably with the previous fall's calf percentage of 15.9.

Calf production during 1974 was excellent. Approximately 50 calves per 100 cows were produced and roughly 30 percent of the herd were calves. Survival of the 1974 calf crop through mid-winter also appears to be excellent (Appendix II).

A good sex and age composition count was not obtained prior to the bulls shedding their antlers. The February 28, 1975 survey was used for comparison with previous sex and age composition counts because of the larger sample size (151), and because it better reflects the calf crop (Appendix III). The bull-cow ratio is approximately 40 per 100 (Appendix II).

Cementum age data were obtained on all 18 moose harvested. Yearlings constituted a third of the harvest (Appendix IV).

Known mortality in the Martin River area from causes other than hunting was nine moose. Three dead moose in Controller Bay were also reported.

Management Summary and Conclusions

The 1974 harvest of 18 bulls was a modest harvest designed to allow the herd to increase. As shown in the numerous surveys flown, calf production and survival from spring through mid-winter was excellent. The herd appears to be responding as desired. Hopefully one additional season with a limited bull harvest will allow the herd to reach the desired size of approximately 175 countable moose.

It should be noted that access continues to be a major obstacle for hunters and may prove to be a management problem if it becomes necessary to harvest a larger number of moose from the Bering River - Controller Bay area. The law prohibiting taking moose the same day airborne hindered access as illustrated by the length of the 1974 season (3 1/2 months) vs the 1973 season (6 days).

Recommendations

Retain the current season and bag limits.

PREPARED BY:

Julius Reynolds
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Supervisor

APPENDIX I

Moose Harvest, Unit 6 - East of the Copper River - Martin River Area

Year	Bulls	Cows	Unid.	Total
1965	8	0	0	8
1966	3	0	0	3
1967	14	0	0	14
1968	15	0	0	15
1969	27	7*	0	34
1970	75**	26*	0	101
1971	39*	37*	0	76
1972	34*	32*	0	66
1973	17*	0	0	17
1974	18*	0	0	18

* Number reported to Cordova Fish and Game office by permit hunters.

** Estimated harvest. Harvest report data was 23 bulls.

PREPARED BY: Julius Reynolds

APPENDIX II

Moose Sex & Age Ratios - Unit 6 - East of the Copper River

Year	Date	Males per 100 Females	Yearling % in Herd	Calves per 100 cows	Calf % in Herd	Twins per 100 Females w/c	Sample Size
1974	April 26		19.5				82
	May 22	36.4	15.3	15.2	8.5		59
	June 10	43.8	-	93.8	39.5		38
	June 27	66.7	7.4	41.7	18.5		27
	Oct. 8*	31.4		60.0	31.3	16.7	67
	Nov. 6	41.8		43.6	23.5	14.3	102
	Dec. 26			50.0	30.1	21.2	136
1975	Jan. 27				28.5	12.1	137
	Feb. 28				30.5	18.9	151
	Apr. 24				26.2	11.8	145

* 18 bulls removed during hunting season, August 20 - November 30.

PREPARED BY: Julius Reynolds

APPENDIX II CONTINUED

Moose Sex & Age Data - Unit 6 - East of the Copper River

Date	Large Males	Small Males	Total Males	Females W/O	Females W/1	Females W/2	Total Females	Total Adults	Lone Calves	Total Calves	Yrlgs.	Unid.	Total Sample
April 26			14				52	66			16		82
May 22			12				33	45		5	9		59
June 10			7				16	23		15	0		38
June 27			8				12	20		5	2		27
Oct. 8*	8	3	11	17	15	3	35	46		21			67
Nov. 6	22	1	23	34	18	3	55	78		24			102
Dec. 26	11	2	13	49	26	7	82	95	1	41			136
Jan. 27			2		29	4		98	2	39		63	137
Feb. 28					30	7		105	2	46		68	151
April 24					30	4		107		38		73	145

* 18 bulls removed during hunting season, August 20 through November 30.

PREPARED BY: Julius Reynolds

APPENDIX III

Moose Sex and Age Ratios - Unit 6 - Martin River Count Area

Year	Total MM Per 100 FF	Sm. MM Per 100 FF	Sm. MM Per 100 Lg. MM	Sm. MM % in Herd	Sm. MM Per 100 MM Calves	Calves Per 100 FF	Twins per 100 FF w/calf	Calf % in Herd	Survey Conditions	Total Sample
1964-65							36.4	26.0	UNK	52
1965-66							20.8	31.0	UNK	93
1966-67	Z E R O	D A T A								
1967-68	76.1	37.0	93.9	15.0	103.3	70.2	25.5	28.5	UNK	207
1968-69							25.0	21.4	UNK	201
1969-70							17.4	20.3	POOR	138
1970-71	41.2	14.5	54.3	8.1	76.0	38.2	6.4	21.3	GOOD	235
1971-72	37.6	14.1	60.0	9.2	177.8	15.9	13.6	10.3	EXCELLENT	261
1972-73	50.7	17.4	52.2	10.2	171.4	20.3	0.0	11.9	GOOD	120
1972-73							0.0	14.8	EXCELLENT	135
1973-74							5.0	15.9	GOOD	132
1974-75	41.8*					50.0**	18.9	30.5	EXCELLENT	151

* Based on a 11/6/74 survey.
** Based on a 12/26/74 survey.

PREPARED BY: Julius Reynolds

APENDIX III continued

Moose Sex and Age Composition - Unit 6 - Martin River Count Area

Date	Lg. MM	Sm. MM	Total MM	FF W/O	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex	Total Sample	Count Time (hours)	Moose per Hour
12/17/64	8	6	14	0	7	4	11	25	0	15	12	52	UNK	NA
1/27/66	8	8	16	1	19	5	25	41	0	29	23	93	2.6	NA
1966-67	Z E R O	D A T A												
12/11/67	33	31	64	37	35	12	84	148	0	59	0	207	3.1	NA
1/18/69	4	3	7	0	24	9*	3	158	0	43	118**	201	UNK	NA
2/13/70	1	0	1	0	19	4	23	110	1	28	86**	138	4.7	NA
12/8/70	35	19	54	84	44	3	131	185	0	50	0	235	2.8	NA
12/2/71	40	24	64	148	19	3	170	234	2	27	0	261	3.1	NA
12/21/72	23	12	35	56	13	0	69	104	1	14	2	120	3.6	NA
3/16/73					19	0		115	1	20	96**	135	3.7	NA
2/26/74					19	1		111	0	21	91**	132	2.7	NA
2/28/75					30	7		105	2	46	68**	151	3.1	NA

* One set triplets.
** Included with total adults.

PREPARED BY: Julius Reynolds

APPENDIX IV

Moose - Unit 6 - East of Copper River

1974 Cementum Age Data

	Males	
Age	Number	Percent
Calf	0	0
1	6	33.3
2	3	16.7
3	3	16.7
4	2	11.1
5	1	5.6
6	1	5.6
7	2	11.1
Total	18	100.1

PREPARED BY: Julius Reynolds

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 6 - West of the Copper River

Season and Bag Limits

September 10 - September 15	One moose by permit; conditions and number of permits will be described by Commissioner's Announcement.

The conditions of this permit hunt were: (1) any person could apply for a permit at the Cordova Fish and Game office during the month of August; (2) a public drawing conducted by the Cordova Fish and Game Advisory Board was held September 4, 1975 for 45 either-sex permits; (3) successful hunters were required to report their kill within two days.

Also, any person under the age of 16 who had their name drawn for a permit was required to pass a firearm safety test prior to receiving a permit. Two minors had their names drawn and both passed a test given September 8th.

Harvest and Hunting Pressure

The 1974 moose harvest west of the Copper River consisted of 12 bulls and 28 cows for a total of 40 moose (Appendix I). One additional bull was taken illegally during the season and a dead cow was observed shortly after the season (presumably hunting mortality).

During the month of August, 553 hunters applied for the 45 permits. Two of the 45 permit holders did not hunt. Thus the hunter success ratio was 93.0 percent.

Weather during the short either-sex season was generally miserable. Heavy rain and strong winds prevailed. Flood waters caused by the rain made the moose more vulnerable to hunters.

Composition and Productivity

As part of a collared moose study initiated in March 1974, monthly surveys were flown (Appendix II). The spring surveys (April, May and June) indicated a short-yearling percent in the herd of 19.0-22.7 which compares favorably with the previous year's percent in the herd (23.2 percent).

Calf production was also noted on the spring flights (late May, mid and late June). Nearly half the cows produced calves, and calf survival through the summer, fall and early winter was excellent as indicated by the calf percent in the herd (Appendix II).

The December 20, 1974 survey provides the basic sex and age composition data for comparison with previous years (Appendix III). The bull-cow ratio (34.1:100) and the calf-cow ratio (51.8:100) were excellent. Sample size was 158 moose.

Cementum age data were obtained from 39 of 40 moose harvested (Appendix IV). Yearlings and four-year-olds were the most common age classes taken.

Approximately 10 moose were known to have expired during the fall and winter of 1974-75. Poaching accounted for approximately half the known mortality.

Management Summary and Conclusions

Monthly moose surveys provided a clear insight into the moose herd west of the Copper River. Winter mortality was relatively minor (estimated 10-15 percent), part of which can be attributed to poaching. Calf production and survival were good and the percent of males in the herd (bull:cow ratio) was slightly higher than desired.

The highest total count of moose west of the Copper River was 158, which is less than the desired countable population level of 175-200.

Recommendations

Retain the present season, but allow only males to be harvested.

PREPARED BY:

Julius Reynolds
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Supervisor

APPENDIX I

Moose harvest, Unit 6 - West of the Copper River

Year	Bulls	Cows	Unid.	Total
1960*	25	0	0	25
1961		NO OPEN SEASON		
1962	25	0	0	25
1963	15	2	0	17
1964	15	0	0	15
1965	20	0	0	20
1966	20	1	0	21
1967	23	0	0	23
1968	28	8	0	36
1969	30**	12	0	42**
1970	14	32	0	46
1971	12	27	0	39
1972	24	23	0	47
1973	18	0	0	18
1974	12	28	0	40

* First harvest since introduction of moose to Unit 6.
** Estimated.

PREPARED BY: Julius Reynolds

APPENDIX II

Moose Sex & Age Ratios - Unit 6 - West of the Copper River

Year	Date	Males per 100 Females	Yearling % in Herd	Calves per 100 cows	Calf % in Herd	Twins per 100 Females w/c	Sample Size
1974	April 25		20.3				74
	May 28	31.0	22.7	31.0	14.8		88
	June 11	31.6	19.0	47.4	21.4		84
	June 26	50.0	11.1	50.0	22.2		54
	July 18	52.3		36.4	19.3	14.3	83
	Aug. 23	41.7		36.1	20.3	30.0	64
	Sept. 27*	36.8		60.5	30.7	25.0	75
	Nov. 7	45.6		42.1	22.4	15.0	107
	Dec. 20	34.1		51.8	27.8	24.2	158
1975	Jan. 29				22.7	34.8	141
	Mar. 3				29.0	31.0	131
	April 28				22.4	23.1	76

* 13 males and 28 females removed during hunting season, September 10 - 15.

PREPARED BY: Julius Reynolds

APPENDIX II continued

Moose Sex & Age Data - Unit 6 - West of the Copper River

Date	Large Males	Small Males	Total Males	Females W/O	Females W/1	Females W/2	Total Females	Total Adults	Lone Calves	Total Calves	Yrlgs.	Unid.	Total Sample
April 25								59			15		74
May 28			13				42	55		13	20		88
June 11			12				38	50		18	16		84
June 26			12				24	36		12	6		54
July 18	16	7	23	30	12	2	44	67		16			83
Aug. 23	10	5	15	26	7	3	36	51		13			64
(Hunting Season)			(-13)				(-28)						
Sept. 27	7	7	14	22	12	4	38	52	3	23			75
Nov. 7	11	15	26	37	17	3	57	83	1	24			107
Dec. 20	16	13	29	52	25	8	85	114	3	44			158
Jan. 29			14		15	8		95	1	32		72	141
Mar. 3					20	9		93		38		64	131
April 28			4		10	3		59	1	17		42	76

PREPARED BY: Julius Reynolds

APPENDIX III

Moose Sex and Age Ratios - Unit 6 - West of the Copper River

Year	Total MM Per 100 FF	Sm. MM Per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/calf	Calf % in Herd	Survey Conditions	Total Sample
1962-63							10.0	32.8	Unknown	67
1963-64	Z E R O	D A T A								
1964-65							18.8	31.0	Unknown	121
1965-66	Z E R O	D A T A								
1966-67	Z E R O	D A T A								
1967-68	13.5	6.8	100.0	4.5	33.3	39.0	7.1	25.6	Excellent	117
1968-69							21.9	26.3	Excellent	156
1969-70							26.3	24.9	Good	193
1970-71	11.4	3.0	36.4	2.0	15.4	39.4	31.6	26.1	Good	199
1971-72	13.3	8.0	150.0	5.1	38.3	41.6	38.7	26.9	Fair	175
1972-73	30.1	7.5	33.3	5.0	73.7	20.4	5.6	13.6	Good	140
1973-74	21.4	7.1	50.0	4.5	39.0	36.6	28.1	23.2	Good	177
1974-75	34.1	15.3	81.3	8.2	59.1	51.8	24.2	27.8	Good	158

PREPARED BY: Julius Reynolds

APPENDIX III continued

Moose Sex and Age Compositions - Unit 6 - West of the Copper River

Date	LG. MM	Sm. MM	Total MM	FF W/O	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hours)	Moose per hour
3/15/63	1	0	1	0	18	2	20	21	0	22	24	67	2.3	NA
1963-64	Z E R O		D A T A											
12/9-10/64	5	6	11	9	26	6	41	52	0	38	31	121	4.7	NA
1965-66	Z E R O		D A T A											
1966-67	Z E R O		D A T A											
12/7/67	5	5	10	49	26	2	77	87	0	30	0	117	4.8	NA
1/15-16/69	2	2	4	0	25	7*	33	37	1	43	76	156	UNK	NA
1/17/70	4	5	9	0	28	10	38	47	1	49	97	193	3.1	NA
11/27/70	11	4	15	94	26	12	132	147	2	52	0	199	3.4	NA
11/2/71	6	9	15	82	19	12	113	128	4	47	0	175	3.5	NA
12/22/72	21	7	28	75	17	1	93	121	0	19	0	140	3.0	NA
1/19/74	16	8	24	80	23	9	112	136	0	41	0	177	2.7	NA
12/20/74	16	13	29	52	25	8	85	114	3	44	0	158	3.2	NA

* Plus 1 female with 3.

PREPARED BY: Julius Reynolds

APPENDIX IV

Moose - Unit 6 - West of Copper River

1974 Cementum Age Data

Age	Males		Females		Total	
	Number	Percent	Number	Percent	Number	Percent
Calf	0	0	1	3.6	1	2.5
1	2	16.7	9	32.1	11	27.5
2	1	8.3	0	0	1	2.5
3	1	8.3	3	10.7	4	10.0
4	6	50.0	4	14.3	10	25.0
5	2	16.7	1	3.6	3	7.5
6			0	0	0	0
7			1	3.6	1	2.5
8			1	3.6	1	2.5
9			1	3.6	1	2.5
10			2	7.1	2	5.0
11			3	10.7	3	7.5
12			1	3.6	1	2.5
Unk			1	3.6	1	2.5
Total	12	100.0	28	100.1	40	100.0

PREPARED BY: Julius Reynolds

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 7 - Seward

Seasons and Bag Limits

That portion of Unit 7 which includes the drainages of Resurrection, Little Indian, Big Indian, Juneau Creek and all Chickaloon River drainages	Sept. 1 - Sept. 10	One moose; antlerless moose may be taken by permit only; dates and conditions of hunt will be described by Commissioner's announcement.
Remainder of Unit 7		One bull

Harvest and Hunting Pressure

Harvest reports indicate that 492 hunters harvested 64 moose during the 1974 season for a success rate of 13 percent (Appendix I). Hunters afield declined by 36 percent from the 1973 level of 779 and hunter success declined by 36 percent from the 1973 level of 21 percent.

Harvest report returns indicate that the harvest was composed of 59 bulls, 2 cows and 3 sex unspecified. Although the antlerless hunt was canceled due to poor recruitment the bull harvest was 44 percent below the 1973 level and 57 percent below the average for the preceding 5 years.

The 1974 season was 10 days compared to 20 days in 1973.

Composition and Productivity

Inclement weather caused a delay in surveys and resulted in only survey areas 5 and 6 (Appendices II and III) being surveyed. In these areas surveys were delayed until February 3 and as a result the only useful information obtained was calf percent of herd. The late timing of the survey resulted in smaller sample sizes and the data may not be comparable to data obtained on November surveys. The sample size for survey area 6 was only 29 animals compared to an average of 122 for the previous 5 years and these data are not adequate for comparative purposes.

The number of moose observed in survey area 5 (Appendices II and III) was considerably below the number normally seen on surveys in November but large enough to be representative. The calf percent of herd was 27.3, 25 percent below the calf percent of herd observed in November of 1973 and 21 percent below the average for the previous 5 years. Whether this is the result of lower productivity or bias due to the late survey date is not known.

Management Summary and Conclusions

The decline in the 1974 harvest can be attributed to two factors, the drastically reduced season of only 10 days and the cancellation of the antlerless season due to poor recruitment. The shortage of yearlings because of prior poor recruitment also contributed to the low harvest.

Since only a small portion of the unit was surveyed in 1974 and well after the optimum time, little can be said regarding composition changes. It appears that calf production in count area 5 was well below normal but because of the late timing of the survey this cannot be stated with any degree of confidence.

Recommendations

No changes are recommended.

PREPARED BY:

Paul A. LeRoux
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

MOOSE - GMU 7 - SEWARD

APPENDIX I

Moose Harvest and Hunting Pressure - Unit 7

Year	Season	Bulls	Cows	Unid.	Total	Hunters	Percent Success
1965	1st	*	*	*	*		
	2nd	*	*	*	*		
	Comb.	60	1	0	61	*	*
1966	1st	*	*	0	*		
	2nd	*	*	0	*		
	Comb.	112	1	0	113	445	25.4
1967	1st	*	*	*	*		
	2nd	*	*	*	*		
	Comb.	123	1	1	125	414	30.0
1968	1st	140	1	0	141		
	2nd	19	0	0	19		
	Comb.	160[2]	1	3	164[2]	481	34.1
1969	Comb.	174	4	1	179	557	32.1
1970	1st	104	0	1	105		
	2nd	23	0	1	24		
	Ant.[1]	0	14[3]	0	14		
	Comb.	152[2]	14[3]	2	168[2]	520	32.3
1971	1st	110	14	2	126		
	2nd	25	0	0	25		
	Comb.	153[2]	14	2	169[2]	563	30.0
1972	1st	111	19	0	130		
	2nd	16	0	0	16		
	Comb.	154[2]	22[2]	0	176[2]	780	22.6
1973		114	47[3]	0	161	779	20.6[4]
1974		59	2	3	64	492	13.0

* Data not available
[1] Antlerless season held December 2-6
[2] Total exceeds summation of various seasons because of kills for which data were not given
[3] Data from permit returns
[4] Computed using four additional cows shown from permit returns

Prepared by: Paul A. LeRoux, Game Biologist III

Appendix II

Sex and Age Ratios, Survey area 5, Placer River

Date	Tot. ♂ Per 100 ♀	Sm. ♂ Per 100 ♀	Sm. ♂ Per 100 Lg. ♂	Sm. ♂ % in Herd	Sm. ♂ Per 100 ♂ calves	Calves Per 100 ♀	Incidence of twins per 100 ♀ w/calf	Calf % in Herd	Hours	Animals Per Hour	Total Animals
2/64	-	-	-	-	-	-	7.8	36	1.6	122.5	196
1964	No data										
1/14/66	6.1	6.1	-	4.2	32	38.5	13.7		1.66	56.6	94
11/14/66	0	0	0	0	0	62.5	0	38.4	0.3	43.3	13
1967	No data										
2/9/68	17.1	17.1	-	10.9	87.5	39.0	6.0	25.0	0.9	71.1	64
11/12/69	10.0	3.3	50	1.9	11.1	60.0	36.0	35.3	1.0	102.0	102
11/24/70	7.1	1.2	20	0.8	6.7	36.9	19.2	25.6	1.2	100.0	121
11/1/71	5.7	*	*	*	*	54.5	17.1	34.0	2.0	70.5	141
1972(12/1)	3.28	3.28	-	1.89	9.30	70.49	19.44	40.57	3.33**	76.28**	106
11/27/73	9.4	3.8	66.7	2.2	12.1	62.3	3.4	36.3	1.43	63.6	91
2/8/75	-	-	-	-	-	-	-	27.3	-	-	77

* Small bulls not properly identified on survey.
** Count time and moose/hour is calculated for C.A. 5 & 6 together.

Prepared by: Paul A. LeRoux, Game Biologist III

MOOSE - GMU - 7

Appendix III

Sex and Age Composition, Survey Area 5, Placer River

Date	Lg. ♂	Sm. ♂	Total ♂	♀ W_0	♀ W_1	♀ W_2	Total ♀	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Moose	Count Time	Moose Per Hour
1964 2/4	1	1	2		59	5	64	126*	1	70	0	196	1.60	122.5
1965	No data													
1966 1/14	0	4	4	43	19	3	65	69	0	25	0	94	1.66	56.6
1966 11/14	0	0	0	3	5	0	8	8	0	5	0	13	.3	43
1967														
1968 12/9	0	7	7	26	14	1	41	48	0	16	0	64	.9	71.1
1969 11/12	4	2	6	35	16	9	60	66	2	36	0	102	1.0	102
1970 11/24	5	1	6	58	21	5	84	90	0	31	0	121	1.2	100
1971 11/1	1	4	5	47	34	7	88	93	0	48	0	141	2.00	70.5
1972 12/1	0	2	2	25	29	7	61	63	0	43	0	106	3.33**	76.28
1973 11/27	3	2	5	24	28	1	53	58	3	33	0	91	1.43	63.6
1975 2/3	-	-	-	-	21	0	-	56	-	21	35	77	-	

* Includes 60 unidentified adults
** Count time for C.A.'s 5 & 6 combined

Prepared by: Paul A. LeRoux, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 9 - Alaska Peninsula

Seasons and Bag Limit

August 20 - December 31 One moose

Harvest and Hunting Pressure

The reported harvest of 705 moose from Unit 9 in 1974 was a decrease from the 1973 record harvest of 839 moose (Appendix I). Bulls comprised 73.8 percent of the harvest, slightly down from the 10-year average of 76.4 percent. Alaskan residents took 50 percent of the harvest (350 moose) and, as in past years, the majority of the harvest (89 percent) occurred prior to November 1.

Composition and Productivity

A single calving survey was flown in 1974 (Appendix II). Results of that survey indicated a continued pattern of poor reproductive success. Calf-cow ratios obtained from the fall sex and age class surveys (Appendices III and IV) support the spring data. The overall fall ratio of 13.5 calves per 100 cows was an improvement over the 8.6 calves per 100 cows obtained in 1973 (Appendix V). At this time the Alaska Peninsula moose herd has experienced five successive years of poor calf production.

All areas surveyed during the fall sex and age composition surveys indicated a continuing decline in the bull-cow ratios. Hunter selectivity for males is continuing to alter the sex ratios. The overall bull-cow ratio of 23 bulls per 100 cows is the lowest on record.

Management Summary and Conclusions

Sport hunting on the Alaska Peninsula has had a marked effect upon the sex composition of the population (Appendices III and IV). In heavily hunted areas such as Mother Goose Lake the ratio has been reduced from 50 to 60 bulls per 100 cows in the mid 1960's to only 15.3 in 1974. Historically, lightly hunted areas such as Cinder River and Dog Salmon River have gone from ratios of 70 to 80 bulls per 100 cows to 28.7 and 22.0 bulls, respectively, during the same time frame. The reduction of the observed bull-cow ratio in the Meshik Trend area from 47.4 bulls per 100 cows in 1973 to 12.8 bulls in 1974 is considered the result of sampling error due to the small sample size and to the movement of a group of males outside the trend area boundaries.

The continued deterioration of the bull-cow ratio in recent years is the result of increased hunting pressure exerted by the recreational meat hunter. These individuals prefer to take males even when females are more abundant. As a result, the younger males have been providing an increasing portion of the harvest. Although existing bull-cow ratios appear adequate to maintain effective breeding, the harvest of the younger age class bulls has seriously reduced recruitment into the older age classes that produce trophies. Conflicts have developed between the recreational meat hunter and the trophy hunter which have resulted in trophy hunting pressure shifting to remote areas or areas with severe logistic problems. Remaining pockets of older age class bulls on the Alaska Peninsula are limited and are not capable of sustaining existing trophy demand.

Over much of the Alaska Peninsula it appears desirable to manage for a quality hunting experience with an objective of producing a sustained harvest of older age class males. Department studies have shown that the unit has the ability to produce large-antlered individuals at a younger age than most other areas of Alaska. The existing pattern of unrestricted animal selection by the hunter has placed heavy pressure on the younger males and, if continued, will further restrict the abundance of older bulls necessary to fulfill the demand. Steps should be taken to direct the recreational meat harvest to the female segment of the herd in order that the younger bulls are allowed to reach maturity.

The Alaska Peninsula moose herd continued to decline in numbers. This decline appeared to be the result of poor calf production rather than the spectacular "crashes" from winter mortality or disease that have been reported in other ungulate populations. Animals being removed from the population through hunting or natural mortality are not being replaced through annual recruitment. Superficial observations indicate there has been a change in willow species composition with preferred species giving way to a species virtually unutilized by moose. If so, the population may be adjusting downward to the lower carrying capacity of a range dominated by species unpalatable to moose.

The slight increase in calves per 100 cows observed in 1974 (Appendix V) appeared to be the result of the extremely mild winter conditions of 1973-74. Because pregnant cows were under less stress during the winter, a greater number gave birth to healthy calves that survived through the summer. However, the pattern of poor reproductive success has not reversed itself and a continued decline of the population can be expected.

The decline in the Unit's harvest in 1974 (Appendix I) is the result of a regulation which did not allow hunters to take a big game animal the same day airborne. Hunter success for those individuals who complied with this regulation was lower than in previous years when flying, spotting, landing and making the kill were legal on the same day. Unfortunately,

the "airborne" regulation was extremely difficult to enforce and was completely disregarded by a large segment of the hunting public. As a result, the honest hunter was at a disadvantage when in competition with his unethical cohort. With the possible loss of aircraft if caught, violators seeking moose for trophy frequently removed only the cape and antlers and abandoned the carcass in order to minimize the time spent in the area of the kill. The wanton waste of moose in Unit 9 was the greatest of any time since the October bull closures of 1970 and 1971. The present inability to effectively enforce the "airborne" regulation is a factor that must be considered in establishing future management programs and regulations.

Recommendations

Regulations should be adopted that will encourage quality hunting and maintain a population of older age class bulls for harvest. The younger age class bulls must receive regulatory protection and the recreational meat harvest directed towards the female segment of the herd. The total bull harvest must be reduced and a shortening in length of the bull season will help meet this objective. In future years a regulation establishing a minimal antler width in specific areas should be considered to further protect the younger age class bulls. Reductions in the length of the total moose season should decrease the overall harvest on a herd that is presently declining due to range related factors.

PREPARED BY:

James B. Faro
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

MOOSE - GMU 9 - Alaska Peninsula

APPENDIX I

Moose Harvest and Hunting Pressure - Unit 9

Year	Bulls	Cows	Unid.	Total	Hunters	Percent Success
1964	185	64	0	249	-	-
1965	213	68	4	285	-	-
1966	240	75	8	323	519	62.2
1967	301	68	9	378	509	74.3
1968	366	72	5	443	583	76.0
1969	317	70	6	393	527	74.6
1970	266	84	2	352	457	77.0
1971	317	116	7	440	591	74.5
1972	454	91	11	556	773	71.9
1973	607	206	26	839	1175	71.4
1974	520	167	18	705	1072	65.8

PREPARED BY: James B. Faro, Game Biologist III

MOOSE - GMU 9 - Alaska Peninsula

Mother Goose to Dog Salmon

APPENDIX II

Moose Productivity, Unit 9 - Alaska Peninsula 1974

Date	Calves per 100 FF	Calves per 100 FF and Yearlings	Percent FF with Calves	Twins per 100 FF with Calf	Total Sample
June 10	29.6	25.0	21.0	41.2	146

	Total Calves	Total Cows & Yearlings	Total Cows	Total Cows w/Twins
June 10	24	96	81	7

PREPARED BY: James B. Faro, Game Biologist III

MOOSE - GMU 9 - Alaska Peninsula

APPENDIX III

Moose Sex and Age Ratios, 1974 - Alaska Peninsula - Unit 9

Trend Area	Total MM per 100 FF	Small MM per 100 FF	Small MM per 100 Large MM	Sm. MM % in Herd	Small MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/calf	Calf % in Herd	Moose per Hour	Total Sample
Mother Goose	15.3	4.1	36.4	3.1	57.1	14.3	3.7	11.0	62.0	254
Pacific	45.8	1.4	3.0	.9	66.7	4.2	0	2.8	98.2	108
Katmai	34.6	7.6	28.1	5.0	83.7	18.1	7.7	11.9	154.0	362
Cinder River	28.7	7.4	35.0	4.9	66.7	22.3	10.5	14.8	94.7	142
Flats	12.5	3.9	45.8	3.2	66.7	11.8	3.1	9.5	183.1	348
Meshik River	12.8	2.6	25.0	2.0	40.0	12.8	0	10.2	24.5	49
Dog Salmon River	22.0	11.0	100.0	8.6	400.0	5.5	0	4.3	63.2	139
TOTALS	23.0	5.6	32.6	4.1	83.5	13.5	5.3	9.9	91.0	1,402

PREPARED BY: James B. Faro, Game Biologist III

MOOSE - GMU 9 - Alaska Peninsula

APPENDIX IV

Moose Sex and Age Composition - Unit 9 - 1974

Trend Area	Date	Lg. MM	Sm. MM	Total MM	FF W/0	FF W/1	FF W/2	Total FF	Total Adults	Total Calves	Unid. Sex & Age	Total Sample
Mother Goose	Nov.15	22	8	30	169	26	1	196	226	28	0	254
Pacific	Nov.16	32	1	33	69	3	0	72	105	3	0	108
Katmai	Nov.18	64	18	82	198	36	3	237	319	43	0	362
Cinder River	Nov.20	20	7	27	75	17	2	94	121	21	0	142
Flats	Nov.20	24	11	35	248	31	1	280	315	33	0	348
Meshik River	Nov.23	4	1	5	34	5	0	39	44	5	0	49
Dog Salmon River	Nov.23	12	12	24	103	6	0	109	133	6	0	139
TOTALS		178	58	236	896	124	7	1,027	1,263	139	0	1,402

PREPARED BY: James B. Faro, Game Biologist III

MOOSE - GMU 9 - Alaska Peninsula

APPENDIX V

Moose Sex and Age Ratios - Unit 9

Year	Total MM per 100 FF	Small MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per. 100 FF w/calf	Calf % in Herd	Moose per Hour	Total Sample
Nov., 1962	99.4	19.0	23.6	8.2	115.2	33.0	24.4	14.2	91.0	1,113
Nov., 1963	62.1	11.9	23.7	6.4	97.5	24.4	17.5	13.1	104.0	1,852
Nov., 1964	67.8	11.8	21.2	6.4	137.7	17.2	9.9	9.3	146.0	1,312
1965*	-	-	-	-	-	-	-	-	-	-
Nov., 1966	73.5	13.9	23.3	6.6	85.9	32.4	16.3	15.4	96.0	786
Oct., 1967	73.0	14.0	23.0	7.0	121.0	24.0	30.0	12.0	89.0	1,447
Oct., 1968	63.3	9.1	15.7	4.8	84.7	21.3	19.1	11.1	163.9	1,619
Nov., 1969	53.9	18.7	52.9	10.3	148.8	25.1	14.1	13.9	65.0	620
Nov. & Dec., 1970	44.9	14.7	48.7	9.4	118.8	12.4	11.3	7.9	93.2	1,016
Oct. & Nov., 1971	46.8	11.2	31.6	7.1	219.7	10.2	4.5	6.5	105.9	1,091
Nov. & Dec., 1972	51.0	11.8	30.1	7.1	170.0	13.9	6.8	8.4	91.3	954
Dec., 1973	30.5	5.1	20.3	3.7	119.0	8.6	11.1	6.2	65.1	677
Nov., 1974	23.0	5.6	32.6	4.1	83.5	13.5	5.3	9.9	91.0	1,402

* Sex and age composition counts were not conducted in 1965

PREPARED BY: James B. Faro, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT 1974

Game Management Unit 11 - Chitina Valley and eastern half of Upper Copper River Basin.

Seasons and Bag Limits

Unit 11, that portion east of the east bank of the Copper River upstream from the Slana River confluence, Tanada Creek, Tanada Lake, and the headwaters of Goat Creek to the Unit 12 boundary.	Aug. 20 - Sept. 30	One bull
Remainder of Unit 11	Aug. 20 - Sept. 30 Nov. 1 - Nov. 30	One moose

During 1960 and 1961, the season was Aug. 20 - Sept. 30 and Nov. 1 - 30 for one bull only. In 1962, a cow season of Oct. 1 - Nov. 30 was added to the existing bull season. From 1963 through 1971, the season and bag limit was changed to one moose from Aug. 20 - Sept. 30 and Nov. 1 - 30. During 1972 and 1973, the Nabesna Road portion of Unit 11 had a bull season from Aug. 20 - Sept. 30 and from Nov. 1 - 30 as well as an Oct. 1 - 7 antlerless moose season. The remainder of Unit 11 had a bag limit of one moose, Aug. 20 - Sept. 30 and Nov. 1 - 30.

Harvest and Hunting Pressure

Harvest report data for Unit 11 are summarized in Appendix I. The annual harvests and sex composition of the harvests have fluctuated without apparent trend. However, the number of hunters has been increasing with a consequent decline in hunter success.

The harvest data are further collated in Appendix II to provide a more detailed analysis. The following description of the Unit 11 harvesting pattern for the past 6 years is based on these data plus other relevant information. Successful hunters in Unit 11 have been roughly divisible into those who use ground vehicles and hunt along the Nabesna Road

(mainly Alaskan residents) and those who use aircraft and hunt in the remainder of Unit 11. A large percentage of the aircraft users were nonresidents, and they were often guided or used air taxi operators with a resulting higher probability of success. Hunting pressure along the Nabesna Road has continuously increased during the 1960's, partly due to good hunting opportunities provided by both moose and caribou wintering in the area. Hunters have reported that moose were commonly seen along the Nabesna Road during the mid-1960's in late fall and early winter. The Nabesna Road was not kept open during winter prior to 1970, although it has since been kept open. Consequently, moose movements into lower elevations during November, coupled with increased hunter access during 1970, resulted in a high harvest. Subsequent harvests along the Nabesna Road have decreased, fewer hunters using highway vehicles were successful, and an increasing percentage of successful hunters used ORV's or snow machines. Local pilots reported that once numerous moose herds around Tanada Lake were quickly reduced as use of snow machines increased (Bill Barnhardt, Windy Wendell, and Red James, personal communications). With closure of the Nabesna Road to hunting during November, 1972, more ORV and snow machine users crossed upper Tanada Creek to hunt in the Upper Copper River and Drop Creek vicinity. As hunting pressure spread peripherally away from the road, fewer moose were available closer to the Nabesna Road. A check station was established along the Nabesna Road during October 1 - 7, 1973. Of 372 hunters interviewed, only 21 percent of the hunting parties saw a moose, and hunter success was only 6.5 percent. During 1974, the decrease in harvest was probably due to a combination of (1) reduced hunting opportunities along the Nabesna Road due to regulation changes, (2) reduced participation during the November season because of the regulation prohibiting hunting the same day as airborne, and (3) a dwindling moose resource. It is clear that improved access and transportation means available to hunters, especially since 1970, have resulted in high harvests, initially close to the road and subsequently spreading to more distant areas. There has been a resultant decreasing availability of moose to hunters.

Composition and Productivity

Composition data from various count areas in Unit 11 are presented in Appendix III. Perhaps the most significant findings from the Mt. Drum composition data are the marked decrease in calf:cow and small bull;cow ratios since 1960 and the marked reduction in sample size during the last two counts. Although natality and calf survival have been low on Mt. Drum in recent years, the relatively low hunting pressure prior up to 1972 (Appendix II) had not caused any marked changes in moose per hour values or sample sizes. There was an abrupt increase in hunting pressure on Mt. Drum and in the Chitina Valley during 1973 and a subsequent drop in moose per hour and sample size values for the Mt. Drum count area. It may be, however, that low sample size values for the Nabesna Road and Mt. Drum count areas during 1973 were due to atypical moose distributions and poor counting conditions. Counting conditions were good during 1974.

The composition data for the Nabesna Road vicinity show decreasing moose per hour values over a period of years. The number of calves born and surviving has declined since 1965. During 1974, the sample size increased (although still too small to yield meaningful data) along with an apparent increase in calf survival.

A new count area was established in the Chitina Valley during 1973. The area is lightly hunted at present but is known to guides and air taxi operators. Of 107 moose counted during 1973, only one calf was seen. The decrease in sample size during 1974 was, therefore, expected. One guide that hunted this herd for several years brought in a moose lung for examination that was heavily infected with hydatid cysts. He said that this condition was more common among these moose than what he is accustomed to.

These combined data indicate a low natality or calf survival in Unit 11. Where hunting pressure is light, moose abundance was apparently stable or decreasing. Where moose removal by harvesting was high, replacement of losses was so low that moose numbers declined rapidly.

Management Summary And Conclusions

Liberal bull and cow seasons have been in effect in Unit 11 since 1962. Winter road maintenance and increasing use of off-road vehicles including snow machines along the Nabesna Road have resulted in high harvests. Because of the low rate of replacement of losses, moose numbers have been declining rapidly along the Nabesna Road. Decreasing calf-cow ratios have existed in the Mt. Drum count area since 1960. Because hunting pressure has been relatively low and because both bulls and cows have been harvested (resulting in more stability in bull:cow ratios), the composition data does not reflect much impact from hunting. However, calf survival is low and is not responding to decreasing moose density. Neither high bull harvests nor antlerless moose seasons can be justified.

The moose situation in Unit 11 is similar to Unit 13, and programs in progress and proposed for Unit 13 will also largely apply to Unit 11. In Unit 11, however, low bull:cow ratios are not a potential cause of low conception rates, and there are fewer reports of grizzly bears and grizzly bear predation. Wolf predation on calves is the more probable cause of the sustained low calf survival.

Recommendations

1. The seasons and bag limits in the Nabesna Road portions of Unit 11 and 12 should correspond.

2. A season of Sept. 1 - Sept. 20 for bulls only for all of Unit 11 would probably be safely conservative until intensive management programs are adopted. Such a season would correspond

to the current season in Unit 13 and would reduce the tendency of hunters to concentrate in areas where seasons are unique and more liberal.

3. The intensive management programs proposed for Unit 13 should also be adopted in Unit 11. Investigative programs proposed for Unit 13 would also apply to Unit 11. A solution to the low natality or calf survival is urgently needed.

PREPARED BY:

Carl McIlroy
Game Biologist III

SUBMITTED BY:

John Vania
Regional Management Coordinator

APPENDIX I

Moose Harvest and Hunting Pressure - Unit 11

Year	Harvest				Hunters	Percentage Success
	Male	Female	Unid.	Total		
1963	86	37	0	123		
1964	89	38	0	127		
1965	116	70	2	188		
1966	89	69	5	163	263	62%
1967	108	70	2	180	317	57%
1968	99	34	8	141	293	48%
1969	101	59	2	162	378	43%
1970	126	115	1	242	562	43%
1971	90	89	2	181	546	33%
1972	86	55	5	146	525	28%
1973	105	77	5	187	594	31%
1974	79	43	1	123	397	31%

Prepared by: Carl W. McIlroy, Game Biologist III

APPENDIX II

A Comparison of Moose Harvest Data for Unit 11.

	1969	1970	1971	1972	1973	1974
Harvest from Nabesna Road Vicinity[a]:	93	161	105	82	46	23
Harvest from Remainder of Unit 11[a]:	36	43	36	43	101	75
Ratio, Nabesna Road: Remainder of Unit 11 harvest[a]::	2.6:1	3.7:1	2.9:1	1.9:1	0.46:1	0.31:1
Transportation Means[b],						
Airplane:	19%	12%	22%	30%	46%	34%
ORV + snow machine:	29%	52%	49%	64%	30%	34%
Afoot + highway vehicle:	38%	25%	18%	13%	12%	18%
Other:	14%	11%	11%	3%	9%	15%
Sample Size:	159	238	175	141	195	131
Percentage of Harvest Taken during November season[c]:	28%	58%	65%	77%	43%	26%
Residents,						
Successful:	103	165	137	117	142	97
Total Hunters:	268	417	467	449	512	346
Success:	38%	40%	29%	26%	28%	28%
Nonresidents,						
Successful:	30	24	37	17	35	23
Total:	37	40	65	52	55	40
Success:	81%	60%	57%	33%	64%	58%
Ratios[d],						
Resident:Nonresident Hunters::	7.2:1	10.4:1	7.2:1	8.6:1	9.3:1	8.7:1
Resident:Nonresident Harvest::	3.4:1	6.9:1	3.7:1	6.9:1	4.1:1	4.2:1
Resident:Nonresident Success::	0.5:1	0.7:1	0.5:1	0.8:1	0.4:1	0.5:1

a. Based only on hunters specifying a location of kill.

b. Based only on successful hunters specifying one or more transportation means; all transportation means included in combinations were tallied.

c. Based only on hunters specifying a date of kill.

d. Based only on hunters specifying whether residents or nonresidents.

Prepared by: Carl McIlroy, Game Biologist III

APPENDIX III

A Comparison of Moose Sex and Age Composition Data

Year	Large Males per 100 Females	Small Males per 100 Females	Calves per 100 Females	Moose per Hour	Sample Size
Mt. Drum Count Area					
1955*	116	29	36	75	300
1956*	130	15	30	54	55
1957*	64	7	39	92	92
1958*	128	12	34	94	291
1960*	64	16	36	48	110
1965*	55	25	19	81	269
1967	62	10	29	117	456
1969	54	11	28	85	299
1970*	46	15	14	59	199
1972	46	5	10	69	250
1973	66	6	12	25	97
1974	53	5	13	16	65
Nabesna Road Count Area					
1965*	22	20	39	52	83
1968*	14	5	12	44	140
1971	11	0	24	20	50
1972	0	7	19	16	39
1973	--**	--**	--**	5	15
1974	31	8	69	7	52
Chokosna River Count Area, Chitina Valley					
1973	42	7	1.4	46	107
1974	44	0	19	29	44

* Area boundary change.
** Data of no value because of small sample size.

Prepared by: Carl McIlroy, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 12 - Upper Tanana River

Seasons and Bag Limits

Aug. 20 - Oct. 7 Nov. 1 - Nov. 30	One moose; provided that bull moose only may be taken from Aug. 20 - Sept. 30 and from Nov. 1 - Nov. 30 and only antlerless moose may be taken from Oct. 1 - Oct. 7.

Harvest and Hunting Pressure

The following table summarizes the annual moose harvests since harvest tickets were initiated in 1963:

Year	Male	Female	Unknown	Total
1963	138	22	1	161
1964	145	16	0	161
1965	151	33	6	190
1966	156	19	7	182
1967	136	42	4	182
1968	132	30	2	164
1969	125	29	4	158
1970	110	26	3	139
1971	107	45	0	152
1972	137	7	1	145
1973	131	56	6	193
1974	151	19	3	173

Information derived from harvest tickets indicated that resident hunting success was 24.4 percent, an increase over 1973 and 1972 figures by 1.9 percent and 9.5 percent, respectively. Nonresident success also improved, with an 11.5 percent success rate reported for the 1974 season. A total of 471 individuals reported hunting in Unit 12, including 387 residents and 73 nonresidents. Residency status was not reported by the remaining 11 people.

The harvest of 173 animals is a slight increase over the 10-year average of 168 animals. The antlerless harvest of 19 animals, 11 percent of the total harvest, represents a 40 percent decrease of the 9-year average of 32 animals (excludes 1972 when antlerless harvest statistics are believed inaccurate). The reasons for the decreased antlerless harvest are not known.

Figures are not available for the harvest chronology, but based on past data I estimate that approximately 20 percent (35 moose) were taken during November.

The Tok River drainage produced the largest harvest with 83 animals (48% of the harvest) taken from there, followed by the Tanana River with 26 animals (15%), the Nabesna with 19 (11%), the White River-Beaver Creek with 10 (6%) and the Chisana with 9 animals (5%). Harvest location for the remaining 26 animals (15%) was not reported. The Tok River drainage also produced the majority of the antlerless harvest with 14 animals reported taken.

Table 1. Annual harvest by drainage.

	Year					
Drainage	1969	1970	1971	1972	1973	1974
Tanana River	29	30	29	23	26	26
Tok River	48	24	40	38	88	83
Nabesna River	45	50	52	50	44	19
Chisana River	9	8	2	3	7	9
White River- Beaver Creek	6	3	7	4	3	10
Unknown	21	23	22	27	25	26
Total	158	139	152	145	193	173

Table 2. Sex composition of harvest by drainage.

Drainage	Male	Female	Unknown	Total
Tanana River	25	1	0	26
Tok River	69	14	0	83
Nabesna River	18	1	0	19
Chisana River	9	0	0	9
White River - Beaver Creek	9	0	1	10
Unknown	21	3	2	26
Total	151	19	3	173

Table 3. Hunter reported transportation modes.

Transportation Mode	Number Reporting Mode*
Aircraft	47
Horse	31
Boat	14
ORV	71
Snow Machine	20
Highway Vehicle	155
Motorbike	1

* Data are from hunters reporting only one mode of transportation.

Composition and Productivity

Aerial composition counts conducted during November in the Tok-Dry Tok River area disclosed a calf:cow ratio of 32:100, which was a substantial improvement over the 1971, 1972 and 1973 calf crops (Table 4).

The Little Tok River was also surveyed during 1974. A considerable decline in the bull:cow ratio was noted when compared with figures obtained in 1968 and in 1973; however, calf:cow figures were improved with a ratio of 27:100 (Table 5).

Table 4. Tok-Dry Tok Rivers composition surveys.

Year	Calves:100 Cows	Moose/Hour	Bulls:100 Cows	Sample Size
1968	39	52	26	154
1969	23	60	25	179
1970	31	126	6	175
1971	16	126	6	247
1972	19	114	16	227
1973	15	137	16	219
1974	32	63	17	233

Table 5. Little Tok River composition surveys.

Year	Calves:100 Cows	Moose/Hour	Bulls:100 Cows	Sample Size
1968	12	114	34	151
1973	11	41	27	154
1974	27	88	19	212

Range and Habitat

Five snow measuring stations were established in 1971 along the Tok-Slana Highway in Unit 12 and snow depths are measured periodically at the stations throughout the winter. While the snow measurements from only one year may have little application, when compared over several years they show comparative differences which may partially indicate the severity of the winter so far as food gathering conditions for moose are concerned.

Browse utilization plots were established along the same route as the snow depth measurement stations. Browse utilization is classified as light, moderate and heavy. Green leaf willow (Salix pulchra) and felt leaf willow (Salix alaxensis) are the primary indicator species. When snow depth along the highway exceeds two feet, moose are forced to the valley floor and if this movement takes place before mid-December, browse utilization is about 100 percent (all available twigs show use). Timing of the migration to winter range as well as moose population size appear to dictate winter range utilization.

During the winter of 1974 snowfall was moderate, measuring about two feet along the valley floor throughout the winter. Most moose moved from the foothills to the valley floor during December. Browse utilization on critical winter range in the Tok River valley was considered to be heavy, with 80-100 percent utilization in all areas examined.

Population Trends

Moose populations remain very low in the Nabesna Road area. Aerial surveys there revealed only four moose per hour and the few tracks observed suggested that only a few moose were present.

Aerial surveys were conducted during early March 1975 in the Tok River drainage in an attempt to obtain data for use in determining population trends. Because moose were distributed in heavy timber an inadequate sample was obtained and results were inconclusive.

Total moose populations in the Alaska Range and Tok River drainages appear similar to those six years ago (when I first surveyed the Tok area) except in local instances. Moose continue to be scarce along roadsides.

Recruitment has been low, (yearlings averaging only 8.2% of the adult population for the past five years) but the greatly improved calf:cow ratios noted in fall 1974 moose surveys may reverse this trend.

It is believed that harvest levels in the Tok River drainage and Alaska Range have approached the desired annual harvest level, assuming a goal of maximum sustained yield under present conditions.

Management Summary and Recommendations

While low calf survival has probably limited moose populations and harvest levels in much of Unit 12, range surveys suggested that the winter range in the Tok River area may be receiving maximum desired utilization and that further expansion of the moose population would be undesirable at this time. Until more winter moose range is made available either through rehabilitation or through natural succession in recent burns we should not attempt to increase overall moose populations.

The reported harvest of 44 animals from the Little Tok represents a large increase over past harvests and is responsible for the decline in the bull:cow ratio.

The creation of the Tok Management Area for sheep may have inadvertently caused a substantial increase in moose hunting effort in the Little Tok by causing several guides and transporters to change their hunting, guiding and transporting areas from the Tok Management Area to the Little Tok-Mentasta Mountains area.

PREPARED BY:

Larry B Jennings
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 13 - Nelchina, Upper Susitna and western half of the Upper Copper River Basins.

Seasons and Bag Limits

Aug. 20 - Sept. 20 — One bull

From 1960 through 1966 the seasons for bull moose were Aug. 20 - Sept. 30 and Nov. 1 - 30. The late season was reduced to Nov. 1 - 20 during 1967 through 1972 and was closed by Commissioner's announcement in 1973. No hunt was authorized in 13C during 1973. There have been antlerless moose seasons in portions of Unit 13 in addition to bull moose seasons since 1962 except for bull moose only seasons during 1965 and 1969. A portion of Unit 13 comprising what is now the eastern half of Subunit 13A was closed to antlerless moose hunting during 1967 and 1968. Prior to 1970, antlerless moose seasons were 2-7 days in length. During 1970 and 1971, however, permits were issued to achieve designated harvest levels in Subunits 13B and 13C only. The antlerless moose season was closed before the hunt by Commissioner's Announcement during 1972 and was not authorized during 1973.

Harvest and Hunting Pressure

Harvest and hunting pressure information is summarized in Appendix I. The moose harvest during 1974 increased substantially from that of 1973. The number of hunters increased less markedly, resulting in an increase in hunter success. Compared to statewide harvests (data not shown), Unit 13 contributed 14 percent of the harvested moose in 1974 as compared to 8 percent during 1972 and 1973. The increase in the Unit 13 moose harvest was not paralleled by increasing harvests statewide.

Transportation trends of successful moose hunters in Unit 13 since 1967 are indicated in Appendix II. Percentages of hunters using horses and motorbikes have remained at a low level. The percentage of successful hunters using snow machines increased rapidly until 1972 and 1973 when early closures and complete closures, respectively, of the late moose season essentially eliminated the opportunity to use snow machines. A major shift occurred after 1971 in use of the three major transportation types. The cumulative effects of elimination of the late moose season, elimination of the antlerless moose season and depleted moose density along transportation corridors mainly affected highway vehicle and "afoot" hunters. The mean number of successful hunters using highway vehicles and "afoot" (148) after 1971 was only 28 percent of the mean number from 1967 through 1971 (523). The number of successful hunters using airplanes from 1967 through 1973 fluctuated without major change,

while the number of off-road vehicle users dropped by half. The percentages of airplane and off-road vehicle users, however, increased because of the magnitude of the reduction in successful highway vehicle-afoot hunters. The 1974 regulation which prohibited moose hunting the same day airborne may have caused the slight reduction in successful hunters using airplanes during 1974 (201) as compared to 1973 (229). The number of successful hunters using off-road vehicles increased during 1974 (320) as compared to 1973 (201). The increased moose harvest during 1974 paralleled the increased use of off-road vehicles.

Harvest data for 1974 showed that 39 percent of the moose were harvested during August. Shorter seasons in the future may cause noticeable crowding of hunting areas as markedly increased numbers of hunters may be afield during the same period. Harvest coding for Unit 13 during 1974 was reorganized to provide harvest data for each moose management unit within GMU 13 (Appendix III). There are few drainages with substantial moose populations that do not have substantial moose harvests.

Natural Mortality

Observations of dead ungulates (mainly moose) found during the 1974-75 winter season are shown in Figure 1. A tabulation of the plotted carcasses shows 35 adult moose, 28 calf moose, 30 unknown age moose, 11 caribou, 9 ungulates of unknown species, and 6 moose dying of starvation (one caribou not killed by wolves that was found near Eureka was not plotted). Of the animals not dying of starvation, signs indicated that all were wolf-kills with the exception of one moose calf killed by a bear. Of known species, 89 percent of the wolf-kills were moose; of moose of known age, 44 percent were calves. By contrast, 20 percent of the moose population was calves. A selectivity of wolf predation for calf moose during the winter is indicated. We have no estimate of the ratio of observed ungulate carcasses to total ungulate carcasses. However, we probably saw only a portion of the carcasses we flew over, and most of Unit 13 was not overflown or was only overflown once in early winter.

Parturition Surveys

Moose parturition surveys were conducted during May and June 1973 for two purposes. Extensive surveys were flown in the western Talkeetna Mountains, Alphabet Hills and Lake Louise flats to see if moose calving concentrations existed other than in the Gakona-Chistochina lowlands. In addition, intensive, repeated surveys in the Gakona-Chistochina lowlands were made to follow the progression of calving and to map weekly moose distributions. No post-calving moose concentrations comparable to the Gakona-Chistochina concentration were found. The peak of calving in the Gakona-Chistochina lowlands occurred during the last week of May and 27 to 29 calves per 100 cows were observed during all June flights (the same calf:cow ratio as found during November 1974 composition surveys of this area). Rough calculations from proceeding November composition counts indicated that the moose groups surveyed during spring on the Gakona-Chistochina lowlands are not representative of the area's moose population. In general, the yearling and bull

ratios appeared to be too high and the observed calf and cow ratio appeared too low. No wolves and only one sow grizzly bear with two yearling cubs were observed in the study area. No cause of the low calf:cow ratios was apparent. Mapped moose distributions seen during each flight showed that some moose dispersed into higher elevations following the receding snowline.

Moose Winter Distributions

Surveys were conducted of the upper Susitna River drainage system at roughly monthly intervals to monitor ungulate and furbearer distributions as part of the studies made for the U.S. Corps of Engineers of the impacts of a dam or dams on the Susitna River. Some results of the study pertaining to moose are described below. Moose generally observed at higher elevations during November (Fig. 2) were found at lower elevations during April (Fig. 3). Moose were probably partially enroute to wintering areas during the November surveys. Some concept of wintering areas of specific moose groups may be indicated by comparing the two maps. As examples, moose seen on the upper Susitna River during November may have concentrated around Valdez Creek and Butte Creek, and moose seen on the MacLaren and Clearwater Creek drainages may have concentrated mainly on Clearwater Creek. These suggested movements are not contradicted by tracks observed of migrating moose during this or past winter surveys. The distribution of the heavy moose concentration at the big bend of the Susitna River during November was not apparent during April.

Composition Surveys

Moose composition surveys were modified within Unit 13 during 1974 as compared to previous years. Count areas were made the same as moose management units (MMUs) so harvest data, composition data and management regulations could be based on individual or clustered MMUs. The total area of each MMU surveyed was searched for moose to obtain baseline inventory data. Each moose observation was sequentially numbered and the assigned number was placed on a map to locate that observation. This information was used to evaluate the composition survey technique.

One area (13-37-16) was counted by 4 different pilot-observer teams (Appendix IV). Bull:cow and calf:cow percentages were similar, although 95 percent confidence intervals were very wide because of the small sample sizes. Sample sizes were too small for the binomial distribution to be closely similar to the normal distribution. Mapped moose groups seen by each team were not similar in spite of the fact that surveys were conducted within a 5-day interval. Either there was considerable movement and exchange between moose groups from day to day, or different moose groups were seen by different teams, or both factors occurred. Past observations by myself indicated that there is considerable daily movement by moose during the period of composition counts.

Examination of our old count areas and new MMUs showed that many yielded sample sizes of moose observations too small to be meaningful.

For example, assuming a finite population correction factor of 0.6 (based on seeing 40 percent of moose collared only a few weeks preceding surveys) and a percentage of 20 percent, the following relationship between sample size and 95 percent confidence intervals can be calculated.

p	n	95% C.I.
20%	100*	13.9 - 26.1%
20%	200	15.7 - 24.3%
20%	400	17.0 - 23.0%
20%	600	17.5 - 22.5%
20%	800	17.9 - 22.1%

* Sample size too small for normal approximation to apply.

Percentages used throughout are based on only two variables (bulls and cows to obtain bull:cow percentages, for example). If bull:cow:calf percentages approximate 20:100:20, then a minimum sample size to obtain reasonably narrow confidence intervals for percentages of bulls and percentages of calves would be 240 total animals, yielding confidence intervals as given above for p = 20, n = 200. Where possible, sample sizes of 400-500 may provide a better balance between precision and cost. These considerations were checked by systematically sampling from raw data sheets for the Gulkana drainage system to obtain clusters of sizes averaging 120 and of sizes averaging 400. As examples of results, percentages from 2 sets of 10 clusters of about 120 sample size and mean percentages of 22 and 23 percent had maximum spreads of 14 percent and 18 percent respectively, whereas percentages from 2 sets of 3 clusters of about 400 sample size and means of 18 and 23 percent had maximum spreads of 1.3 percent and 3.0 percent, respectively.

Because all moose group observations were located on a map during surveys, observations could be regrouped by subarea (Appendix V). Moose management units within the Gulkana-Chistochina drainage system were compared to see if significant differences existed, but none was present. Moose observations were also grouped into above 3000 ft. and below 3000 ft. clusters. Sample sizes were too small in the Oshetna drainage (13-06) to allow meaningful comparisons. In the pooled Gulkana-Chistochina Basin MMUs (13-29, 13-36, and 13-37), bull:cow percentages were significantly different at the 90 percent level but not at the 95 percent level. Calf:cow percentages were similar above and below 3000 ft.

Moose management units were subjectively grouped according to location, terrain and similarity of bull:cow:calf ratios and the count data from individual MMUs within these clusters were pooled to obtain larger sample sizes (Appendix III). The results show that calf:cow percentages were similar in all areas surveyed (p = 22.4% to 25.8% or 29 to 35 calves per 100 cows) except for drainages of the Susitna River below the mouth of the Oshetna River (p = 14.0% or 16 calves per 100 cows). The lowest bull:cow percentages were found on the western slopes

of the southern Talkeetna Mountains (p = 9.7% or 11 bulls per 100 cows) and on the upper Susitna and MacLaren Rivers (p = 12.3% or 14 bulls per 100 cows) whereas the remaining areas of Unit 13 that were surveyed showed bull:cow percentages between 16.2 percent and 18.7 percent (or 19 to 23 bulls per 100 cows). There was no apparent correlation between low bull:cow percentages and low calf:cow percentages, although there did appear to be a greater range of calf sizes observed during surveys of the Oshetna River vicinity.

Results of a moose survey in McKinley National Park (which is partly in GMU 13) by park rangers are shown below for comparison to Unit 13 data (raw data have been recalculated to a form comparable to GMU 13 data).

	Per 100 cows	Percentage (no.)	95% Confidence Interval
Bull:Cow:	57	36.2% (531)	33.0% to 39.4%
Calf:Cow:	27	21.5% (432)	18.5% to 24.5%

Bull:cow percentages are relatively high as one would expect, but calf:cow percentages are slightly lower (not significantly) than most areas in GMU 13.

A geographical presentation of moose composition data obtained from Unit 13 since 1952 is provided in Figure 4. Although many factors may affect the results of aerial surveys, the large sample sizes, counts over the same areas each year by experienced pilot plus observer teams (a good pilot that searches for moose will see at least as many moose first as the backseat observer) and counts during similar time periods each year have tended to eliminate much of the variability. The graph shows a decreasing trend in moose per hour values (reflecting density, a balance between mortality and replacement) and a decreasing trend in large bull:cow ratios (reflecting a balance primarily between hunting mortality and replacement). Calf:cow ratios (reflecting natality minus summer-fall mortality) have fluctuated with an overall decline since the 1950's. Small bull:cow ratios (reflecting the cumulative effects of natality, summer-fall mortality, winter mortality and hunting pressure on yearling bulls) have declined in parallel with calf:cow ratios.

Assessments of these moose population indices follow. Bull harvests have been relatively low since 1971 (Appendix I), and the decline in bull:cow ratios (Fig. 4) has leveled off since 1971 (a tenuous, ballpark calculation of total moose numbers can be made using this relationship). The allowable bull harvest is now closely related to small bull:cow ratios, and the latter are low. Because: (1) moose per hour values did not level off since 1971 and (2) the slope of moose per hour values is similar to, or steeper than the slope of bull:cow ratios, it appears that moose per hour values have been primarily influenced by factors other than harvest mortality. High, sustained natural mortality as indicated by observations during the winter of 1974-75 (Fig. 1) plus

very low replacement rates as indicated by the small bull:cow ratios probably primarily account for the declines. The parallel between slopes of small bull:cow and calf:cow ratios indicates that both slopes have been changing because of a common influence. Recent unpublished data from Unit 13 (VanBallenberghe, personal communication) indicate that late winter pregnancy rates are near 85 percent. Therefore, declining summer-fall calf mortality appears to have been the main changing factor common to all other changing moose population indices. Aerial assessments of moose body condition made in the upper Susitna, Oshetna, and Copper River basins have shown most adult moose to have been in the "moderately fat" condition class (classes were dead, bony, moderately fat, and fat) near the end of the 1974-75 winter, a winter with above average snowfall. Poor nutrition of fetuses or newborn calves is not indicated. Predation appears to have been the most likely cause of most summer-fall calf mortality. The apparent inverse correlation between wolf population abundance trends and calf:cow ratios is striking (Fig. 1).

Grizzly bears have frequently been seen on moose carcasses but the degree of their selectivity for calves is unknown. Weather may play a role, but this influence is not apparent. For example, a regression of calf:cow ratios on average May temperatures at Gulkana from 1952 through 1973 had a correlation coefficient of 0.086 (where 0 = no correlation and the $\pm$ = perfect correlation), implying no correlation. Hypothermia of newborn calves was hypothesized. Similarly, a regression of calf:cow ratios on the preceeding winter's snow points (from Al Johnson, the number of days each winter with snow $\geq$ 24 inches) from 1952 through 1974 had a correlation coefficient of -0.35, implying low correlation. Malnutrition of fetuses or newborn calves was hypothesized. Total annual precipitation had changed during the last 20 years. Grouping the years to maximize differences, mean annual precipiation from 1943 through 1954 was 11.3 inches (sd = 2.3 inches), from 1955 through 1962 was 12.5 inches (sd = 1.3 inches), from 1963 through 1969 was 9.5 inches (sd = 2.4 inches), and from 1970 through 1974 was 11.7 inches (sd = 1.3 inches). Therefore, the mid-1960's were exceptionally dry years. Although local pilots have reported a drying up of some ponds in the late 1960's, and vegetation studies in Unit 13 have shown an increasing amount of dwarf birch, the effects of these changes on moose are conjectural.

Management Summary and Conclusions

Moose seasons in Unit 13 have gradually been restricted following apparent reductions in the moose resource. Harvests during recent years are half or less of harvests in the mid-1960's, and would be still lower had hunting effort not continually shifted to areas where returns were better. Some of this shift is apparent in changing success patterns of transportation types. The major hunter type getting a smaller portion of the moose resource during recent years is the highway vehicle-afoot hunter. Whereas the bulk of the highway vehicle-afoot hunters in the 1960's probably hunted from highway vehicles, it is probable that the

bulk of these hunters now travel some distance from the highways to hunt, mainly because moose immigration into heavily hunted areas is low because of poor replacement levels. Yet, there are few good hunting areas in Unit 13 for this type of hunter. The designated areas for walk-in hunters have few vulnerable moose. The higher harvest during 1974 was paralleled by increased use of off-road vehicles, whereas the regulation prohibiting hunting the same day airborne may have been responsible for the reduced take by aircraft-borne hunters.

Flights during the 1974-75 winter yielded observations of 120 ungulate carcasses. Of these 94 percent were wolf-kills; 89 percent of the wolf-killed ungulates were moose and 44 percent of the wolf-killed moose were calves. These observations do not represent the total natural mortality in Unit 13.

Parturition surveys during 1973 revealed calf:cow ratios during all June flights of 27 to 29 calves per 100 cows. No cause of the low calf:cow ratios was apparent. It is believed that the moose composition seen during early summer was not representative of the moose composition seen during early winter.

Moose distributions of the upper Susitna basin were observed and plotted during monthly mid-winter surveys. Shifts from high altitudes to lower elevations along drainages were observed. Short of a visual or radio-collaring study, some tentative conclusions about wintering areas of specific moose groups were indicated.

Tests of composition data obtained from four different pilot-observer teams on the same area showed general agreement in results, but the results were flawed by small sample sizes. Confidence intervals vary with sample size and percentages, assuming roughly equal observability of moose to different pilot-observer teams. With percentages of calves and bulls both near 20 percent, as they are in Unit 13, minimum sample sizes for subareas should be roughly 240 moose and 400 to 500 moose may provide a better balance between cost and precision. Subareas can be tested for differences; where differences in percentages are not significant, pooling of data may considerably shorten confidence intervals. Surveying sub-areas to obtain specific sample sizes is risky because moose sexes or ages may not be of the same composition above and below timberline. The bull:cow ratios in the Gulkana drainages were significantly different at the 90 percent confidence level above and below 3000 feet elevation. Survey teams would be tempted to survey where moose were most abundant and viewable, at and above timberline.

A review of moose composition indices, their interrelationships, and other pertinent information indicates that summer mortality of calves appears to be the main common cause of declines in November calf:cow ratios, small bull:cow ratios, large bull:cow ratios and moose per hour values. Wolf predation on calves is the main suspected cause

of summer calf mortality. The low calf:cow ratios seen during early June are puzzling, although high sustained predation coupled with a prolonged calving period, as suggested by VanBallenberghe, could explain it.

Regressions of calf:cow ratios on weather parameters had low correlation coefficients. The 1960's were dry years compared to earlier periods. The effect of these dry years on moose is not clear.

Recommendations

1. Maintain a bull only hunting season of Sept. 1 - 20.
2. Intensify studies on moose to find the cause(s) of low November calf:cow ratios.
3. Intensify studies on survey and inventory techniques to improve their usefulness.
4. Begin monitoring the interrelationships between range use, winter severity and moose condition assessments.
5. Consider regulations that will reapportion the moose resource so that viewers and "afoot" hunters will get a larger share at the expense of hunters using off-road vehicles.

PREPARED BY:

Carl McIlroy
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

MOOSE - GMU 13 - Nelchina Basin

APPENDIX I

A Comparison of Annual Moose Harvest and Hunting Pressure

Year	Season	Male	Female	Unknown	Total	Hunters	Percent Success
1963	Total	1385	343	7	1735		
1964	Total	1213	394	0	1607		
1965	Total	1318	3	10	1331		
1966	Total	1336	181	36	1553	4163	37%
1967	1st	1009	319				
	2nd	112	0				
	Total	1217*	319	16	1552	4027	39%
1968	1st	1013	243				
	2nd	171	0				
	Total	1240*	243	29	1512	4476	34%
9	1st	817	0				
	2nd	87	7	8			
	Total	1204	7	8	1219	3381	36%
1970	1st	746	56	14			
	2nd	271	58	8			
	Total	1141*,***	158***	30*	1329	3585	37%
1971	1st	703	333				
	2nd	205	338				
	Total	1126*	671****	18	1815	4881	37%
1972	1st	559	5	7			
	2nd	39	2	1			
	Total	689*	7*	16*	712	3199	22%
1973	Total	604	4	10	618	2513	25%
1974	Total	768	3	23	794	2770	29%

* Moose whose date of kill is unknown are included in the total.
** 220 antlerless moose were known killed.
*** Adult, antlerless bulls killed during the late antlerless season are included.
* Data from antlerless permit returns. Harvest ticket returns indicated a female kill of 614.

PREPARED BY: Carl McIlroy, Game Biologist III

MOOSE - GMU 13 - Nelchina Basin

APPENDIX II

Transportation Trends of Successful Hunters Since 1967[a].

Year	TRANSPORTATION TYPE: Airplane	Horse	Boat	Motorbike	Snowmachine	Off-Road Vehicle	Highway Vehicle And Afoot	Sample Size
1967, %:	22%	2%	4%	____	1%	34%	37%	
no.:	310	26	57	____	21	475	525	1414
1968, %:	19%	3%	6%	____	3%	34%	35%	
no.:	288	39	85	____	52	515	517	1496
1969, %:	22%	2%	5%	< 1%	2%	30%	39%	
no.:	260	18	55	9	26	357	470	1195
1970, %:	20%	2%	4%	< 1%	10%	25%	39%	
no.:	259	24	52	5	131	323	505	1299
1971, %:	19%	3%	8%	< 1%	11%	24%	33%	
no.:	349	57	141	12	206	436	596	1797
1972, %:	34%	7%	8%	< 1%	5%	28%	18%	
no.:	252	51	57	5	37	210	132	744
1973, %:	36%	3%	8%	< 1%	< 1%	32%	20%	
no.:	229	21	50	4	1	201	123	629
1974, %:	24%	3%	10%	1%	< 1%	38%	23%	
no.:	201	29	82	11	1	320	190	834

[a]. Because of hunters using more than one transportation type or not reporting any transportation types, the numbers and percentages used below should be interpreted as levels rather than as absolute values.

PREPARED BY: Carl McIlroy, Game Biologist III

MOOSE - GMU 13 - Nelchina Basin

APPENDIX III

Composition and Harvest Data within Moose Management Units.

MMU	Key Feature	Area sq. mi.	Moose Harvest	Composition Surveys			
				No.	No./Sq.Mi.	bull:cow P♂[d] (95% C.I.)[e.] [bulls/100 cows]	calf:cow P♀[d.] (95% C.I.)[e.] [calves/100 cows]
13-01	Chickaloon R.	379	11	0			
13-02	Caribou Cr.	381	14	0			
13-03	Little Nelchina R.	479	44	1930	1.1	9.7% (8.6-10.8) [10.7♂/100♀]	22.6% (21.1 - 24.1%) [29.2♀/100♀]
13-04	Tyone Cr.	574	23				
13-05	L. Oshetna R.	111	6				
13-06	Oshetna R.	551	62				
13-07	Talkeetna R.	533	18	0			
13-08	Kosina Cr.	476	15	356	1.9		
13-47	Fog Lakes	202	7			18.7% (17.4-20.0%) [23.0♂/100♀]	14.0% (11.7-16.3%) [16.3♀/100♀]
13-18[a.]	Watana Cr.	438	18	---			
13-17[a.]	Brushkana Cr.	362	12	---			
13-09[a.]	Chunilna Cr.	704	3	Insufficient sampling			
13-11[a.]	Troublesome Cr.	477	20				
13-13	Portage Cr.	283	1				
13-15	Tsusena Cr.	223	0				
13-12	Chulitna Cr.	1215	3	Not Surveyed			
13-14	E. Fork Chulitna R.	184	1				
13-16	Jack Cr.	312	15				
13-20	Broad Pass	313	23				
13-21	Wells Cr.	263	3				

PREPARED BY: Carl McIlroy, Game Biologist III

APPENDIX III (cont.) Composition and Harvest Data within Moose Management Units.

MMU	Key Feature	Area Sq. Mi.	Moose Harvest	Composition Surveys: No.	No./Sq. Mi.	bull:cow ♂[d.] (95% C.I.)[e.] bulls/100 cows	calf:cow ♀ [d.] (95% C.I.)[e.] calves/100 cows
13-22	Upper Nenana R.	243	6	0			
13-23	W. Fork Susitna R.	397	1				
13-24	Valdez Cr.	515	21	403	0.3	17.9%(14.6-21.2%) [14.0♂/100♀]	25.8%(22.3-29.3%) [34.7♀/100♀]
13-25	MacLaren R., north	444	14				
13-28	MacLaren R. south	530	21				
13-19[b.]	Coal Cr.	468	8	834	0.8	16.2%(14.3-18.1%) [19.3♂/100♀]	23.6%(21.5-25.7%) [30.9♀/100♀]
13-30[a.]	Lake Louise	1906	50	---			
13-26	Delta R.	450	1	Not Surveyed			
13-27	Tangle Lks.	244	11	Not Surveyed			
13-29[c.]	Alphabet Hills	979	23				
13-36	Gakona R.	1140	12	1458	0.5	18.6%(16.9-20.3%) [22.9♂/100♀]	22.4%(20.6-24.2%) [29.0♀/100♀]
13-37	Chistochina R.	649	5				
13-38	Mid. Fork Chistochina	145	0	0			
13-39	E. Fork Chistochina	219	4	0			
13-41	Indian Cr.	147	5	0			
13-42	Ahtell Cr.	187	4	0			
13-40	Slana R.	314	12	Insufficient Sampling			
13-43	Suslositna Cr.	154	3				
13-31	Matanuska R.	367	6				
13-32	S. Fork Matanuska	1215	3				
13-33	Nelchina R.	785	11				
13-34	Klutina R.	1973	33	Not Surveyed			
13-35	Tonsina Lk.	590	6				
13-44	Bernard Cr.	592	12				
13-45	O'Brien Cr.	448	4				
13-46	Tasnuna Cr.	668	0				

APPENDIX III (cont.) Composition and Harvest Data within Moose Management Units.

MMU	Key Feature	Area Sq. Mi.	Moose Harvest	Composition Surveys			
				No.	No./Sq. Mi.	bull:cow $P_{\sigma^{\prime}}$[d]. (95% C.I.)[e]. [bulls/100 cows]	calf:cow P_{φ}[d]. (95% C.I.)[e]. [calves/100 cows]
13-10	Unknown	---	63				
13-48	Susitna R.	---	9				
13-49	Chulitna R.	---	2				
13-50	Gulkana R.	---	3	Harvests not locatable within specific MMUs.			
13-51	Copper R.	---	2				
13-52	Anch.-Fbks. Hwy.	---	0				
13-53	Denali Hwy.	---	92				
13-54	Richardson Hwy.	---	7				
13-55	Glenn Hwy.	---	17				

a. Surveyed only that portion draining into the Susitna R.
b. Survey excluded Jay Cr.
c. Survey excluded area east of Gulkana R.
d. Percentages were calculated as (for bulls, for example) $P = \frac{100n}{n} + n$.
e. 95% Confidence Intervals were calculated as $C.I. = p \pm t \frac{p \cdot q}{n} \times FPCF$

where t = student's t value, q = 100-p, n = total sample, and FPCF is finite population correction factor, assumed to approximate 0.6. The FPCF was based on seeing 40 percent of 70 moose collared in the Gakona and Gulkana River drainages approximately two weeks prior to composition surveys.

PREPARED BY: Carl McIlroy, Game Biologist III

MOOSE - GMU 13 - Nelchina Basin

APPENDIX IV

Results of Replicate Moose Composition Surveys, 1974, MMU 13-37-16 (upper Chistochina River).

Survey Conditions

Team Number	Survey Date	Experience Pilot	Experience Observer	Weather	Moose per Hr.	Sample Size
1	8 Nov.	Exp.	Inexp.	Good - clear.	36	120
2	9 Nov.	Exp.	Exp.	Good but overcast.	23	121
3	11 Nov.	Exp.	Exp.	Marginal, snowing.	59	150
4	12 Nov.	Exp.	Inexp.	Overcast, turbulent.	73	110

Survey Results

	Survey Team 1	2	3	4
Bull:Cow, [a] p(no.):	18.9% (95)	23.0% (100)	20.0% (115)	16.7% (8[illegible]
95% C.I.:	12.7 - 25.1%	16.5 - 29.5%	15.1 - 26.7%	10.4 - 23.
Calf:Cow, [a] p(no):	24.5% (102)	21.4% (98)	27.8% (126)	27.1% (96)
95% C.I.:	17.9 - 31.1%	15.0 - 27.8%	21.7 - 34.0%	20.0 - 34.1%

a. The percentage, p, was calculated as 100 x no. bulls/ (no. bulls + no. cows). Calf:cow ratios were calculated similarly. Calculations for 95 percent confidence limits (95% C.I.) were made using the equation $C.I. = p \pm t_{0.5}\sqrt{\frac{p\,q}{n}\,\frac{N-n}{N-1}}$ where $q = 100-p$. The Finite Population Correction Factor $\frac{N-n}{N-1}$ was approximated as 0.6 based on seeing 40 percent of moose that were collared in the Gulkana drainage system within two weeks of composition surveys.

PREPARED BY: Carl McIlroy, Game Biologist III

MOOSE - GMU 13 - Nelchina Basin

APPENDIX V

Moose Composition Differences by Altitude and Area[a].

Area Differences drainages within the Gulkana-Chistochina Basin.

	Moose Management Unit			
	13-29	13-36	13-37	Pooled Areas
Bull:Cow, p (no.):	18.8% (781)	17.6% (250)	19.5% (149)	18.6% (1180)
95% C.I.:	17.7 to 19.9%	13.9 to 21.3%	14.5 to 24.0%	16.9 to 20.3%
Calf:Cow, p (no.):	21.6% (809)	22.6% (266)	26.4% (163)	22.5% (1238)
95% C.I.:	19.4 to 23.8%	18.7 to 26.5%	21.1 to 31.7%	20.7 to 24.3%

Altitude Differences

Moose Management Unit 13-06	Percentage (no.)	95% Confidence Interval
Bull:Cow, All Moose > 3000':	9.0% (321)	6.6 to 11.4%
All Moose < 3000':	10.2% (98)	5.5 to 14.9%
Calf:Cow, All Moose > 3000':	25.1% (390)	21.8 to 28.4%
All Moose < 3000':	23.5% (115)	17.4 to 29.6%

Pooled Moose Management Units 13-29, 13-36, and 13-37

Bull:Cow, All Moose > 3000':	20.1% (671)	17.8 to 22.4%[b].
All Moose < 3000'	15.5% (317)	12.4 to 18.6%[b].
Calf:Cow, All Moose > 3000':	23.0% (696)	20.6 to 25.4%
All Moose < 3000':	22.8% (347)	19.4 to 26.2%

a. Percentages, p, were calculated as $100 \times \mathfrak{E}x_{i/n}$. Confidence intervals at the 95 percent level, 95% C.I., were calculated as $C.I. = p \pm t\sqrt{\frac{p\,q}{n}\,\frac{N-n}{N-1}}$ where $q = 100 - p$ and $\frac{N-n}{N-1}$ was estimated to be 0.6

b. Confidence intervals do not overlap at the 90% level.

PREPARED BY: Carl McIlroy, Game Biologist III

Figure 1. Ungulate carcasses found during the winter and early spring, 1974-75. Sightings are from ADFG employees plus 20 other sightings observed by and printed here with permission of Victor Van Ballenberghe. Other sightings are indicated as "reported". All solid symbols were wolf kills except 1 calf moose killed by a bear.

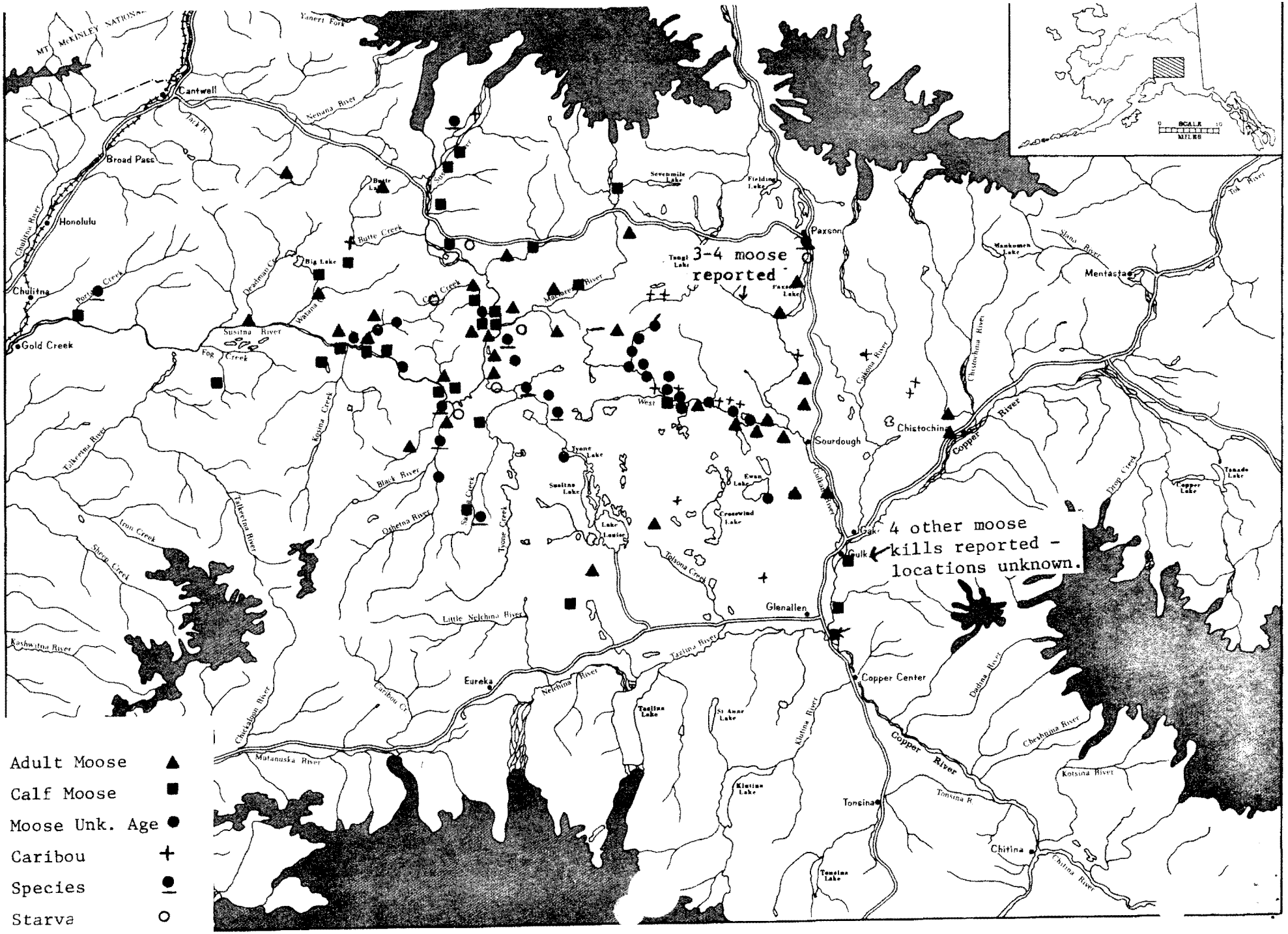


Figure . bserved moose during November, 1974 surveys. E ot represents 6 moose; e.g., a local area with than moose is not represented, 4 to 9 moose are repr ted by one dot, etc. The boundary of the Susit River study area is shown.

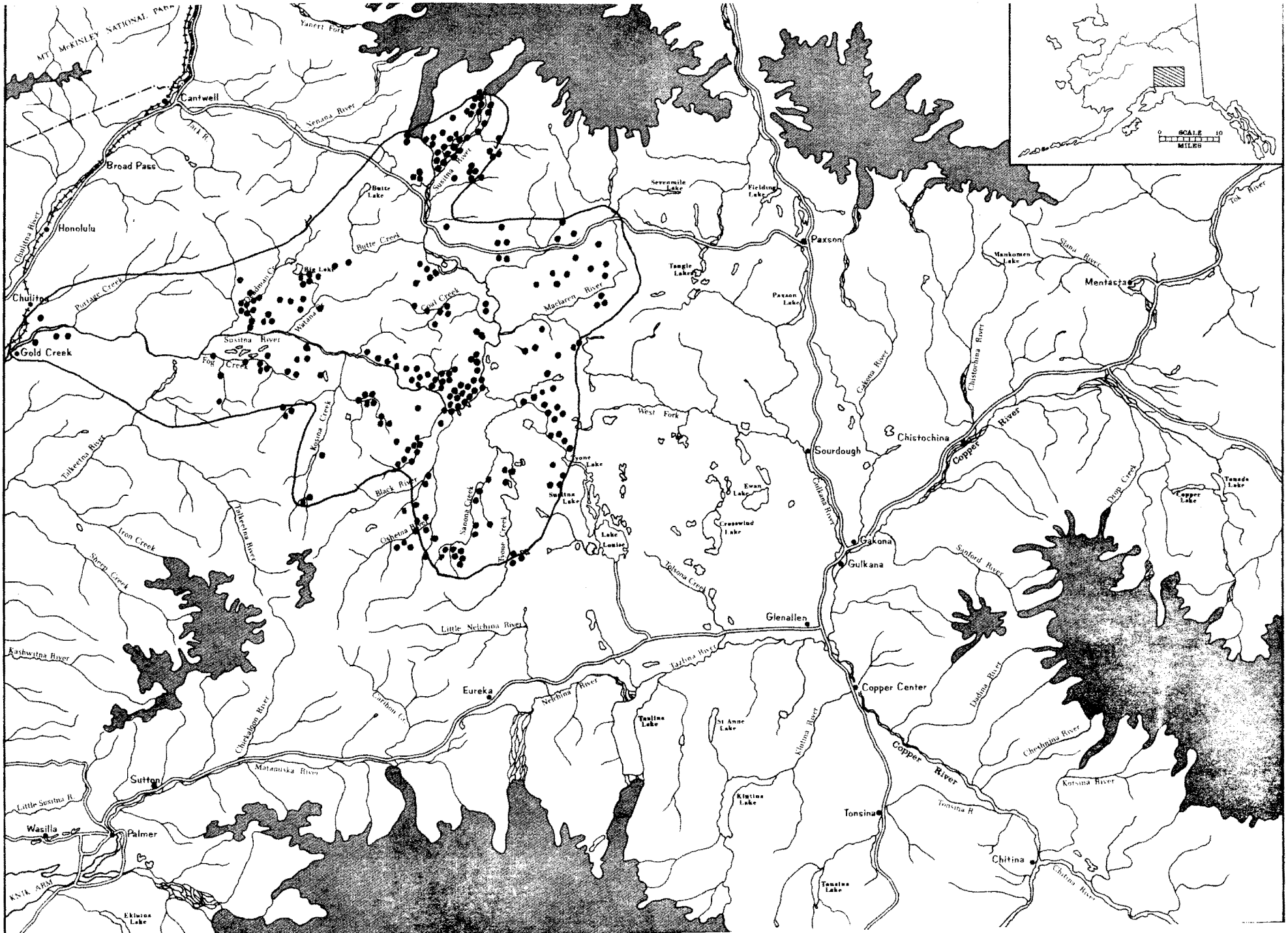


Figure 3. Observed moose and cumulative tracking of moose during April, 1975. Each dot represents 6 moose; e.g., a local area with less than 4 moose is not represented, 4 to 9 moose are represented by one dot, etc. Heavy use areas, based on cumulative moose tracking, are indicated by diagonal cross-hatching from upper left to lower right. Moderate use areas are indicated by diagonal cross-hatching from upper right to lower left. Light use areas are not cross-hatched. The boundary of the Susitna River study area is shown.

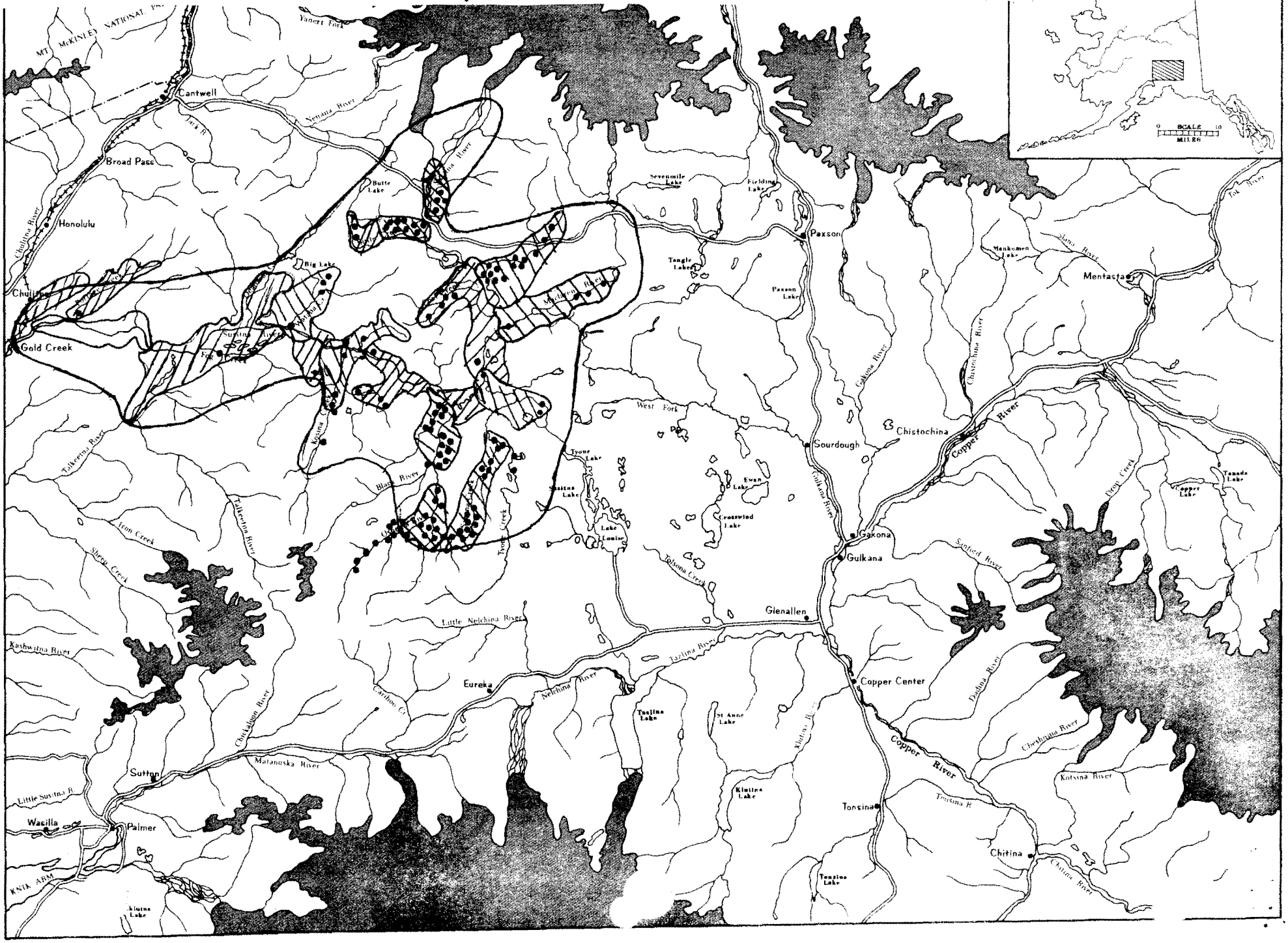
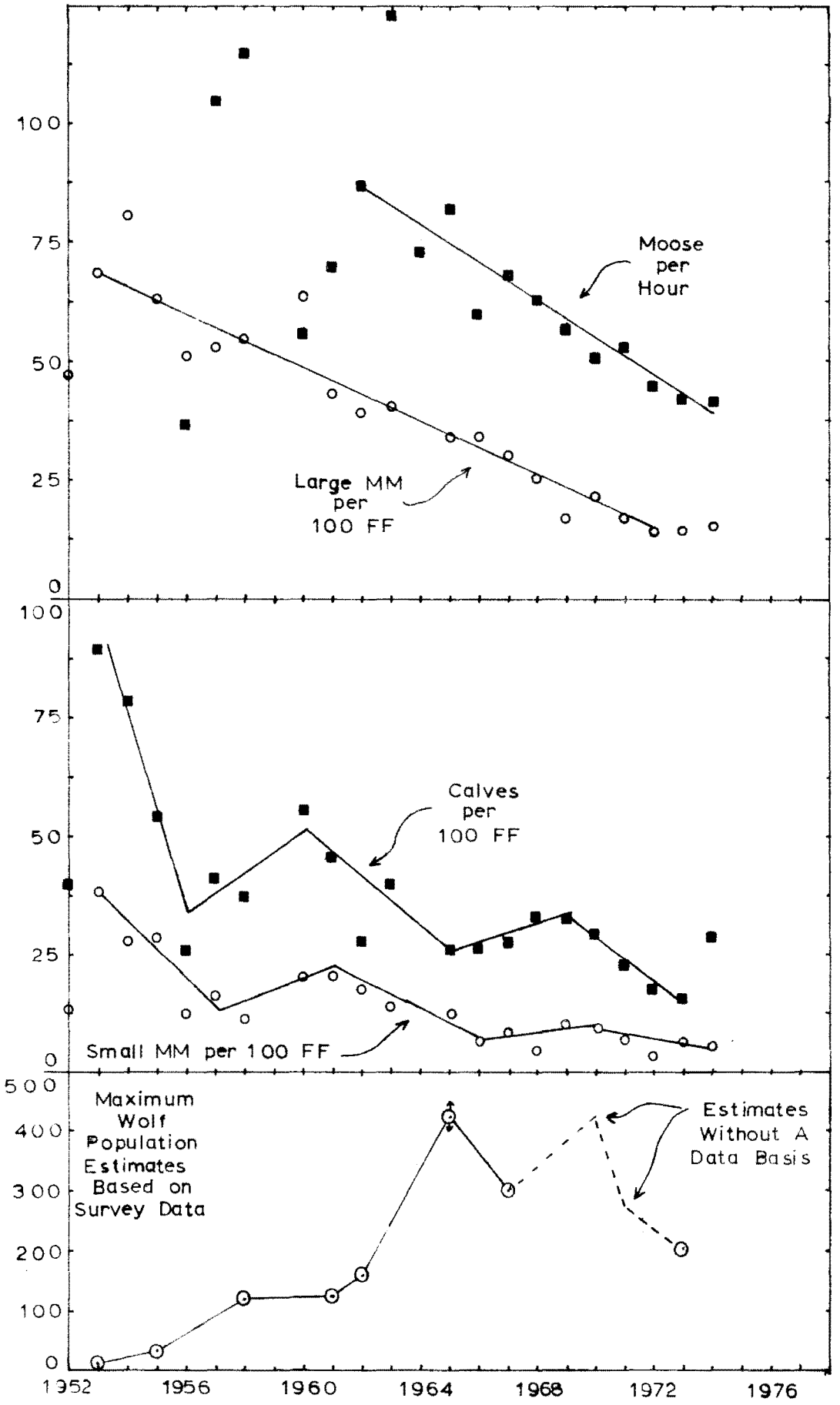


Figure 4. A comparison of Unit 13 moose population indices and estimates of wolf abundance for the period 1952 through 1974.



MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 14A - Palmer

Seasons and Bag Limits

Aug. 20 - Sept. 20	One moose; antlerless moose may be taken by permit only; dates and conditions of hunt will be described by Commissioner's announcement.

The antlerless season was not held in 1974.

Harvest and Hunting Pressure

The final IBM reported harvest for Subunit 14A totaled 167 moose, of which 164 were males and 3 of unknown sex (Appendix I). The 1974 harvest was the lowest since recording these data began in 1965. No antlerless season was held in 1974.

Although the season length did not change from 1973 to 1974, the dates of the season were altered from August 10-September 10 and November 1-November 10 in 1973 to August 10-September 20 in 1974 and eliminated the second season. The harvest was reduced 51.7 percent from 1973 and 67 percent from the 1970 to 1973 4-year average of 512.

Due to report deadlines, the data collected on moose mortality during the winter of 1974-75 in Subunit 14A from causes other than hunting are not complete at this writing. Appendix II reveals verified moose mortality from such causes during the period June 1, 1973 through May 31, 1974. Documented highway killed moose totaled 33; illegal kills 49; train kills 7; incidental kills 7 and winter kills 7, for a total of 103. In several categories, such as train, incidental and winter kills, the verified mortalities were up from 1972-73. In one category, road kill, the mortality dropped slightly from 36 in 1972-73 to 33 in 1973-74. The illegal kill category stayed the same, with 49 mortalities verified.

Composition and Productivity

A sample of 1,932 moose were tallied in Game Management Subunit 14A count areas 1 through 8 during a moose sex and age survey conducted from December 9 through 12, 1974 (Appendix III). The 1974 count was 50 moose less than the 1973 count. The bull/cow ratio increased from 5.9 bulls per 100 cows in 1973 to 11.0 bulls per 100 cows in 1974. The calf/cow ratio at 42.0 calves per 100 females, and the incidence of twins at 6.9 twins per 100 cows with calf, were similar to the 1973 ratios.

Three parturition counts were conducted between June 4 and June 13, 1974 (Appendix IV). The highest calf/cow ratio observed was on June 4 when 58.9 calves per 100 adult females were noted in a sample of 130 moose. Had we been able to differentiate female yearlings in the surveys and include them with the females, the result would have been a lower calf/cow ratio. The observed incidence of twins varied from 32.0/100 females w/calf on June 4, 1974 to 29.2/100 on June 7, 1974 to 0.0/100 on June 13, 1974. A small sample size (77) was partially responsible for not recording twins on June 13, 1974.

The pregnancy status of 13 adult female moose killed illegally or by automobiles during the winter of 1973-74 (Appendix V) revealed 84.6 percent were pregnant. In 1972-73, 82.8 percent in the same category were pregnant, indicating a high level of pregnancy in any given year. The twins per 100 females with fetus ratio was 30/100 in the 1973-74 period.

Fifty-one adult female moose incisors from train, auto, incidental and illegally killed moose during the period June 1, 1973 through May 31, 1974 were collected, processed, and microscopically read at the Palmer office of the Alaska Department of Fish and Game (Appendix VI). The mean age of the 51 moose was 6.35 years. The age of moose in these samples is continuing to rise. In 1970-71 the mean age was 5.93 years, (sample size 44) in 1971-72, 5.22 (sample size 68), and in 1972-73, 6.16 (sample size 49). The trend toward older age class animals in the female segment of the population was expected due to the lack of antlerless hunts in 4 of the past 5 years.

The average age of 17 male moose jaws collected during the 1974 hunting season was 1.24 years (Appendix VII). This is a reduction from 1.78 years in 1973. Two factors may be responsible for this decrease; closure of the November bull season decreased the harvest of some older bulls which had not migrated out of the remote inaccessible portions of the subunit; secondly, the low bull/cow ratio of 5.9 bulls per 100 females observed during the fall 1973 moose sex and age composition surveys indicates that relatively fewer older bulls would have been available to hunters during the fall 1974 season. Many of the bulls in the fall 1974 population would have been yearlings.

Management Summary and Conclusions

The moose population in Game Management Subunit 14A is continuing to recover after winter losses in 1970-71 and 1971-72. The sample size of moose sex and age composition counts conducted in 14A was nearly the same as the count in 1973. Winter mortality rose somewhat in 1974 when compared to 1973, but was much lower than the 1970-71 and 1971-72 winters. Documented illegal kills remained at 49, the same total as 1973. Train and incidental kills were both up slightly.

Calf production and twinning rates were similar to 1973, totaling 42 calves/100 females and 6.9 twins/100 females with calf in 1974, a continuation of increasing calf survival to the fall season since the low of 29 calves/100 females in 1972. Pregnancy status of female moose

killed illegally or by automobiles continues to remain at a high level. The bull/cow ratio increased as expected from 5.9 bulls/100 females in 1973 to 11.0 bulls/100 females in 1974. The reasons for the increase were closure of the second or November season and a 52.6 percent decrease in the bull harvest.

The 1974 moose harvest in Subunit 14A was the lowest since harvest data have been collected for the subunit. This is partially the result of not taking any antlerless moose. A Game Division decision was reached in late December to cancel the antlerless hunt. For three consecutive years, 1972 through 1974, antlerless moose hunts in Subunit 14A have not been held. In 1970, an antlerless hunt scheduled for 14A was also cancelled. If antlerless hunts are not held in future years in 14A, the risk of herd expansion beyond the capability of the range to support its numbers is very possible. Winter kill occurred in the winters of 1970-71 and 1971-72 when the total sample sizes were similar to 1973 and 1974 surveys.

The average age of bull moose taken in Subunit 14A remains below 2 years, and the average age of female moose that died from various non-hunting causes during the winter of 1973-74 is similar to 1973, but increasing.

Winter range continues to decline due to expansion of human activities. Suppression of fires and a lack of browse rehabilitation programs will continue the trend. Logging has not increased to the point where any beneficial aspects can be noted for browse production. Deteriorating winter habitat continues with no indication of a reversal in the trend.

Recommendations

A continuation of the present August 20-September 20 moose season is acceptable.

Antlerless seasons must be promulgated and held late in the year when moose from remote areas and higher elevations move into accessible portions of 14A.

Efforts to inaugurate a program to rehabilitate moose browse in 14A should be increased.

PREPARED BY:

Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

Appendix I. Moose Harvest and Hunting Pressure in Alaska's Game Management Subunit 14A, 1970-1974.

Year	Date	Bulls	Cows	Unid.	Total	Number of Hunters	Percent Success
1970	8/20-9/20	182	0	1	183		
	11/1-11/20	102	0	6	108		
	To be announced Antlerless	Season Cancelled by Public Pressure					
	Unknown Date	79	2	4	85		
	TOTAL	363	2	11	376	897	41.9
1971	8/20-9/20	177	0	1	178		
	11/1-11/20	225	0	0	225		
	9/1-9/20 Antlerless	0	101	0	101		
	11/1-11/14 Antlerless	0	233	0	233		
	Unknown Date	127	145	9	281		
	TOTAL	529	479	10	1018	2090	48.7
1972	8/20-9/20	83	1	1	85		
	11/1-11/20	100	1	0	101		
	9/1-9/20 Antlerless	0	75	0	75		
	To be announced Antlerless	Season Cancelled					
	Unknown Date	29	17	2	48		
	TOTAL	212	94	3	309	No Data	No Data
1973	8/20-9/10	136	0	2	138		
	11/1-11/10	167	0	3	170		
	To be announced Antlerless	Season Cancelled					
	Unknown Date	34	1	3	38*		
	TOTAL	337	1	8	346	1506	23.0
1974	8/20-9/20	164	0	3	167		
	To be announced Antlerless	Season Cancelled					
	TOTAL	164	0	3	167	1225	13.6

* This figure includes 4 male moose, 1 female, and 1 moose of unknown sex reportedly taken in October, December, January or February.

PREPARED BY: Jack C. Didrickson, Game Biologist III

Appendix II. Verified Moose Mortality (Excluding Hunting) in Alaska's Game Management Subunit 14A During the Period June 1-May 31, 1970 to 1974.

1970-71

Road Kill						Train Kill						Incidental Kill						Illegal Kill						Winter Kill					
*Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.
18	31	15	31	4	99	6	4	-	1	11	22	2	10	7	10	2	31	3	20	5	6	18	52	1	6	5	3	-	15

1971-72

8	35	27	28	11	109	2	4	0	3	6	15	6	13	2	3	5	29	3	30	0	4	8	45	0	6	8	10	1	25

1972-73

4	20	6	4	2	36	0	0	0	0	0	0	0	2	0	2	1	5	3	31	2	6	7	49	0	0	0	0	0	0

1973-74

2	17	7	5	2	33	1	2	1	2	1	7	0	2	1	4	0	7	1	37	2	2	7	49	1	1	2	3	0	7

* Ad. M.= Adult Male; Ad. F.= Adult Female; Calf M= Calf Male; Calf F= Calf Female; ? = Unknown Sex or Age; Tot. = Total.

Total Confirmed Non-Hunting Kill

	1970-71	1971-72	1972-73	1973-74
Adult Male	30	19	7	5
Adult Female	71	88	53	59
Calf Male	32	37	8	13
Calf Female	51	48	12	16
? Sex &/or Age	35	31	10	10
Total	219	223	90	103

PREPARED BY: Jack C. Didrickson, Game Biologist III

Appendix III. Moose Sex and Age Composition and Ratios, Alaska's Game Management Subunit 14(A), 1968-1974.

Year	Large MM	Small MM	Total MM	FF W/0	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (Hrs.)	Moose per Hour
1968 12/2-6, 14	138	98	236	793	603	42	1438	1674	9	696	8	2378	43.7	54
1969	Sex and age composition counts were not conducted due to unfavorable weather conditions.													
1970 11/24-27	83	60	143	957	543	48	1548	1694	13	652	19	2360	48.1	49
1971 11/23-24, 29	58	78	136	866	485	17	1368	1504	27	546	13	2063	59.2	34.8
1972 11/30 12/2	34	52	86	715	274	6	995	1081	3	289	25	1395	49.7	28.1
1973 12/21-22	32	46	78	811	489	32	1332	1410	9	562	10	1982	42.7	46.4
1974 12/9-12	50	98	148	764	447	33	1244	1392	9	522	18	1932	50.5	38.3

Year	Total MM per 100 FF	Small MM per 100 FF	Small MM per 100 Large MM	Small MM % in Herd	Small MM per 100 MM Calves	Calves per 100 FF	Twins per 100 cows w/Calf	Calf % in Herd	Moose per Hour	Total Moose
1968	16.4	6.8	72.6	4.1	28.1	48.4	6.5	29.3	54	2378
1969	Sex and age composition counts were not conducted due to unfavorable weather conditions.									
1970	9.2	3.9	72.3	2.6	18.4	42.1	8.1	27.6	49	2360
1971	9.9	5.7	134.5	3.8	28.6	39.9	3.4	26.4	34.8	2063
1972	8.6	5.2	152.9	3.7	36.0	29.0	2.1	20.7	28.1	1395
1973	5.9	3.5	143.8	2.3	16.4	42.2	6.1	28.5	46.4	1982
1974	11.9	7.9	196.0	5.1	37.5	42.0	6.9	27.3	38.3	1932

PREPARED BY: Jack C. Didrickson, Game Biologist III

Appendix IV. Moose Productivity in Alaska's Game Management Subunit 14A, 1974.

Date	Newborn Calves			Yearlings			Totals				Males	Calves per 100 FF	Calves per 100 FF + 1/2 Yrlgs.*	Yrlgs. per 100 FF	Twins per 100 FF w/Calf	Total Moose
	FF/0	FF/1	FF/2	WO/FF	FF/1	FF/2	Calves	Yrlgs.	FF	Unk.						
6/4	23	17	8	23	8	0	33	31	56	0	10	58.9	46.2	55.4	32.0	130
6/7	21	17	7	17	8	2	31	29	55	0	6	56.4	44.6	52.7	29.2	121
6/13	17	5	0	10	8	5	5	28	35	0	9	11.1	10.2	40.0	0.0	77

* One half of the yearlings are assumed to be females and would be classed with adult females in the fall sex and age composition count. Thus adding 1/2 of the yearlings to the adult females would most nearly approximate the standards by which the subsequent fall calf/cow ratio is obtained.

PREPARED BY: Jack C. Didrickson, Game Biologist III

Appendix V. Pregnancy Status of Female Moose Killed Illegally or by Automobile in Alaska's Game Management Subunit 14A During the Period November 16, 1973 through May 31, 1974.

Cementum Age Class	Sample Size	Pregnant	Not Pregnant	One Fetus	Two Fetuses	Unknown No. of Fetuses	% Pregnant	Twins per* 100 FF w/Fetus
1+	1	0	1	-	-	-	0.0	-
2+	0	0	0	-	-	-	-	-
3+	0	0	0	-	-	-	-	-
4+	1	1	0	1	0	0	100.0	0.0
5+	2	2	0	1	1	0	100.0	50.0
6+	0	0	0	-	-	-	-	-
7+	3	2	1	1	0	1	66.7	-
8+	3	3	0	3	0	0	100.0	0.0
9+	1	1	0	0	1	0	100.0	100.0
10+	0	0	0	-	-	-	-	-
11+	1	1	0	0	1	0	100.0	100.0
12+	0	0	0	-	-	-	-	-
13+	0	0	0	-	-	-	-	-
14+	0	0	0	-	-	-	-	-
15+	1	1	0	1	0	0	100.0	0.0
Total	13	11	2	7	3	1	84.6	30.0

* From a sample of 10 moose from which the number of fetuses present was determined.

PREPARED BY: Jack C. Didrickson, Game Biologist III

Appendix VI. Age Composition of Female Moose Taken by Hunters During Antlerless Moose Seasons, 1969-70 through 1972-73; and Train, Automobile, Illegal and Incidental Kills During the Periods June 1 through May 31, 1970-71 through 1973-74 in Alaska's Game Management Subunit 14A.

	Miscellaneous [1] Kills 6/1-5/31	Hunter Kills During Antlerless Moose Seasons [2]
	Mean Age [3]	Mean Age
1969-70	-	6.67 (126)
1970-71	5.93 (44)	-
1971-72	5.22 (68)	5.15 (437)
1972-73	6.16 (49)	5.19 (90)
1973-74	6.35 (51)	-

1. Miscellaneous kills include train, automobile, illegal and incidental kills.

2. 1969-70 season: 1/28-2/5/1970.
   1970-71 season: No antlerless season.
   1971-72 season: 9/1-20/1971, 11/1-14/1972.
   1972-73 season: 9/1-20/1972.
   1973-74 season: No antlerless season.

3. Sample size in parentheses, excludes calves.

PREPARED BY: Jack C. Didrickson, Game Biologist III

Appendix VII. Age Composition of Male Moose Taken by Hunters During Moose Seasons, 1964 through 1974; and Train, Automobile, Illegal and Incidental Kills During the Periods June 1 through May 31, 1970-71 through 1973-74 in Alaska's Game Management Subunit 14A.

	Miscellaneous [1] Kills 6/1-5/31	Hunter Kills During Moose Seasons
	Mean Age [2]	Mean Age [2]
1964-65	-	2.14 (14)
1965-66	-	2.50 (26)
1966-67	-	1.89 (37)
1967-68	-	2.09 (23)
1968-69	-	2.78 (64)
1969-70 [3]	-	4.41 (27)
1970-71	4.57 (14)	-
1971-72	4.75 (16)	2.17 (29)
1972-73	2.00 (7)	1.70 (10)
1973-74	Insufficient sample (3)	1.78 (41)
1974-75	Not yet available	1.24 (17)

1. Miscellaneous kills include train, automobile, illegal and incidental kills.

2. Sample size in parentheses excludes calves.

3. All moose taken during January 28 through February 5, 1970 antlerless hunt.

PREPARED BY: Jack C. Didrickson, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 14B - Willow to Talkeetna

Seasons and Bag Limits

Aug. 20 - Sept. 20	One moose; antlerless moose may be taken by permit only; dates and conditions of hunt will be described by Commissioner's announcement.

Two hundred and fifty permits to take antlerless moose were issued in 1974. The dates of the hunt coincided with the dates of the bull season.

Harvest and Hunting Pressure

The final reported moose harvest in Subunit 14B totaled 59, of which 41 were males and 18 were females (Appendix I). The 1974 harvest was the second lowest since collection of harvest data began in 1965. The only previously recorded lower harvest was 51 in 1972. The 1974 harvest was 33.3 percent of the previous 9-year average of 177.

1974 was the first year during which no November bull moose season was scheduled.

Due to report deadlines, the data collected on moose mortality during the winter of 1974-75 in Subunit 14B from causes other than hunting are not complete at this writing. Appendix II reveals verified moose mortality from such causes during the period June 1, 1973 through May 31, 1974. Documented road killed moose totaled 5, incidental kills 1 and illegal kills 2, for a total of 8. No effort was made to determine the magnitude of the railroad kill. This is the lowest recorded non-hunting moose mortality in Subunit 14B since collection of these data began during the winter of 1970-71.

Composition and Productivity

On November 20, 1974 a sample of 550 moose were tallied in 11.2 hours of flying in count areas between Sheep Creek and Willow Creek (Appendix III). No effort was made to fly all 14B count areas. The bull/cow ratio increased from a low of 10.6 bulls per 100 cows in 1973 to 13.8 in 1974. The calf/cow ratio of 29.4 was below the 1973 level of 36.5 and the previous 4-year average of 34.1. The incidence of twins per 100 females with calf was 8.7, the highest recorded in recent years. The number of moose observed per hour of count time was 49.1, above the 1972 and 1973 levels, but slightly below the 1971 level.

Fourteen adult female incisors from hunter-killed moose were collected, processed and read after the 1974 antlerless season (Appendix IV). The mean age of the 14 moose was 4.93 years. This was slightly above the lowest recorded average age for the subunit (4.69) from a sample of 13 incisors collected during the 1972 antlerless season. In both cases sample sizes were very small. Mean ages of female moose taken in Subunit 14B during the past 6 years have fluctuated, probably because sample sizes were small.

Management Summary and Conclusions

The 1974 moose harvest was at a low level for the third year in succession. The closure of the November season was partially responsible for the decrease in the 1974 harvest.

In response to the closure of the November season the bull/cow ratio rallied slightly from a low of 10.6 bulls/100 cows in 1973 to 13.8 in 1974. The number of moose observed per hour was considerably higher than during the previous two years, but this may be partially a result of the abbreviated count flown in 1974.

The recorded incidence of non-hunting mortality was very low during the winter of 1973-74. This may partially be the result of a reduced effort to document kills and partially because moose did not move into the highway and railroad area during that winter.

The average age of female moose taken by hunters during fall 1974, suggests the accessible moose population in 14B is a younger herd than in past years, but these data are subject to question because of the small sample size.

Subunit 14B has a large moose population capable of sustaining greater harvests, which might be obtained in several ways. Construction of access routes would enable hunters to get into remote sections of the subunit where most of the moose population may be found during the hunting season. However, to construct enough trails to have any effect would be costly and time consuming. A second suggestion would be to hold moose seasons late in the year when most of the subunit moose population has moved into accessible areas. Current public opposition to the taking of female moose carrying fetuses has curtailed the use of this method. In addition, the Subunit 14B moose population does not move into accessible areas every winter. Mild winters allow the moose to remain in remote areas all year long. The Department should have the flexibility to announce moose seasons by permit during those winters when moose actually do become available. Mortality from miscellaneous causes (primarily railroad and winter kills) as seen during the winters of 1970-71 and 1971-72 may be reduced if the Department has the authority to schedule moose seasons when the moose reach accessible wintering areas.

Recommendations

Provide for late antlerless permit hunts when and if the moose move into accessible areas. The flexibility to hold such hunts as late as the month of February should be acquired.

The shortened bull season should be maintained in accessible portions of Subunit 14B.

A browse rehabilitation program should be initiated.

PREPARED BY:

Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

Appendix I. Moose Harvest and Hunting Pressure in Alaska's Game Management Subunit 14B, 1970-1974.

Year	Season	Bulls	Cows	Unid.	Total	Hunters	Percent Success
1970	8/20-9/30	34	0	0	34		
	11/1-11/20	21	0	1	22		
	To be announced Antlerless	Cancelled					
	Unknown Date	26	0	0	26		
TOTAL		81	0	1	82	264	31.1
1971	8/20-9/30	36	0	4	40		
	11/1-11/20	48	0	1	49		
	9/1-9/30 Antlerless	0	39	0	39		
	11/1-12/15 Antlerless	0	101	0	101		
	Unknown Date	40	103*	0	143		
TOTAL		124	243*	5	372	950**	39.2**
1972	8/20-9/30	13	0	0	13		
	11/1-11/30	12	0	0	12		
	9/1-9/30 Antlerless	0	16	0	16		
	Unknown Date	10	0	0	10		
TOTAL		35	16*	0	51	289**	17.6**
1973	8/20-9/20	28	0	1	29		
	11/1-11/20	59	0	1	60		
	To be announced Antlerless	Cancelled					
	Unknown Date	6	0	1	7		
TOTAL		93	0	3	96	395	24.3
1974	8/20-9/20	36	0	0	36		
	8/20-9/20 Antlerless	0	18	0	18		
	Unknown Date	5	0	0	5		
TOTAL		41	18	0	59	355	16.6

* Using antlerless permit returns rather than harvest report returns.

** Using harvest report returns plus additional successful permit returnees who did not submit harvest report.

PREPARED BY: Jack C. Didrickson, Game Biologist III and
Don Cornelius, Game Biologist II

ppendix II. Verified Moose Mortality (Excluding Hunting) in Alaska's Game Management Subunit 14B, June 1-May 31, 1970-71 through 1973-74.

1970-71

Road Kill						Train Kill						Incidental Kill						Illegal Kill						Winter Kill					
Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.	Ad. M.	Ad. F.	Calf M	Calf F	?	Tot.
0	7	0	0	3	10	16	43	7	9	40	115	0	0	0	0	0	0	1	0	0	1	0	2	24	9	19	24	5	81

1971-72

2	1	2	1	1	7	13	18	7	7	30	75	3	0	0	0	0	3	3	3	0	0	0	6	3	4	8	4	0	19

1972-73

1	0	0	0	2	3	0	4	2	1	3	10	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1

1973-74

0	3	0	1	1	5	Tracks not walked						0	1	0	0	0	1	1	1	0	0	0	2	0	0	0	0	0	0

* Ad. M.= Adult Male; Ad. F.= Adult Female; Calf M= Calf Male; Calf F= Calf Female; ? = Unknown Sex or Age; Tot. = Total.

Total Confirmed Non-Hunting Kill

	1970-71	1971-72	1972-73	1973-74
Adult Male	41	24	1	1
Adult Female	59	26	4	5
Calf Male	26	17	2	0
Calf Female	34	12	2	1
? Sex &/or Age	48	31	6	1
Total	208	110	15	8

PREPARED BY: Jack C. Didrickson, Game Biologist III and Don Cornelius, Game Biologist II

Appendix III. Moose Sex and Age Composition and Ratios, Alaska's Game Management Subunit 14B, 1970 through 1974.

Year	Large MM	Small MM	Total MM	FF W/0	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hrs.)
1970 11/23,26	214	104	318	671	390	28	1089	1407	5	451	64	1922	----
1971 10/29 11/1	197	98	295	838	317	12	1167	1462	3	344	4	1810	34.6
1972 12/5-15	148	19	167	550	201	5	756	923	2	213	6	1142	36.0
1973 11/28,12/3	56	21	77	479	233	14	726	803	4	265	7	1075	32.7
1974* 11/20	31	22	53	280	95	9	384	437	0	113	0	550	11.2

Year	Total MM per 100 FF	Small MM per 100 FF	Small MM per 100 Large MM	Small MM% in Herd	Small MM per 100 MM Calves	Calves per 100 FF	Twins per 100 cows w/Calf	Calf % in Herd	Moose per Hour
1970	29.2	9.5	48.5	5.6	46.1	41.4	6.7	24.3	----
1971	25.3	8.4	49.7	5.4	57.0	29.5	3.6	19.0	52.2
1972	22.1	2.5	12.8	1.7	17.8	28.2	2.4	18.7	31.7
1973	10.6	2.9	37.5	2.0	15.8	36.5	5.7	24.8	32.9
1974*	13.8	5.7	71.0	4.0	38.9	29.4	8.7	20.5	49.1

* Only the portion of Subunit 14B between Willow Creek and Sheep Creek was flown in 1974.

PREPARED BY: Jack C. Didrickson, Game Biologist III and Don Cornelius, Game Biologist II.

Appendix IV. Age Composition of Female Moose Taken by Hunters In Alaska's Game Management Subunit 14B During Antlerless Moose Seasons, 1964, 1969, 1971, 1972 and 1974; and Train, Automobile, Illegal and Incidental Kills During the Periods June 1 through May 31, 1970-71 through 1973-74.

Year	Miscellaneous Kills * 6/1 - 5/31 Mean Age **	Hunter Kills During Antlerless Moose Seasons Mean Age **
1964-65	No Data	5.25 (36)
1969-70	No Data	9.42 (31)
1970-71	6.00 (40)	----------
1971-72	6.77 (13)	6.21 (184)
1972-73	Insufficient sample (3)	4.69 (13)
1973-74	8.20 (5)	----------
1974-75	Not Available	4.93 (14)

* Miscellaneous kills include train, automobile, illegal and incidental kills.

** Sample size in parentheses, excludes calves.

PREPARED BY: Jack C. Didrickson, Game Biologist III and
Don Cornelius, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 14C - Anchorage

Seasons and Bag Limits

Sept. 3 - Sept. 20	One moose; antlerless moose may be taken by permit only. Dates and conditions of the hunt will be described by commissioner's announcement.

Harvest and Hunting Pressure

Appendix I shows the moose harvest data for Game Management Subunit 14C from 1965-1974. In 1974, 46 moose including 41 males, 4 females and 1 sex unknown were harvested. Of the 4 females taken, 2 were either misreported or illegally killed and 2 were taken during the Anchorage International Airport archery hunt, during which 515 archers hunted 2,185 hours and took 14 shots.

The harvest of 41 bull moose in the subunit, 51 percent of the previous five-year average, was the lowest since harvest data have been recorded. The 14 shots by airport archers compare with 68 taken in 1973-74.

Appendix II shows the percent success among people hunting bull moose. These data exclude the Fort Richardson and airport hunts. From the late 1960's through 1974, success has declined from approximately 40 percent to 15 percent.

Appendix III enumerates the nonhunting mortality of moose from June 1, 1974 through May 31, 1975. These data represent the highest nonsport kill in 14C since such data have been collected, although they may be somewhat inflated due to duplication of records from various agencies responding to road kills (Fish and Wildlife Protection, State Troopers, City Police, Military Police and Fish and Game). Poaching totals are also possibly inflated as it is frequently difficult to ascertain if remains found at a particular location were from a kill at that site or were deposited there. Officer Bob Brown of Wildlife Protection, feels the totals are 90 percent accurate (personal communication).

Composition and Productivity

Composition of the 14C moose population remained fairly constant from 1966 through 1971 (Appendix IV). Since then a decrease in total

sample, moose per hour, and small bulls/100 cows has been noted. Because of the lateness of the count, bull ratios are only available from the Eagle River, Peters Creek, Ship Creek and Ft. Richardson areas during 1974. The continuing decline of small bulls/100 cows perhaps illustrates poor overwinter survival of the relatively substantial calf crop. The decreased total sample reflects the very high nonsport harvest over the past few years. Poor calf survival and/or heavy nonsport harvest is clearly illustrated in Eagle River where the sample size has dropped by one-third since 1970 and yearling bulls have been nearly absent since 1972 (Appendix V).

Management Summary and Conclusions

The reduced hunting harvest reflects shortened seasons, closed areas and reduced moose populations. Of these factors, the lack of huntable moose is of greatest significance and is attributable to several factors - clearly shown in Appendices II through V. The increased auto accident kill, rather than indicating an increased moose population, most likely reflects the great increase in Anchorage area traffic and consequently moose-auto accidents. The high poaching total also illustrates the encroachment of the Anchorage populace into moose wintering areas and consequently the irrestible temptation to "pot" a moose from ones back porch.

Although direct comparison between all known mortality factors and the annual increment is difficult, it is probably safe to assume that far more animals are being lost to the population than are entering it. In view of the rapidly growing Anchorage populace, there is little reason to believe that the downward trend will reverse itself.

Recommendations

More extensive fall, winter and spring surveys than in previous years should be undertaken in order to get a more accurate estimate of over-winter survival. Various agencies responsible for handling poaching and road kills should be required to fill out a standard form for the particular incident. Data on various mortality factors in addition to hunting should be made available to members of the public in hopes that more public pressure can be exerted toward discouraging poaching. Regardless of attempts made to assist the local moose population, it seems inevitable that their numbers will continue to decline.

PREPARED BY:

David Harkness
Game Biologist II

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

APPENDIX I

MOOSE HARVEST - UNIT 14C

	Bulls	Cows	Unk. Sex	Totals
1965	246	249	2	497
1966	134	77	4	215
1967	55	1	5	61
1968	90	38	0	128
1969	92	14	2	108
1970	65	5	6	76
1971	98	44	1	143
1972	55	36	3	94
1973	93	40	4	137
1974	41	4	1	46

APPENDIX II

Comparison of Success Among Persons Hunting Bull Moose Excluding Airport and Fort Richardson Hunt.

	Bull Kill	# Hunters	Percent Success
1969	92	215	42.8
1970	65	181	35.9
1971	93	226	41.2
1972	41	137	29.9
1973	78	388	20.1
1974	41	265	15.5

Submitted by: David Harkness, Game Biologist II

APPENDIX III

Verified Moose Mortality Other Than Hunting - 14C, 1974 - 1975.

	Vehicle	Poached	Other (Train, Winter Kill)	Total
June-74	1	0	0	1
July	2	0	1	3
August	2	1	0	3
Sept.	2	3	2	7
Oct.	1	0	1	2
Nov.	2	0	0	2
Dec.	8	2	0	10
Jan.-75	16	17	2	35
Feb.	6	11	8	25
March	20	34	4	58
April	7	8	3	18
May	7	1	3	11
Totals	74	77	24	175

Submitted by: David Harkness, Game Biologist II

APPENDIX IV

Moose Sex and Age Ratios 1966 - 1974 - 14C

Date	Tot. MM per 100 FF	Sm. MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Incidence of twins per 100 FF w/calf	Calf % in Herd	Animals per Hour	Total Sample
1966	18.2	9.9	118.8	6.3	53.5	37.0	4.5	23.7	43	300
1967	22.1	14.7	200.0	7.8	57.1	51.5	3.1	27.3	24	128
1968	22.9	8.4	58.3	5.5	61.8	27.7	11.5	18.3	74	376
1970	23.7	9.5	66.7	5.3	40.0	47.4	6.4	26.4	46	757
1971	21.3	11.2	112.1	7.5	86.7	26.0	2.8	17.2	61	870
1972	21.9	6.0	37.9	3.9	37.9	31.7	6.7	20.7	36	639
1973	15.8	6.2	63.6	4.1	35.2	34.9	6.3	23.2	36.5	694
1974*	-	-	-	-	-	-	-	22.9	31.1	528
1974**	21.5	5.8	26.9	3.5	27.2	42.6	16.3	25.9	31.5	397

* All areas
** Ft. Rich, Ship Cr., E. River, Peters Cr. only

Submitted by: David Harkness, Game Biologist II

APPENDIX V

Moose Sex and Age Ratios 1967 - 1974 - Eagle River

Date	Tot. MM per 100 FF	Sm. MM per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Incidence of twins per 100 FF w/calf	Calf % in Herd	Animals per Hour	Total Sample
2/11/67*	-	-	-	-	-	-	3.8	26.9	83	108
12/20-21/67	22.1	14.7	200.0	7.8	57.1	51.5	3.1	27.3	24	128
10/27/70	14.9	11.5	333.3	6.6	39.2	58.6	6.4	33.8	40	151
11/4/71	18.5	13.8	300.0	9.0	78.3	35.4	5.0	23.0	30	100
12/5/72	22.2	0	0	0	0	47.2	0	27.9	21	61
12/21-27/73	7.7	0	0	0	0	33.8	5.3	23.9	39.1	92
11/26/74	6.8	1.4	25.0	1.0	11.1	24.7	13.3	18.8	41.7	96

Remarks: *Late count, ratios not usable. Counts flown in 50's and early 60's available in segment reports.

Submitted by: David Harkness, Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 15A - Kenai

Seasons and Bag Limits

Aug. 20-Sept. 30	One moose; antlerless moose may be taken by permit only; dates and conditions of hunt will be described by commissioner's announcement.

Harvest and Hunting Pressure

Harvest reports indicate that hunters took 152 moose in Subunit 15A during the 1974-75 season. The harvest was composed of 141 bulls; 6 cows and 5 sex unknown (Appendix I). The bull harvest was down 41 percent from 1973-74 when 259 bulls were taken and the total harvest was down 44 percent from 1973-74 when 270 total moose were taken. The decline in the harvest is attributed to the shortened season and to the low survival of calves through the winter of 1973-74 which resulted in few yearling bulls being recruited.

Composition and Productivity

Sex and age composition surveys conducted in 1974 with the assistance of the USF&WS showed 8.7 bulls per 100 cows compared to 9.3 bulls per 100 cows in 1973 (Appendices II and III). The observed calf/cow ratio was 41.2 compared to 37.2 calves per 100 cows in 1973. The differences in the bull/cow ratios and calf/cow ratios between 1973 and 1974 are not large enough to be significant.

Small bull:100 cows ratios and the small bull percent of herd increased from the all time low recorded in 1973 but are still very low at 2.9 and 2.0, respectively. These improved ratios indicate slightly better over-winter survival of calves through the relatively mild winter of 1973-74.

Spring survival surveys were flown on May 3, 1975 (Appendix IV). Overwinter calf mortality as determined from this survey was extremely high at 86.9 percent. This rate of mortality is similar to that experienced during the winter of 1971-72. Snow depth and duration were also similar to those experienced in 1971-72.

Calves appeared to be doing well until mid-January when the first dead and moribund calves were observed. Mortality continued into May. Two of 6 calves seen on the May 3 survival survey were in very poor condition and probably did not survive.

Two old cow mortalities were observed which were attributed to malnutrition.

The census of Subunits 15A and 15B combined was conducted by the random stratified sampling technique. These counts, conducted by the U.S. Fish and Wildlife Service with assistance from the Department of Fish and Game, showed a decline in moose numbers between 1971 and 1974 of 26 percent and between 1974 and 1975 of 30 percent (Appendix V). Since calf survival and yearling bull ratios observed in Subunit 15B in 1973 and 1974 indicate good recruitment it is believed that most of the reduction occurred in Subunit 15A populations.

Management Summary and Conclusions

The 1974 harvest was the lowest ever recorded. The low harvest was the result of a shortened season and bull-only hunting made necessary by the declining status of the population.

Calf losses through the winter of 1974-75 were extremely high, making the outlook for the 1975 season even poorer than it was in 1974. Overwinter calf losses have averaged 79 percent for the past 4 years resulting in the recruitment of an average of about 5 yearlings per 100 adults in the population. This rate of recruitment is inadequate to cover even natural mortality, excluding losses to hunting, road kills and predation.

The high loss of calves during the winter and low recruitment rates are due to poor range quality. Analyses of bone marrow collected from 8 calves and 2 adults found dead indicate death was due to malnutrition. No improvement in calf survival over the past 4 years, even though the population has declined drastically, strongly suggests that the quality of forage on the winter range is inadequate to provide the nutrition needed by calves to survive the winter. It appears that the 1947 burn that has been the main winter feeding area for moose in this subunit has lost its capacity to carry large numbers of moose.

Range rehabilitation work performed by the U.S. Fish and Wildlife Service during the past winter and the 1969 burn should begin to produce significant quantities of forage in the next year or two. While those areas will partially offset the loss of the 1947 burn, they represent only a fraction of the area. Until such time as larger areas are converted to browse production, Subunit 15A will not support the numbers of moose it did in the 1960's.

Recommendations

The 1975 season should be shortened to not more than 20 days. No antlerless seasons should be held until there is an upward trend in the population.

PREPARED BY:

Paul A. LeRoux
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

MOOSE - GMU 15 (A) - Kenai

APPENDIX I

se Harvest and Hunting Pressure - Subunit 15 (A) (Harvest Ticket Return Data)

Year	Season	Bulls	Cows	Unid.	Total	Hunters	Percent Success
1965	1st	*	0	0	*		
	2nd	*	299	0	*		
	Combined	365	299	0	664	*	*
1966	1st	211	185	0	396		
	2nd	137	0	0	137		
	Combined	382[1]	185	0	567	*	*
1967	1st	185	0	0	185		
	2nd	62	0	0	62		
	Combined	247	0	0	247	1036	24
1968	1st	166	1	0	166		
	2nd	91	0	0	91		
	Combined	268	1	0	269	1092	25
1969	1st	*	*	*	*		
	2nd	*	*	*	*		
	Antlerless		NOT HELD				
	Combined	287	*	7	294		
1970	1st	134	0	3	137	*	*
	2nd	69	0	1	70	*	*
	Antlerless	16	191	3	209	*	*
	Combined	291[2]	191	11	493	918	54
1971	1st	153	223[2]	1	376		
	2nd	141	261[2]	0	402		
	Antlerless						
	Combined	369[1]	484[2]	4	853	1637	52
1972	1st	106	145[2]	1	236		
	2nd	54	0[2]	0	54		
	Combined	193[2]	145[2]	1	339	1518	22
1973	1st	156	4	2	162	1427	19
	2nd	82	2	1	85		
	Combined	259[1]	7[1]	4[1]	270		
1974		141	6	5	152	801	19

* Data not available
[1] Total of 1st and 2nd season may be less than for combined season because of inclusion of animals for which date of kill was not given.
hese data from permit returns. Numbers include both male and female calves.

Prepared by: Paul A. LeRoux, Game Biologist III

Appendix II

Moose Sex and Age Composition - Subunit 15 (A)

Year	Large MM	Small MM	Total MM	FF W/0	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample
12/3-21/62	85	76	161	597	317	52	966	1127	2	423	18	1568
1/1964	-	-	-	-	284	19	-	1660	-	511	-	2171
12/1-12/64	145	66	211	1254	470	25	1740	1951	-	520	-	2471
6/1965*	-	-	298	475	188	17	680	978	-	222	-	1200
6/1966*	-	-	230	345	104	4	453	683	-	112	-	795
10/3-16/67*	29	17	46	280	96	18	394	440	-	135	-	575
12/1968*	148	125	273	945	598	32	1575	1848	14	676	137	2661
11/18-20/69	40	17	57	243	181	14	438	495	1	210	-	705
11/30-12/2/70	98	58	156	756	305	19	1080	1236	4	343	6	1586
11/8-16/71	185	98	283	940	367	17	1324	1607	14	415	5	2027
11/27-12/5/72	136	35	171	678	399	19	1096	1267	14	451	5	1723
11/21-27/73	89	17	106	752	367	21	1140	1246	15	424	7	1677
11/20-24/74**	41	21	62	440	254	18	712	774	3	293	0	1067

* Lowlands

** CA's 19[illegible], 19E and 19F omitted.

MOOSE - GMU 15 (A) - Kenai

Appendix III

Moose Sex and Age Ratios - Subunit 15 (A)

Year	Total MM Per 100 FF	Small MM Per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF W/calf	Calf % in Herd	Animals per Hour	Total Sample
1962[1]	16.7	7.9	89.4	4.8	35.8	43.8	14.9	27.0	-	1568
1963[1]	-	-	-	-	-	-	6.3	23.6	-	2171
1964[1]	12.0	3.8	46.0	2.7	25.4	29.9	5.1	21.0	-	2471
1965[2]	43.8	-	-	-	-	32.6	8.3	18.5	-	1200
1966[2]	50.8	-	-	-	-	24.7	3.7	14.1	-	795
1967[2]	11.7	4.3	58.6	3.3	25.0	34.3	15.8	23.5	-	575
1968	20.0	9.0	82.8	5.1	38.6	46.9	5.1	26.7	-	2661
1969[3]	17.4	-	-	-	-	42.8	-	29.7	-	705
1970	14.1	5.4	59.2	3.6	32.9	32.1	5.9	21.9	58	1586
1971	21.4	7.4	53.0	4.8	47.0	31.5	4.4	20.6	49.7	2027
1972	15.6	3.2	25.7	2.0	15.5	41.2	4.5	26.3	39.2	1723
1973	9.3	1.5	19.1	1.0	8.0	37.2	5.4	25.4	45.4	1677
1974[4]	8.7	2.9	51.2	2.0	14.3	41.2	6.6	27.5	42.3	1067

[1] Varied count areas
[2] Lowlands only
[3] Count areas 9A, 11, 12A, 12B, 18A, 18B
[4] CA's 19C, 19D, 19E and 19F omitted.

Prepared by: Paul A. LeRoux, Game Biologist III

MOOSE - GMU 15 (A) - Kenai

Appendix IV

Productivity (Spring Fall survival) Ratios and Percents

Date	Bulls/* 100 Cows	Yearlings/* 100 Cows	Calves/ 100 Cows in Fall	Yrlg. % of Herd	Calf % of Fall Herd	% Calf Winter Mortality	Total Sample
(4/14-5/4-70)[1]	21.4	24.6	42.8	16.4	29.7	44.8	744[2]
(5/14/71)[3]	15.8	14.0	32.1	10.9	21.9	50.2	245
(5/15/72)[4]	16.5	4.8	31.5	4.0	20.6	80.6	302
(5/10/73)	-	-	41.2	6.5	26.3	71.5	142
(5/7/74)[5]	-	-	37.2	6.5	25.4	74.4	277
(5/3/75)[6]	-	-	42.1	3.6	27.5	86.9	195

* Use only if survey is conducted late enough to distinguish bulls, if not, work with calf % in herd.
1 From data compiled on tagging recon flights. Data compiled by Bob LeResche.
2 Includes 30 antlerless long yearlings. Data compiled by Bob Le Resche.
3 Area surveyed included only Moose River Flats.
4 Area surveyed included Moose River Flats and area between Kenai River and Skilak Loop, Sterling Highway.
5 Area surveyed Beaver Creek, Swanson River, Moose River Flats and area between Skilak Loop Road and Kenai River.
6 Area surveyed included Moose River Flats, Swanson River and Swan Lake Road rehab area.

Prepared by: Paul A. LeRoux, Game Biologist III

MOOSE - GMU 15 (A) - Kenai

Appendix V

Moose Population levels of Subunits 15 (A) and 15 (B) combined as determined by the random stratified sampling technique.

Year	Population Estimate	Confidence Limit
1964	8279 ± 1556	90%
1965	7432 ± 1561	90%
1966	7152 ± 1262	90%
1967	6732 ± 1413	90%
1971	7904 ± 1461	90%
1973	5692 ± 1348	90%
1974	4850 ± 1045	90%
1975	3374 ± 985	90%

epared by: Paul A. LeRoux, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 15B - Soldotna

Seasons and Bag Limits

Unit 15B East, that portion of Subunit 15B east of a straight line from the mouth of the Shantatalik Creek on Tustumena Lake, to the head of the westernmost fork of Funny River; east of Funny River from the head of its westernmost fork to the Kenai National Moose Range boundary, and south to the Kenai National Moose Range boundary eastward from Funny River to the Kenai River.	Aug. 20-Sept. 30	One bull
Unit 15B West (the remainder of Subunit 15B.	Aug. 30-Sept. 30	One moose; antlerless moose may be taken by permit only; dates and conditions of hunt will be described by Commissioner's announcement.

Harvest and Hunting Pressure

Harvest reports indicated a harvest of 97 moose in 1974 (Appendix I). The antlerless season scheduled for 15B West was not held, although it was published in the Regulations. There have been no antlerless seasons held in 15B West since 1970, when the subunit was divided into East and West sections.

The number of hunters declined by 64 percent from 877 in 1973 to 313 in 1974; success remained the same at 30 percent. Residents had a 29 percent success ratio and 50 percent of 24 nonresidents were successful. The large reduction in the number of hunters was probably due primarily to changes from either-sex in 1973 to bulls only in 1974.

The chronology of the harvest is presented in Appendix VI. Forty-eight percent of the known data harvest occurred in the first 10 days of the season with an additional 38 percent in the last two weeks of the season. This is a normal chronology of harvest and is similar to the August-September portion of the 1973 harvest, even though part of 15B had a November season in 1973.

Composition and Productivity

Sex and age composition surveys were conducted with the assistance of the USFWS and showed 23.4 bulls and 34.9 calves per 100 cows in the fall (Appendices II and III). The bull/cow and small bull/cow ratios

declined by 34 percent and 39 percent, respectively. This appears to have been due to the large bull harvest in 1973. The 1972 sex and age composition data also showed similar declines after a large bull harvest in 1971.

Production and oversummer survival of calves continued a 4-year upward trend. The 35 calves/100 cows was second only to the 37 calves/100 cows recorded in 1962 (Appendix III). The incidence of twins was also the second highest recorded in the 13-year history of sex and age composition surveys. Total sample size was down, but only about half the amount of effort was expended surveying in 1974 as in 1973.

Spring survival counts initiated in 1973 were continued in 1975 (Appendices IV and V). Although the sample size is small (62) the findings of 85.7 percent calf mortality overwinter corresponds well with the 86.9 percent mortality observed in 15A and 95 percent in 15C. Winter conditions in 15B were similar to those in 15A and 15C. Snow was deep, persisted late and spring weather was cold. Several dead calves were reported in 15B and numerous calves were observed to be in poor condition during the winter. Although the sample size for the spring survival survey was small, other observations support the findings of very poor calf survival through the winter.

Management Summary and Conclusions

Fall surveys appeared to confirm the belief that hunters were making heavy inroads into the bull population in 1974, especially in the upper Funny River horsetrail area. Although production was exceptionally good for 15B, the bad winter and late spring of 1974-75 effected a high mortality among calves.

Recommendations

Elimination of the either-sex season in 1974 was intended to reduce the attractiveness of the area for hunting and expecially reduce the bull harvest in the upper Funny River horsetrail area. The bull harvest did decline but still may have beeen excessive in view of pending plans for trophy management in this area. Therefore 15B East should be closed to bull hunting for one year.

Poor winter survival of calves dictates maximizing production by not harvesting cows for 1975 in any of 15B.

Since 15B West has relatively good access and would be subjected to excessive hunting pressure if left open during periods when most surrounding units are closed, the seasons should be made Sept. 1 Sept. 20 to conform with 15A and 15C.

PREPARED BY:

Spencer Linderman
Game Biologist II

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

MOOSE - GMU 15 (B) - SOLDOTNA

Appendix I

Moose Harvest and Hunting Pressure - Subunit 15 (B) - Soldotna

Year	Bulls	Cows	Unk. Sex	Totals	No. Hunters	Percent Success
1965	183[1]	193[1]	1[1]	377		
1966	119[1]	26[1]	4[1]	149		
1967	69[1]	0	1[1]	70		
1968	108[1]	6[1]	2[1]	116		
1969	119[1]	55[3]	2[1]	176		
1970	69[1]	75[1] *(15BE=50, 15BW=18) (Unk.=7)	2[1]	146		
1971	128[1]	79[2](15 BE)	5[1]	212		
1972	73[1]	11[2](15 BE)	1[1]	85		
1973	145[1] 15BE=82 15BW=63	116[1](15 BE)	6[1]	267	877	30
1974	95[1]	1[1]	1[1]	97	313	31

[1] Data derived from harvest reports.
[2] Data derived from registration permit returns.
[3] Data derived from field observations.

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15 (B) - Soldotna

Appendix II

Moose Sex and Age Composition - Subunit 15 (B)

Year	Large MM	Small MM	Total MM	FF W/0	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (Hrs.)	Moose Per Hour
12/3-21/62	377	61	438	673	317	28	1018	1456	2	375	1	1832	-	-
1963	NO COUNTS MADE													
12/64	337	46	383	690	166	10	866	1249	1	187	0	1437	22	65
1965	NO COUNTS MADE													
1966	NO COUNTS MADE													
1967	NOT AVAILABLE													
1968	NO COUNTS MADE													
1969	NO COUNTS MADE													
12/2-4/70& 12/12/70	184	17	201	455	75	2	531	732	0	77	5	817	10.4	78.6
1971	NO COUNTS MADE													
12/1-2/72	200	14	214	515	174	4	693	907	4	186	0	1093	17.79	61.4
11/19-21/73	188	28	216	436	166	7	609	825	4	184	1	1010	23.4	43.2
11/20-23/74	102	14	116	338	147	10	495	611	6	173	0	784	13.4	57.7

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15 (B) - Soldotna

APPENDIX III

Moose Sex and Age Ratios - Subunit 15 (B)

Year	Total MM per 100 FF	Small MM Per 100 FF	Sm. MM per 100 Lg. MM	Sm. MM % in Herd	Sm. MM per 100 MM Calves	Calves per 100 FF	Twins Per 100 FF w/calf	Calf % in Herd	Animals per Hour	Total Sample
1962	43.2	6.0	16.2	3.3	32.5	36.9	8.1	20.4	-	1832
1963	NO COUNTS MADE									
1964	44.2	5.3	13.7	3.2	52.0	21.6	5.7	13.0	65	1437
1965	NO COUNTS MADE									
1966	NO COUNTS MADE									
1967	28.8	3.8	13.8	2.4	44.0	15.8	2.0	10.9	-	457
1968	NO COUNTS MADE									
1969	NO COUNTS MADE									
1970	37.8	3.2	9.2	2.1	47.2	14.5	2.6	9.4	78.6	817
1971	NO COUNTS MADE									
1972	30.9	2.0	7.0	1.3	15.1	26.8	2.3	17.0	61.4	1093
1973	35.5	4.6	14.9	2.8	30.4	30.2	4.0	18.2	43.2	1010
1974	23.4	2.8	13.7	1.8	16.2	34.9	6.4	22.1	58.5	784

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15 (B) - Soldotna

APPENDIX IV

Moose Productivity (spring-fall survival) composition

Date	Cows w/1 Ylgs.	Cows w/2 Ylgs.	Total Cows	Unid. Adults	Total Adults	Lone Ylgs.	Total Ylgs.	Unid. sex & Age	Total Sample
5/11/73	10	0	10	67	77	5	15	0	92
5/08/74	16	0	16	92	108[1]	3	19	0	127
5/06/75	2	0	0	58	60	0	2	0	62[2]

1 Includes 9 bulls

2 Extremely poor counting conditions contributed to the small sample size.

MOOSE - GMU 15 (B) - Soldotna

Appendix V

Moose (spring-fall survival) ratios and percents

Date	Calves/ 100 Cows in fall	Yrlg. % of herd	Calf % of fall herd	% Calf winter Mortality	Total Sample
5/11/73	26.8	16.3	17.0	4.1	92
5/08/74	30.2	15.0	18.2	21.3	127
5/06/75[1]	34.9	3.2	22.1	85.5	62

1 Extremely poor counting conditions contributed to the small sample size.

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15 (B) - Soldotna

Appendix VI

Chronology of the harvest - 1974

	August	September				October	November			
	20-31	1-7	8-15	16-23	24-30		1-7	8-15	No Date	Total
Males	43	5	5	23	12	3			4	95
Females	1									1
Unk.	1									1
Total	45	5	5	23	12	3			4	97

Prepared by: Spencer Linderman, Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 15C - Homer

Seasons and Bag Limits

August 20 - September 30	One moose; antlerless moose may be taken by permit only. Dates and conditions of the hunt will be described by Commissioner's announcement.

Harvest and Hunting Pressure

Harvest reports showed a 1974 harvest of 230 bulls in Subunit 15C (Appendix I). The bull harvest increased by 22 percent from 1973 and was similar to the 5-year average of 227 bulls. The season was lengthened by 20 days in 1974 into prime late September hunting time.

A permit hunt for antlerless moose was held September 1-20. Subunit 15C was the only area on the Kenai Peninsula which had an antlerless hunt in 1974. Five hundred permits were issued and 133 moose were reported taken. During a September 1-23 season in 1973, 143 antlerless moose were reported harvested by 500 permittees. From past years' data the number of antlerless moose harvested appears to be highly predictable, based on the number of permits issued and the season length. A harvest of 133 antlerless moose was reported by permit returns. The total from harvest reports was 123 for a difference of 8 percent. In 1973 and 1972 the differences were 15 percent and 5 percent, respectively.

Hunting pressure has increased steadily since 1970 (Appendix I). The number of hunters afield in 1974 (1,240) increased by 10 percent over 1973 and was 60 percent higher than 1970. This increase in hunting pressure came in spite of a 16 percent decrease in hunting pressure for Unit 15 as a whole. The increase was most likely due to the 20 day longer season concurrent with considerably reduced season lengths in both 15A and 15B.

Hunter success dropped in 1972 to nearly half of what it had been the previous 5 years and it has never recovered. The small 3 percent increase in success in 1974 is made somewhat more significant considering the 2 percent increase in number of hunters. This is probably a reflection of good survival of calves through the previous winter (Appendix IV).

Much of the bull harvest occurs during the first week and the final two weeks of the season (Appendix VI). The antlerless harvest was heavy in the first week of the season and declined slowly in succeeding weeks.

Composition and Productivity

Sex and age composition counts were conducted in all count areas of 15C (Appendices II and III). After a substantial recovery of the bull/cow ratio from 9.8 bulls:100 cows in 1972 to 18.8 in 1973, the ratio dropped to 14.3 in 1974. The yearling bull percent in the herd dropped from 4.8 percent to 3.5 percent. The calf/cow ratio in the herd increased from 27.9 to 31.8:100 and the observed incidence of twins nearly doubled.

An unusually low number of moose were observed in the alpine areas where moose are normally concentrated at survey time. Two areas, the Caribou Hills count area and count area C to the southwest, yielded very low numbers of moose. One hundred and fourteen moose were observed in the Caribou Hills count area compared to an average of 590 for the previous 5 years. In count area C 56 moose were observed compared to an average of 272 for the previous 5 years. The snow was unusually deep in these areas and the abundance of tracks indicated that most moose had migrated to lower elevations just prior to our surveys. In these alpine areas moose are highly visible and the percent observed is high, while the adjacent areas through which they migrate are densely forested and only a small percentage are observed. Because of this difference a large portion of these animals were missed on the survey, accounting for the small sample size of 955.

In addition, this situation also introduces a bias in the total survey results because the Caribou Hills traditionally has the highest bull/cow ratios and the lowest calf/cow ratios in the unit. As a result the computed bull/cow ratio for the unit as a whole is probably deflated, while the calf/cow ratio is inflated. The degree of bias is not known.

Spring survival surveys were conducted in May 1975 (Appendix IV). Unusually deep snow over most of the Kenai Peninsula, coupled with a late and cold spring, was the cause of the high calf mortality. The severe winter of 1971-1972 produced nearly identical spring survey figures and one can reliably predict an essentially missing cohort in the next several years' harvests. The small surviving cohort of 1971 calves can be readily identified as 3-year-old animals in the 1974 antlerless moose harvest (Appendix V). Examination of the age structure of the 1972 and 1973 harvests show this same group to be poorly represented.

Thirty-seven moose carcasses were examined within an 8-mile radius of Homer during late winter. Thirty-two of these animals were calves and preliminary examination showed advanced malnutrition as the cause of death in all cases. One adult appeared not to have been suffering from malnutrition but was believed to have been killed by wolves. Laboratory examination of femur marrow is pending.

Management Summary and Conclusions

The 1974 bull harvest of 230 bulls was the highest harvest since 1971 when 263 bulls were taken. The increased harvest is attributable to good production and overwinter survival of calves. In addition the season was 20 days longer than in 1973 and 129 more hunters reported hunting the subunit.

The average age of the antlerless moose harvested has shown no trend over the past 6 years (Appendix V). Interpretation of these data is complicated by the effects of recruitment on the mean age of the herd. The great variation in survival of calves over the past 6 years makes any conclusions drawn from these data questionable at best.

Since yearling bulls normally comprise a sizable portion of the harvest in 15C and overwinter calf survival was very poor, the outlook for bull hunting in 1975 is poor.

Incidental to other surveys, more than a dozen wolf-killed moose were discovered in 15C during the winter. It is believed that a very low proportion of wolf-killed moose are observed. The expanding wolf population is becoming a significant factor influencing the harvestable surplus of moose in this subunit. The opening of a trapping season in 1975 may help slow the rate of increase of wolves.

Recommendations

Since the huntable bull population in 1975 will be missing most of the important yearling bull segment, the bull season should be shortened. Although harvesting bulls without a substantial harvest of cows may further reduce the bull/cow ratio, the antlerless season should be suspended for 1975 to maximize productivity.

Prepared by:

Spencer Linderman
Game Biologist II

Submitted by:

John S. Vania
Regional Management Coordinator

MOOSE - GMU 15(C) - HOMER

Appendix I

Moose Harvest and Hunting Pressure - Subunit 15(C) - Homer

Year	Bulls	Cows	Unk. Sex	Total	Hunters	Percent Success
1961	-	106[2]	-	-	-	-
1962	-	100[2]	-	-	-	-
1963	349[1]	147[1]	-	496	-	-
1964	470[1]	337[1]	-	807	-	-
1965	263[1]	229[1]	-	492	-	-
1966	278[1]	72[1]	-	350	-	-
1967	294[1]	-	-	294	643	46
1968	404[1]	20[1]	5[1]	429	972	44
1969	420[1]	109[3]	4[1]	533	-	-
1970	319[1]	68[1]	7[1]	394	775	51
1971	263[1]	146[2]	4[1]	413	836	49
1972	170[1]	114[2]	0[1]	284	1041	27
1973	152[1]	143[2]	5[1]	300	1111	27
1974	230[1]	133[2]	3[1]	366	1240	30

1. Data derived from harvest ticket reports.

2. Data derived from permit hunt reports.

3. Data derived from field observations.

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15(C) - HOMER

Appendix II

Moose Sex and Age Ratios - Subunit 15(C)

Year	Total MM per 100 FF	Sm MM per 100 FF	Sm MM per 100 Lg. MM	Sm MM % in Herd	Sm MM per 100 MM Calves	Calves per 100 FF	Twins per 100 FF w/calf	Calf % in Herd	Animals per Hour	Total Sample
1964	22.4	7.8	53.6	2.8	28.8	52.6	2.0	19.0	-	1848
1965	32.6	9.7	42.3	5.9	61.3	31.5	6.0	19.2	57.0	1889
1966	16.9	6.3	59.6	4.2	41.2	30.7	4.5	20.4	61.0	794
1967	21.4	6.7	45.8	4.2	34.0	40.0	7.2	24.6	150.0	3038
1968	20.6	6.1	41.8	3.8	30.2	40.1	6.9	25.0	60.5	1883
1969	13.9	6.5	88.0	4.5	46.6	27.9	5.8	19.1	53.6	1636
1970	20.4	3.3	19.1	2.3	27.0	24.3	4.1	16.7	150.0	1992
1971	26.0	7.7	42.2	5.3	82.6	18.7	7.7	12.8	48.4	1436
1972	9.8	0.8	8.7	0.6	6.2	25.4	2.1	18.7	72.5	2073
1973	18.8	7.1	60.3	4.8	50.6	27.9	3.9	19.0	62.9	1833
1974	14.4	5.2	56.7	3.6	32.5	32.1	7.1	21.9	33.4	960

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15(C) - HOMER

Appendix III

Moose Sex and Age Composition - Subunit 15(C)

Year	Large MM	Small MM	Total MM	FF W/0	FF W/1	FF W/2	Total FF	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Time (hrs.)	Moose per Hour
12/8-17/64	97	52	149	323	336	7	666	815	-	350	673	1838	-	-
11/30/65-12/17/65	265	112	377	824	313	20	1157	1534	12	365	3	1902	33.08	57
12/20-29/66	57	34	91	384	147	7	538	629	4	165	13	807	13.0	62
10/24-28/67	277	127	404	1196	641	50	1887	2291	6	747	0	3038	19.0	160
11/68	170	71	241	738	404	30	1172	1413	6	470	0	1883	31.0	61
12/11-12/69	83	73	156	826	278	17	1121	1277	1	313	46	1636	30.3	54
11/1-3/70	235	45	280	1051	306	13	1370	1650	1	333	9	1992	13.2	151
11/22-24/71	180	76	256	814	156	13	983	1239	2	184	13	1436	29.67	48
11/28-12/2/72	138	12	150	1149	368	8	1525	1675	3	387	11	2073	28.6	72
11/19-12/1/73	146	88	234	914	320	13	1247	1481	2	348	4	1833	29.3	63
11/22-11/30/74	60	34	94	468	171	13	652	746	12	209	0	955	28.7	33

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15(C)MER

Appendix IV

Productivity (spring/fall survival) Ratios and Percents

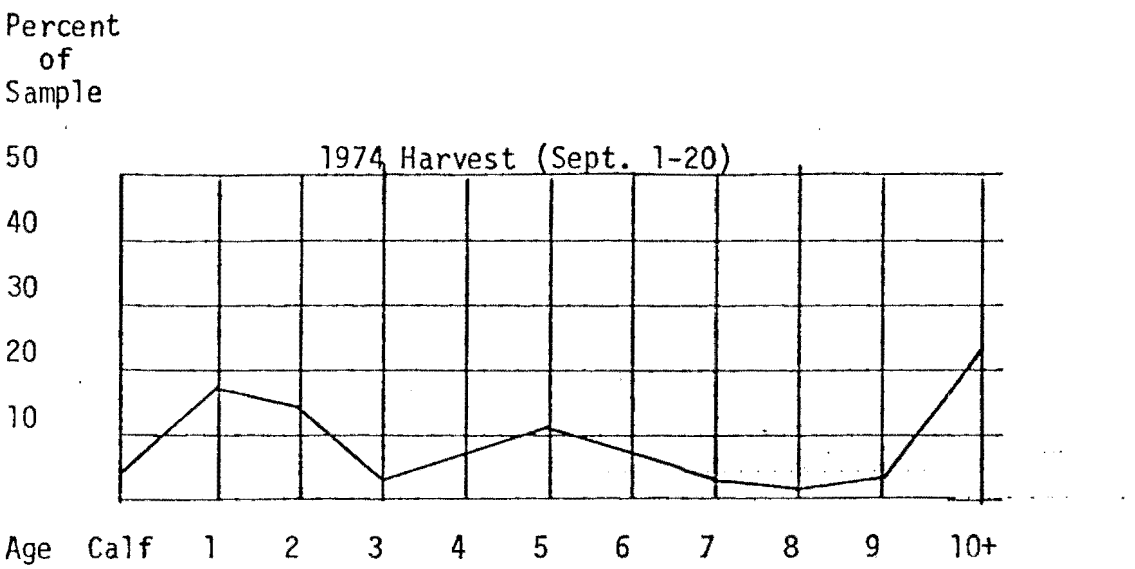
Date	Bulls 100 Cows	Yearlings/ 100 Cows	Calves/ 100 Cows in Fall	Yrlg. % of Herd	Calf % of Fall Herd	% Calf Winter Mortality	Total Sample
5/8/72	-	-	19	1	13	92	102
5/11/73	-	-	25	16	19	14	149
5/8/74	-	-	28	20	19	-	64
5/5-6/75	-	-	32	1	22	95	123

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15 (C) - Homer

Appendix V

Age Structure of Antlerless Moose Harvest



1974 AGES	#	%
Calf	4	3
1	21	18
2	16	14
3	3	3
4	9	8
5	15	13
6	11	9
7	6	5
8	2	2
9	3	3
10	7	6
11	6	5
12	4	3
13	3	3
14	3	3
15	2	2
16	2	2

Year	Mean Age[1]	% over 6 years[1]	Sample size[1]
1969	6.8	47	98
1970	6.9	44	52
1971	4.9	29	132
1972	6.1	33	98
1973	5.6	32	114
1974	6.6	34	113

[1] Excluding calves

Prepared by: Spencer Linderman, Game Biologist II

MOOSE - GMU 15 - Homer

Appendix VI

Chronology of the harvest - ALL MOOSE

	August			September			November				No Date
	20/31	1/7	8/15	16/23	24/30	October	1/7	8/15	16/23	24/30	
Males	76	27	25	40	40	6				1	15
Females	1	49	32	26	2	4				1	8
Unk.	1	0	0	1	1	0				0	0
Total	78	76	57	67	43	10				2	23

Prepared by: Spencer Linderman, Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 16 - West Side of Cook Inlet

Seasons and Bag Limits

Subunit 16A	Aug. 20 - Sept. 30	One moose; antlerless moose by permit only; dates and conditions of hunt will be described by Commissioner's announcement.
Subunit 16B	Aug. 20 - Sept. 30 Nov. 1 - Nov. 20	One moose.

Harvest and Hunting Pressure

The reported harvest for Unit 16 totalled 528 moose of which 336 were bulls, 185 were cows and 7 were of unknown sex (Appendix I). A total of 75 males, 33 females and 2 of unknown sex were taken from Subunit 16A (Appendix II) while 261 males, 152 females and 5 of unknown sex were harvested in Subunit 16B (Appendix III).

The total reported harvest for Unit 16 was the lowest recorded since 1968. A reduction in the 1974 harvest of 42.9 percent was noted when compared with the 1973 harvest. When compared with the 5-year 1969 through 1973 average of 796 moose, the 1974 harvest represents a decrease of 268 or 34 percent. The 1974 harvest of 110 moose in Subunit 16A exceeded the 1973 reported harvest by 27 moose.

A total of 367 moose (266 males, 95 females and 6 unidentified) were reported harvested during the August-September season in Unit 16. Ninety-nine moose (49 males, 49 females and one unidentified) were taken during the November season which took place in Subunit 16B only. Sixty-two moose were killed on unknown dates.

Seventy-four bulls were reported taken in 16A during the first season. In 16B, three times as many bulls were harvested in the August-September season as in the November season.

An antlerless season in Subunit 16A began on August 20 and ended September 30 with 33 female moose harvested by the 200 permit holders. Four hundred eighty-four persons applied for the antlerless hunt in Subunit 16A.

Although means of transportation shifted slightly in Unit 16, the use of aircraft was still high with 62.5 percent of the successful hunters utilizing this method, down from the 1973 average of 80 percent (Appendix IV). The use of boats by successful hunters increased from 5.9 percent in 1973 to 11.6 percent in 1974.

Subunit 16B was again monitored closely during the November moose season by Alaska Department of Fish and Game personnel. Aerial hunting pressure decreased dramatically with the imposition of a regulation requiring that hunters not hunt the same day they are airborne. In 1973, 265 bulls were taken by hunters during the November season while in 1974, 40 bulls were taken in that month. It should be noted that the 10-day emergency closure (November 20-30) in 1973 was carried as a published regulation in 1974. Also, a November 1-10 bull season was held in 16A in 1973, but not in 1974.

Light hunting pressure was also noted in the southern portion of Subunit 16B, when flights were conducted out of Kenai on November 3, 1974 and November 10, 1974. Similar reports were received from airborne observers monitoring hunting pressure in nearly all portions of Unit 16 at various times throughout November. Attempts were made by hunters on snow machines to reach Subunit 16B in the vicinity of the upper Kahiltna River via the Petersville Road in Subunit 16A. Although they were successful in getting the machines across the Kahiltna River, overflow was encountered and at least one hunter was flown out with frostbite. In the future, snow machine use will probably decrease because the open season (November 1-10) will not provide enough snow cover and freezing weather to allow the crossing of the Kahiltna River.

Composition and Productivity

Aerial sex and age composition counts were conducted in portions of Unit 16 during 1974. The Peters Hills count area in Subunit 16A was flown for the seventh consecutive year. Area "C" was eliminated during 1974. A sample size of 757 moose was obtained, revealing a bull/100 cow ratio of 18.4, a reduction from 20.7 in 1973 (Appendix V). The bull/cow ratio has been continually decreasing from a high of 33.4 in 1970. The calf/cow ratio of 47.6 calves per 100 cows in 1974 showed a slight increase over the 1973 ratio of 45.2. The incidence of twins decreased from 11.3 twins per 100 cows with calf in 1973 to 6.7 in 1974.

The area initiated in the 1973 moose sex and age composition counts known as Sunflower Basin was flown again in 1974. The bull/100 cow ratio in Sunflower Basin increased from 29.5 in 1973 to 34.3 in 1974 (Appendix VI). The calves/100 females ratio decreased from 34.1 in 1973 to 26.5 in 1974 and the incidence of twins per 100 females with calf dropped from 7.3 to 3.9.

The Mt. Susitna-Mt. Beluga area has been flown each year since 1968 except for 1969, when weather would not permit a survey. The bull:cow ratio (34.2 males/100 females) remains virtually the same as in 1973 (34.1 males/100 females) as shown in Appendix VII. The bull/cow ratio was at a high of 65.2 in 1970, but the sample size was small (175). The calf/100 cows ratio decreased from a high of 44.1 in 1973 to 38.5 in 1974. The twinning rate also decreased from 11.3 twins per 100 cows with calf in 1973 to 8.7 in 1974.

The sample size in 1974 was 730 compared to 324 during the 1973 surveys. It was felt that the date of the survey (November 25 and 26, 1974) was early enough to find most moose before they began moving to winter range.

Mt. Yenlo was flown for the first time in 1974. A total sample of 121 moose (Appendix VIII) revealed a bull/100 cow ratio of 50.0 and a calf/100 cow ratio of 39.1. Eighty-six moose per hour were seen.

A survey was conducted in the Redoubt Bay area in the southern portion of Unit 16, but too late in the year to obtain viable ratios (Appendix IX). The calf percentage in the herd was higher in 1974 (26.5) than in 1973 (25.4) or 1972 (19.1).

Appendix X reveals the age composition of 26 female moose taken in Subunit 16A during 1974. The average age was 6.27 years which is an increase from 1971 (5.91 years) and identical to a sample of 100 female moose taken in 1970 (6.27 years). An insufficient sample was obtained to compare male ages with previous years.

Aerial surveys of moose mortality were conducted in several areas of Unit 16 during the late winter period (Appendix XI). The Alexander Creek area was flown once each month for a period of four months beginning in January. The total sample size decreased each month which may be due to movement patterns. The calf percentage in the herd remained stable until March, when it is believed the animals dispersed. Eight dead moose were found on Alexander Creek and none were noted on the lower Yentna and the lower Susitna Rivers. Two dead moose were noted in the McArthur River to Drift River area.

Management Summary and Conclusions

The reported harvest of 528 moose is the lowest on record since 1968. The regulation requiring that no hunting take place the same day a hunter is airborne appears to have been responsible for the reduction in harvest of 43 percent from 1973.

In 1973, nearly the same number of moose were taken during the first and second seasons. In 1974, 75 percent of the harvest occurred during the first season in 16B, and 25 percent in the second season. There was no second or November season in 16A.

Aircraft are still the most popular means of transportation for hunters in Unit 16, but in 1974 their use was reduced to 62.5 percent of the successful hunters from 80.6 percent in 1973. The use of boats by successful hunters increased from 5.9 percent in 1973 to 11.6 percent in 1974.

Six winter mortality flights were conducted in Subunit 16B, most of them on Alexander Creek. Calf percentages in the herd increased until the last flight, which was conducted on April 21, 1975, when it was felt the moose had left the wintering area.

Moose sex and age composition counts reveal the population in most areas of Unit 16 is continuing to recover from the severe winters of 1970-71 and 1971-72. Bull/cow ratios are declining, due partially to hunter preference for bull moose, and the probability of male-selective winter mortality. Sample sizes in most areas closely approximate or exceed the 1973 sample sizes. Calf/100 cow ratios are similar to the 1973 surveys as is the age composition of female moose teeth collected in Subunit 16A.

Recommendations

If hunters continue to observe the regulation which requires that they may not hunt the same day airborne, a relaxation of season length may be in order provided that surrounding units have similar seasons. Reductions in moose harvest are not desirable if winter mortality claims surpluses.

Aerial hunter pressure surveys should be conducted during the November season as well as the winter-spring mortality flights.

The possibilities for browse rehabilitation in Unit 16 should be investigated.

PREPARED BY:

Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

Appendix I. Moose Harvest and Hunting Pressure in Alaska's Game Management Unit 16, West Side of Cook Inlet, 1969-1974.

Year	Season	Bulls	Cows	Unid.	Total	Hunters	Percent Success
1969	8/20-9/30	252	0	5	257		
	11/1-11/30	183	0	1	184		
	11/21-11/30 Antlerless	0	123	0	123		
	Unknown Date	180	44	1	225		
TOTAL		615	167	7	789	1366	57.8
1970	8/20-9/30	238	0	3	241		
	11/1-11/30	228	0	5	233		
	11/21-11/30 Antlerless	0	152	0	152		
	Unknown Date	132	60	7	199		
TOTAL		598	212	15	825	1442	57.2
1971	8/20-9/30	174	0	0	174		
	Yentna 8/20-12/31	9	-	1	10		
	11/1-11/30	249	-	4	253		
	11/21-11/30 Antlerless	0	174	2	176		
	Unknown Date	153	61	8	222		
TOTAL		585	235	16	836	1648	50.7
1972	8/20-9/30	142	0	1	143		
	Yentna 8/20-11/30	11	-	0	11		
	11/1-11/30	236	-	0	236		
16A - 16B -	8/20-9/30 Antlerless and 8/20-9/30 & 11/1-11/30	0	119	0	119		
	Unknown Date	69	25	4	98		
TOTAL		458	144	5	607	1413	42.9
1973	8/20-9/20	303	128	10	441		
	Yentna 8/20-11/30	9	8	0	17		
16A - 16B -	11/1-11/10 and 11/1-11/20	265	143	5	413		
16A -	Antlerless	Cancelled					
	Unknown Date	32	18	4	54		
TOTAL		609	297	19	925	1995	46.4
1974	16A - 8/20-9/20 and 16B - 8/20-9/30	266	95	6	367		
	16B - 11/1-11/20	49	49	1	99		
16A -	8/20-9/20 Antlerless	0	30	0	30		
	Unknown Date	21	11	0	32		
TOTAL		336	185	7	528	1580	33.4

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix II. Chronology of Moose Harvest from Harvest Reports in Alaska's Game Management Subunit 16A, 1974.

	August *	September				October	November	
	20-31	1-7	8-15	16-23	24-30		1-7	8-15
Male	24	9	3	15	16	2	-	-
Female	20	3	2	2	4	-	1	-
Unknown	0	0	0	1	1	-	-	-
Total	44	12	5	18	21	2	1	-

	November		December				
	16-23	24-30	1-15	16-23	24-31	Jan.-Feb.	No Date
Male	1	-	-	-	-	1	4
Female	-	-	-	-	-	-	1
Unknown	-	-	-	-	-	-	0
Total	1	-	-	-	-	1	5

* Season August 20-September 30.

Total male	- 75
Total female	- 33
Total unknown	- 2
Total	110

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix III. Chronology of Moose Harvest from Harvest Reports in Alaska's Game Management Subunit 16B, 1974.

	August	September				October	November	
	20-31	1-7	8-15	16-23	24-30		1-7	8-15
Male	48	18	35	50	48	2	13	13
Female	38	10	8	22	16	1	12	12
Unknown	0	3	0	0	1	-	0	1
Total	86	31	43	72	65	3	25	26

	November		December					
	16-23	24-30	1-7	8-15	16-23	24-31	Jan.-Feb.	No Date
Male	22	1	-	-	-	-	-	11
Female	24	-	-	-	-	-	-	9
Unknown	0	-	-	-	-	-	-	0
Total	46	1	-	-	-	-	-	20

Total male - 261
Total female - 152
Total unknown - 5
Total 418

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix IV. Hunter Success vs. Transport Means from Harvest Report Data in Alaska's Game Management Unit 16, 1974.

Transport Means*	Successful Means of Transport				% of Successful Hunters Utilizing Transport Means	Unsuccessful Means** of Transport				Total Reported Methods of Transport
	Res.	NR.	Unk.	Total		Res.	NR.	Unk.	Total	
1. Aircraft	276	70	4	350	62.5	444	35	10	489	839
2. Horse	4	2	0	6	1.1	7	0	0	7	13
3. Boat	61	4	0	65	11.6	124	5	4	133	198
4. Motorbike	3	0	0	3	.5	7	0	0	7	10
5. Snow machine	13	0	0	13	2.3	12	2	0	14	27
6. Off-road Vehicle	36	1	2	39	7.0	126	3	1	130	169
7. Highway Vehicle ("afoot")	56	1	2	59	10.5	323	6	1	330	389
No Means Reported	24	0	1	25	4.5	79	1	3	83	108
Total				560					1193	1753

* Method of transport means counted more than once when listed in combinations.
** Unsuccessful moose hunters are not required to mark method of transportation on IBM harvest report card.

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix V. Moose Sex and Age Composition and Ratios in Alaska's Game Management Unit 16, Peters Hills Count Area, 1967-1974.

Area*	Date	Large M	Small M	Total M	F W/0	F W/1	F W/2	Total F	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hrs.)
1.	12/4-6/67	121	52	173	443	205	31	679	852	2	269	0	1121	8.9
2.	12/9-20/68**	60	32	92	225	115	10	350	442	5	140	5	587	10.1
3.	11/12-23/70	67	42	109	177	131	18	326	435	0	167	0	602	n/a
3.	11/8-9/71	94	40	134	354	153	5	512	646	1	164	5	815	19.3
3.	11/6/72	82	12	94	366	122	12	500	594	2	148	0	742	18.4
3.	11/27-28, 12/1/73	74	31	105	303	181	23	507	612	4	229	15	856	20.8
3.	11/18-19/74***	34	50	84	261	182	13	456	540	9	217	0	757	17.0

Year	Total M per 100 F	Small M per 100 F	Small M per 100 Large M	Small M % in Herd	Small M per 100 M Calves	Calves per 100 F	Incidence of Twins per 100 F W/Calf	Calf % in Herd	Animals per Hour	Total Sample
1967	25.5	7.7	43.0	4.6	38.7	39.6	13.1	24.0	126	1121
1968	26.3	9.1	53.3	5.5	45.7	40.0	8.0	23.8	58	587
1970	33.4	12.9	62.7	7.0	50.3	51.2	12.1	27.7	N/A	602
1971	26.2	7.8	42.6	4.9	48.8	32.0	3.2	20.1	42	815
1972	18.8	2.4	14.6	1.6	16.2	29.6	9.0	19.9	40	742
1973	20.7	6.1	41.9	3.7	27.1	45.2	11.3	27.2	41	856
1974	18.4	11.0	147.1	6.6	46.1	47.6	6.7	28.7	44.5	757

Remarks: * 1. Peters Hills to Kahiltna.
2. Peters Hills and Petersville Road.
3. Count Areas A, B, C, D, E, F.

** Count area not flown in 1969.
*** Count area C not flown in 1974.

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix VI. Moose Sex and Age Composition and Ratios in Alaska's Game Management Unit 16 Sunflower Basin Count Area, 1973-1974.

Date	Large M	Small M	Total M	F W/O	F W/1	F W/2	Total F	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hrs.)
10/23/73	64	25	89	206	89	7	302	391	0	103	0	494	5.8
11/8/74	49	21	70	153	49	2	204	274	1	54	0	328	5.6

Year	Total M per 100 F	Small M per 100 F	Small M per 100 Large M	Small M % in Herd	Small M per 100 M Calves	Calves per 100 F	Incidence of Twins per 100 F W/Calf	Calf % in Herd	Animals per Hour	Total Sample
1973	29.5	8.3	39.1	5.1	48.5	34.1	7.3	20.9	85	494
1974	34.3	10.3	42.9	6.4	77.8	26.5	3.9	16.5	58.6	328

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix VII. Moose Sex and Age Composition and Ratios in Alaska's Game Management Unit 16, Mt. Susitna-Mt. Beluga Count Area, 1968-1974.

Date	Large M	Small M	Total M	F W/0	F W/1	F W/2	Total F	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hrs.)
12/12, 14, 17/1968	105	19	124	191	64	3	258	382	0	70	5	457	8.5
1969	Not Flown												
12/1/1970	49	9	58	64	22	3	89	147	0	28	0	175	2.1
10/29/1971	240	65	305	445	181	8	634	939	1	198	2	1139	18.4
12/6-7/1972	80	4	84	330	69	1	400	484	2	73	0	557	14.0
11/25-26, 12/3/1973	49	12	61	108	63	8	179	240	0	79	5	324	9.9
11/19-20/1974	103	41	144	272	136	13	421	565	0	162	3	730	14.4

Year	Total M per 100 F	Small M per 100 F	Small M per 100 Large M	Small M % in Herd	Small M per 100 M Calves	Calves per 100 F	Incidence of Twins per 100 F W/Calf	Calf % in Herd	Animals per Hour	Total Sample
1968	48.1	7.4	18.1	4.2	54.3	27.1	4.5	15.3	54	457
1969	Not Flown									
1970	65.2	10.1	18.4	5.1	64.3	31.5	12.0	16.0	85	175
1971	48.1	10.2	27.1	5.7	65.6	31.2	4.2	17.4	63	1139
1972	21.0	1.0	5.0	0.7	11.0	18.3	1.4	13.1	40	557
1973	34.1	6.7	24.5	3.8	30.4	44.1	11.3	24.8	33	324
1974	34.2	9.7	39.8	5.6	50.6	38.5	8.7	22.2	51	730

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix VIII. Moose Sex and Age Composition and Ratios in Alaska's Game Management Unit 16, Mt. Yenlo Count Area, 1974.

Date	Large M	Small M	Total M	F W/0	F W/1	F W/2	Total F	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hrs.)
11/10/74	18	14	32	40	23	1	64	96	0	25	0	121	1.4

Year	Total M per 100 F	Small M per 100 F	Small M per 100 Large M	Small M % in Herd	Small M per 100 M Calves	Calves per 100 F	Incidence of Twins per 100 F W/Calf	Calf % in Herd	Animals per Hour	Total Sample
1974	50.0	21.9	77.8	11.6	112.0	39.1	4.2	20.7	86.4	121

Appendix IX. Moose Sex and Age Composition and Ratios in Alaska's Game Management Unit 16, Redoubt Bay Count Area, 1972-1974.

Date	Large M	Small M	Total M	F W/0	F W/1	F W/2	Total F	Total Adults	Lone Calves	Total Calves	Unid. Sex & Age	Total Sample	Count Time (hrs.)
12/3-4/72	24	2	26	183	54	4	241	267	1	63	0	330	7.3
12/1/73	26	15	41	124	53	11	188	229	3	78	0	307	8.5
4/13/75 *	--	--	--	79**	24	7	---	110	2	40	1	151	4.3

Year	Total M per 100 F	Small M per 100 F	Small M per 100 Large M	Small M % in Herd	Small M per 100 M Calves	Calves per 100 F	Incidence of Twins per 100 F W/Calf	Calf % in Herd	Animals per Hour	Total Sample
1972	10.8	0.8	8.3	0.6	6.3	26.1	6.9	19.1	45	330
1973	21.8	8.0	57.7	4.9	38.5	41.5	17.2	25.4	36	307
1974 *	----	---	----	---	----	----	22.6	26.5	35	151

* Flown late, bulls had dropped antlers.
** Includes males.

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix X. Age Composition of Adult Moose Taken by Hunters in Game Management Subunit 16A During Moose Seasons, 1969-1971 and 1974.

Year	Mean Age*	
	Female	Male
1969	6.09 (57)	3.33 (9)
1970	6.27 (100)	3.34 (35)
1971	5.91 (66)	4.54 (24)
1974	6.27 (26)	Insufficient Sample (3)

* Sample size in parentheses, excludes calves.

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

Appendix XI. Moose Winter Mortality Flights in Alaska's Game Management Unit 16, 1974-1975.

Area	Date	Total Adults	Lone Calves	Total Calves	Unident. Sex & Age	No. of Dead Moose	Calf % in Herd	Count Time(hr)	Moose per Hr	Total Sample
Alexander Creek	1/29/75	156	0	37	0	0	19.2	.75	257	193
	2/20/75	138	1	38	0	0	21.6	1.20	147	176
	3/18/75	92	1	27	0	1	22.7	.75	158	119
	4/21/75	58	0	8	2	8	12.1	1.20	57	68
Lower Yentna	1/29/75	154	0	39	0	0	20.2	1.1	175	193
Lower Susitna, Yentna below Skwentna	5/14/75	30	0	5	0	0	14.3	3.3	11	35
McArthur River to Drift River	4/13/75	110	2	40	1	2	26.5	4.3	35.1	151

PREPARED BY: Jack C. Didrickson and Don Cornelius
Game Biologist III and Game Biologist II

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 17 - Bristol Bay

Seasons and Bag Limits

August 20 - December 31 — One bull

Harvest and Hunting Pressure

The reported harvest of 69 moose for 1974 was the highest in Unit 17 history (Appendix I). Alaskan residents reported 58 percent of the total harvest.

Composition and Productivity

No data are available.

Management Summary and Conclusions

The reported harvest for this unit must be considered minimal. A subsistence survey conducted by the University of Alaska in the summer of 1974 indicated local villages are responsible for a late winter and early spring illegal harvest at least double the annual reported harvest. Attempts to enforce the closed season during the winter of 1974-1975 resulted in an outcry from local residents and representatives of the Bristol Bay Native Association. Efforts must be continued to obtain compliance with the regulations or the regulations should be changed to provide for the "traditional" harvest pattern of the villages. However, it appears that the late winter-early spring hunting has been effective in maintaining low populations of moose near the villages that are utilizing them as a source of meat.

The increase in the reported harvest resulted because the unit's season length was more liberal than the seasons for areas normally hunted by Anchorage area residents. As a result, additional hunting pressure was directed into Unit 17. Should hunting pressure continue to increase, restrictions in season length may be recommended.

Recommendations

No changes in seasons or bag limits are recommended. Efforts to obtain compliance with the regulations must be continued.

PREPARED BY:

James B. Faro
Game Biologist III

SUBMITTED BY:

John S. Vania
Regional Management Coordinator

MOOSE - GMU - 17 Bristol Bay

APPENDIX I

Moose Harvest and Hunting Pressure - Unit 17

Year	Bulls	Cows*	Unid.	Total	Hunters	Percent Success
1964	31	1	-	32	-	-
1965	41	1	-	42	-	-
1966	25	1	-	26	90	28.9
1967	37	0	1	38	77	49.4
1968	45	0	1	46	66	69.7
1969	11	1	3	15	31	48.4
1970	23	0	2	25	35	71.4
1971	36	0	1	37	63	58.7
1972	35	0	3	38	74	51.4
1973	39	2	1	42	94	44.7
1974	65	2	2	69	119	58.0

* No legal cow season has been held.

PREPARED BY: James B. Faro, Game Biologist III

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 18 - Yukon-Kuskokwim Delta

Seasons and Bag Limits

Aug. 20 - Dec. 31 One bull

Harvest and Hunting Pressure

The reported 1974 harvest was eight moose. Most Unit 18 hunters prefer to hunt in the better moose habitat found in Units 21 and 19. However, moose are taken at any time when found in this unit. The unreported harvest of moose in Unit 18 possibly exceeds 50 animals annually. Relocation of many tundra village people into the Bethel area has created major moose hunting problems. People who were formerly largely dependent on fish, birds and sea mammals are now turning to moose hunting to meet their protein needs. Unfortunately, these needs clash with those of upriver residents, on both the Yukon and Kuskokwim. Signs of increased affluence are common, such as new outboards in the 40-65 horsepower range and the ability to charter aircraft to adjacent units for hunting purposes. Regional philosophy towards hunting is also different in Unit 18 since Eskimos still worry about "starvation times" and will consistently overharvest available wildlife resources. Such action is not consistent with good management practices and has become a prime issue in this unit.

Range and Habitat

Considerable moose range is available along the river floodplains of the lower Yukon and part of the lower Kuskokwim. However, moose are not given a chance to pioneer this vacant habitat.

Population Trends

Moose continue to be found infrequently in Unit 18.

Management Summary and Recommendations

Unit 18 residents must be made aware of moose problems within this unit if the goal of establishing viable populations is to be achieved. Contact through radio, T. V. and with village hunters is now possible. This approach should not be expected to produce immediate results due to the cultural background of the area residents and resistance to outside intervention.

PREPARED BY:

Peter E. K. Shepherd
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 19 - McGrath

Seasons and Bag Limits

Aug. 20 - Dec. 31	One moose; antlerless moose may not be taken prior to Oct. 1.

Harvest and Hunting Pressure

The reported 1974 moose harvest was 164 bulls, 21 cows and 5 sex unknown, for a total of 190 animals. This represents a slight decrease over the 1973-74 kill, but can largely be attributed to a lower spring cow harvest (a portion of the unit was open in the spring of 1974). Low water during early fall 1974 restricted hunters to the less favorable Kuskokwim River habitat. However, water levels rose in mid-September and permitted hunting of the more populated side streams. Another factor which influenced the harvest of moose in the McGrath area, especially, was the very late leaf fall which occurred in early October.

Hunting pressure in the Holitna and middle Kuskokwim areas increased measurably for the third season in a row. Boats from as far downriver as Kalskag were seen near Vinasali Mountain (35 miles below McGrath). Hunters from Bethel and below were commonly seen on the Holitna and Hoholitna Rivers. These hunters took an estimated 100 moose from these drainages and adjacent side streams. Most of the moose were not reported on harvest tickets. The estimated kill for Unit 19, including unreported kills, was about 400 moose.

Composition and Productivity

Sex and age composition counts were made in the McGrath and Farewell areas of Unit 19 during December 1974. Little change was noted in the Farewell bull:cow ratios, but yearling survival appears to have been much better, as evidenced by the increase in small bulls. Small bulls composed 5.8 percent of the sample in 1974. Calf production of 30.7 per 100 cows was similar to the 1973 data.

The Black River burn (McGrath area) counts did not include a representative sample of cows. Many cows may have remained in the floodplains of the Kuskokwim or Takotna Rivers. Calf production of 25.8 per 100 cows in this sample suggested that the 1974 crop was somewhat better than in 1973.

A spring count (February 2, 1975) of 115 adults and calves made on the Kuskokwim and Takotna Rivers contained 16 cows with 1 calf and 4 cows with 2 calves. This count revealed that calves composed about 20 percent of the herd. In addition, the incidence of twinning was much higher (20 per 100 cows with 1 calf) than indicated in the previous fall count.

Range and Habitat

Snowfall during the winter of 1974-75 was not severe, but as much as four feet accumulated in some local areas. Snow texture was generally very powdery and light. Moose did not appear to be seriously restricted by this snowpack. Maximum snow depths were reached in late January and early February. Movements of moose from higher areas into the riparian habitat occurred later than in the past several years and most moose began to appear on the rivers by mid-January. Snowfall was heavier than normal in the Farewell and Alaska Range foothills. There was very heavy snowfall in the Holitna drainage, so much in fact that few moose wintered in the upper sections of this watershed.

Population Trends

Moose populations in Unit 19 continued to show an encouraging recovery from the losses of the severe winters of the early 1970's. Production of the McGrath area moose may still not be up to a maintenance level for this population. Wolf predation has slacked off in most areas, but still constitutes a dampening effect on the recovery of several populations, i.e. Holitna River and North Fork. A survey over the headwater streams of the Kuskokwim confirmed many local complaints about lack of moose on the North Fork, Slow Fork and East Fork of the Kuskokwim. These moose are not recovering as well as those in many other drainages in Unit 19. Much of this problem can be attributed to wolf predation, heavier than normal snowfall and subsistence use.

Management Summary and Recommendations

Moose populations, with a few exceptions, have recovered sufficiently in Unit 19 to permit a limited antlerless season during the spring months. Restrictive changes are felt to be unnecessary except in the Holitna and North Fork areas. These restrictions should only involve the curtailment of the open season, when moose become concentrated on river floodplains.

PREPARED BY:

Peter E. K. Shepherd
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 20A - Tanana Flats, North Slope of the Alaska Range

Seasons and Bag Limits

Aug. 20 - Sept. 20	One moose
Nov. 1 - Nov. 20	

Harvest and Hunting Pressure

Based on harvest ticket returns the reported legal sport kill of moose for the 1974 season was 341 animals, a decrease of 369 moose over the 1973 harvest, and below the 6-year (1968-73) average annual harvest of 394. The 1974 harvest consisted of 171 males, 160 females and 10 sex unknown. Bulls comprised 50 percent of the harvest, reflecting the marked increase in the proportions of cows harvested during the past few years.

Table 1 summarizes trends in hunting effort and success in the subunit for the past six years. The decrease in the number of hunters and the percent success during 1974 can be attributed to a shorter season, fewer moose and partial compliance with the no hunting same day airborne regulation. The percent success during 1974 was similar to that of hunters in Unit 20C which was traditionally lower than in 20A. The proportion of resident hunters remained unchanged since 1969 (83-88% of the total hunters).

Table 1. GMU 20A moose hunting pressure and success, 1969-73.

Year	Total Hunters	Successful Hunters			Percent Success
		Res.	Non-res.	Unk.	
1969	639	162	51	44	40
1970	642	188	44	66	46
1971	904	257	85	5	38
1972	1,059	382	80	11	45
(preliminary compilation; final program not re-run).					
1973	1,515	542	126	42	47
1974	1,266	264	53	24	27

Appendix I lists those areas where substantial numbers of moose were harvested in 1974. Concentrated hunting effort in the Gold King-Japan Hills area for the third consecutive season accounted for 29 percent of the moose harvested from known locations. This area was once noted for the production of trophy bulls. However, the heavy hunting pressure has substantially lowered the number of bulls while increasing demands for moose by hunters has resulted in a high proportion of cows

in the harvest from the Gold King-Japan Hills area (62%). Similar to past years, moose from the Wood River and the Tanana Flats made up a substantial portion of the total harvest, 24 percent each (Appendix I).

Analysis of transportation types utilized by successful moose hunters (Appendix II) indicates that aircraft users continue to account for approximately 42 percent of the harvest while the remainder of the harvest is split among many other modes of transport. Regulations affecting the use of aircraft could be very effective in reducing the kill in Unit 20A. Hunters utilizing boats are taking a declining proportion of the moose. Since boats are used primarily in the northern portion of the subunit, this decline likely reflects the apparent decrease in moose numbers migrating to the northern portion of 20A from 20B during the springs of 1973 and 1974. This change in moose movements may be associated with increasing man-made barriers along the southern boundary of Unit 20B. The proportions of moose taken with the aid of snow machines and ORVs have remained nearly the same for the past three years, approximately 20 and 15 percent, respectively.

Composition and Productivity

Initial production of calves was determined by capturing and palpating 59 cow moose during the period of May 8 through 14, 1975. The mean pregnancy rate for all age classes was 84 percent. Ninety-four percent of the cows three years old or older during estrous were pregnant, which is comparable to pregnancy rates from other portions of Alaska. However, the number of pregnant cows in the yearling and two-year-old classes were lower than expected although the sample size for these age classes was too small to draw any firm conclusions (Table 2). By comparison, Modafferi (personal communication) found the percentage of pregnant cows in southcentral Alaska to average approximately 20 and 80 percent for yearlings and two-year-old moose, respectively. Since initial production of calves in 20A appears similar to other productive moose populations in Alaska, high calf mortality appears responsible for low rates of recruitment.

Table 2. The age and reproductive status of 55 cow moose captured, palpated, collared May 8-14, 1975 on the Tanana Flats, Alaska

	Age during estrous (yr)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Mean
Pregnancy rate (%)	0	25	83	100	100	87	100	100	100	83	100	100	100	100	84
Sample size	3	4	7	2	5	8	3	5	4	7	3	2	1	1	

Composition counts were flown during June to determine neonate survival. Ratios of calves:100 cows and parturitions:100 cows determined by aerial surveys (Table 3) were low in all count areas when compared with initial production (Table 2). Habitat types seem to influence survey results among count areas; the lowest ratios of calves:100 cows were found in the heavily wooded count areas, numbers 2 and 3 (Table 3). Assuming that all adult moose have a nearly equal probability of being seen during surveys, these data suggest a high mortality rate of neonates and/or a high proportion of calves were not located.

Table 3. Age and sex composition of moose observed during aerial surveys over the Tanana Flats, 1975.

Count Area	Date	Calves/ 100 cows	Cows w/1 or 2 calves/100 cows	Total Cows	Total Bulls	Total Moose	Moose/ Hr.
1	2-3 June	53	48	64	32	134	19
1	11-13 June	48	43	158	81	343	33
2 & 3	10 June	20	20	55	37	104	14

Resightings of collared moose between June 2 and 13, 1975 indicated substantially lower neonate mortality than was suggested by the general aerial surveys (Table 4). It was concluded from the present tagging study that the number of cows with calves was underestimated in normal surveys during June, resulting in excessively high estimates of calf mortality. If data from the tagging study are representative, calf mortality and calves:100 cows by mid-June were probably near 20-25 percent and 75:100 cows, respectively, rather than the values reported in Table 3. These conclusions are supported by observation of calf survival of radio-collared moose (Coady and Haggstrom, personal communication) and studies of moose aggregation by Peek et al. 1974 and moose movements by LeResche et al. 1973. A full discussion of the moose tagging during 1975 will be reported elsewhere.

Table 4. The presence of calves with collared moose resighted between June 2 and 13, 1975.

Reproductive status during May	W/0 calf (percent)	W/1 calf	W/2 calves	Calves/ 100 Cows	Parturition/ 100 Cows
Pregnant	5(22)	16	2	87	78
Not pregnant	4(100)	0	0	0	0
Combined	9	16	2	74	67

Calf mortality during summer and fall is probably greater than 50 percent considering that only a mean number of 18 calves per 100 cows was seen in all areas surveyed in 20A during the fall of 1974 (Table 5). However, biases associated with sex and age composition in fall surveys have not yet been fully evaluated. Fall counts do provide an annual trend of calf survival and during the past two years calves:100 cows have continued to decline from the moderate level seen during 1971 and 1972 (Table 5).

Table 5. GMU 20A fall sex and age composition summary 1971-74.

	1971	1972	1973	1974
Males per 100 females	37	40	38	34
Calves per 100 females	28	30	23	18
% yearling bulls in herd	2	5	4	2
% calves in herd	16	17	14	12
% large bulls in herd	21	19	20	21

Pre-calving surveys conducted in standardized count areas on the Tanana Flats during May 1974 and 1975 indicate very low recruitment of yearlings (Table 6). Calf survival during winter appears to have declined from values in excess of 50 percent during 1971-72 and 1972-73 to values below 50 percent during winters of 1973-74 and 1974-75 if the comparison of fall calf:cow ratios with spring yearling:cow ratios is a valid indicator (Tables 5 and 6). Decreased calf survival probably reflects the increasing importance of wolf predation on a decreasing moose population. Recruitment has reached a low enough level that the moose population in 20A will continue to decline as a result of natural mortality alone. Hunting will simply increase the rate of decline in numbers of moose.

Table 6. Recruitment of yearlings during spring, 1969-75, GMU 20A.

	1969	1970	1971	1972	1973	1974	1975
% yearlings in herd	10	18	4	11	13	8	6
yearlings per 100 F	26	34	6	17	20	12	8

Bull:cow ratios continued to decline in the flats and foothills of Subunit 20A indicating bull harvest rates greater than the recruitment rates (Table 7). The bull:cow ratio west of the Wood River in the foothills has reached a sufficiently low level (16) that further regulatory action must be taken to reduce the harvest of bulls.

Table 7. Bulls per 100 cows seen during fall moose surveys in Unit 20A

Area	Bulls per 100 cows			
	1971	1972	1973	1974
Foothills east of Wood River			80	46
Foothills west of Wood River		35*	19	16
Flats	42	47	45	35

*foothills combined

Age composition data from the 1974 harvest are based on such a small sample (41 moose) that little information can be derived (Appendix III). However, when age data are pooled for cow moose collected from 1972 to spring 1975, it becomes apparent that recruitment has been poor in recent years, thus confirming survey results (Fig. 1). These age data are typical of a declining population.

Management Summary and Recommendations

The moose harvest declined during 1975 as a result of the shortened season, no hunting the same day airborne and possibly the fact that due to pipeline construction more hunters were employed at high paying jobs which demanded long hours. At any rate, there was not the great flurry of interest in moose as a meat source like we saw during 1973. In spite of the reduced harvest, the known number of moose taken was similar to estimates of yearling recruitment. Hence, natural mortality factors resulted in the further decline of moose in GMU 20A. Any hunting mortality will contribute to the decline in moose numbers and will limit the potential long-term management goal of quality hunting in the foothills and mountains.

The greatest problem facing the 20A moose population is that of low calf survival. Currently, calf production is "normal" or "average," however, calf mortality is high during the entire first year of life. The single most important factor regulating calf survival at this time is predation. Without the management of predator populations, Alaskans cannot expect to see any short-term increase in moose. Further declines are almost assured. If a high proportion of the wolves are taken during the winter of 1975-76, we will be able to further assess the regulatory controls that wolves have on moose populations. Presently the key to ungulate management and continued hunting in Unit 20A is the management of predator populations.

PREPARED BY

William C. Gasaway
Game Biologist III

SUBMITTED BY

Oliver E. Burris
Regional Management Coordinator

Appendix I. Summary of areas contributing the majority of the moose harvested - GMU 20A

Location	% of total harvest			
	1971	1972	1973	1974
Tanana River	4	7	4	4
Wood River	20	20	17	24
Dry Creek	5	6	5	3
Gold King-Japan Hills	9	16	28	29
Tanana Flats	31	30	29	24
Tatlanika River	-	-	1	3
Totatlanika River	-	-	2	3
Delta River, Little Delta River, Delta Creek	-	-	10	8
Yanert River	-	-	2	3

Appendix II. GMU 20A, summary of successful moose hunters by transport method, 1972, 1973, 1974 seasons.

Transport type	No. Moose Harvested			Percentage of known transport harvest		
	1972	1973	1974	1972	1973	1974
Aircraft only	153	241	131	42	41	43
Horse only	-	-	10	-	-	3
Boat only	74	88	42	20	15	14
Snow machine only	65	102	52	18	18	17
Snow machine with off-road highway vehicle	6	21	5	2	4	2
Off-road vehicle only	47	83	44	13	14	15
Highway vehicle only	18	44	17	5	8	6
Off-road with highway vehicle	3	4	1	1	1	0
Known transportation method harvest (includes only transport types which could be classified into above types).	366	583	302			

Appendix III. Age composition of 1974 moose harvested in Unit 20A, 20B, 20C.

Age Class	GMU 20A M	F	Total No.[1]	%	GMU 20B M	F	Total No.	%	GMU 20C[2] M	F	Total No.	%
Calf	0	3	3	7	0	1	1	4	0	0	0	0
1	0	1	1	2	6	0	6	25	7	1	8	23
2	2	1	3	7	3	1	4	17	1	1	2	6
3	2	1	3	7	2	1	3	13	4	1	5	15
4	1	0	1	2	3	0	3	13	1	0	1	3
5	2	1	3	7	1	0	1	4	1	0	1	3
6	3	1	4	10	1	0	1	4	3	1	4	12
7	0	1	1	2	1	0	1	4	5	0	5	15
8	2	3	5	12	0	2	2	8	1	0	1	3
9	2	0	2	5	0	0	0	0	0	0	0	0
10	1	1	2	5	0	1	1	4	2	0	2	6
11	1	1	2	5	0	0	0	0	3	0	3	9
12	0	5	5	12	0	0	0	0	2	0	2	6
13	1	2	3	7	0	0	0	0	0	0	0	0
14	2	0	2	5	0	1	1	4	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	1	1	2	0	0	0	0	0	0	0	0
Total Sample Size	19	22	41		17	7	24		30	4	34	

[1] Including 6 unknown sex
[2] Excluding Taylor Highway, Eastern 20C

Appendix IV. Areas contributing to the majority of the 1974 moose harvest - GMU 20A.

Location	M	F	?	Total	Percentage of Known Location Harvest
Totatlanika River	5	1	0	6	2
Tatlanika River	1	3	0	4	1
Tanana River	3	8	0	11	4
Tanana Flats (McDonald Creek, Bonnifield Trail, Bombing Range, Blair Lakes, Salchaket Slough, Clear Creek)	35	33	3	71	24
Wood River	37	33	0	70	24
Delta River, Delta Creek, Little Delta River	17	8	0	25	8
Dry Creek	7	1	0	8	3
Gold King, Japan Hills	30	50	6	86	29
Yanert River	12	4	0	16	5
Known Location Harvest	147	141	9	297	

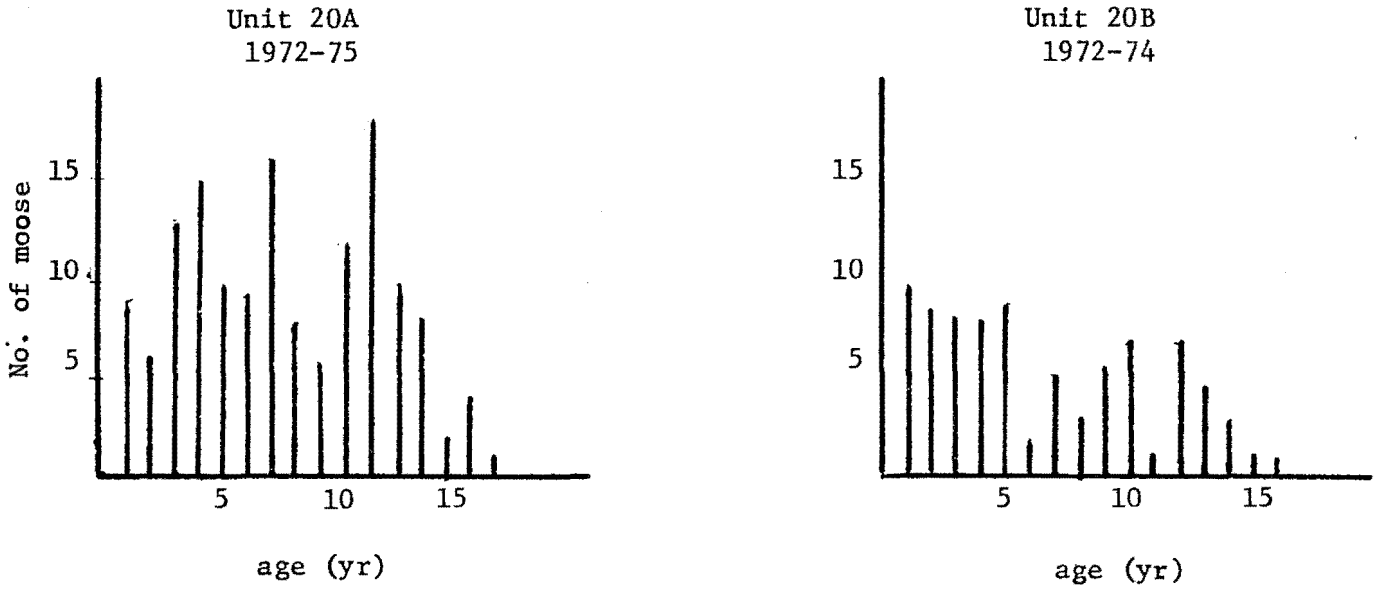


Fig. 1. The age structure of cow moose harvested in GMU 20A and 20B. Due to small annual sample sizes age values collected during several years were pooled.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 20B - Fairbanks, Central Tanana Valley

Seasons and Bag Limits

Aug. 20 - Oct. 7 Nov. 1 - Nov. 30	One moose; bull moose only may be taken from Aug. 20 - Sept. 30 and from Nov. 1 - Nov. 30, and antlerless moose only may be taken from Oct. 1 - Oct. 7.

Harvest and Hunting Pressure

The number of hunters utilizing Subunit 20B during 1974 was second only to that of 1973. The reported legal sport kill of moose for the 1974 season was 168 animals, down from the record high of 301 reported harvested during the 1973 season (Table 1). Decline in kill was of a greater magnitude than the decline in hunters and is reflected by the extremely low percent success of hunters (Table 1). Poor success of hunters in 20B was likely a result of decreased availability of moose. Bull ratios, moose seen per hour and recruitment rates all indicate a general decline in the number of moose in all surveyed portions of Subunit 20B.

Table 1. GMU 20B - Moose hunting pressure, success and moose harvested during the period 1969-74.

	Total	Successful Hunters			Percent	Moose Harvested		
Year	Hunters	Res.	Nonres.	Unk.	Success	Male	Female	Unk.
1969	574	115	14	17	25	133	11	2
1970	640	152	11	54	34	197	15	5
1971	915	158	24	2	20	170	14	3
1972*	1,098	170	14	1	17	116	69	8
1973	1,599	251	40	10	19	209	84	8
1974	1,235	140	22	6	14	127	38	3

* (preliminary compilation; final program not re-run).

Appendix I lists those areas supporting most of the moose harvest in Subunit 20B and reflects the concentrated hunting effort along road systems in the area. The Chena drainage supports the largest proportion of the moose harvest and includes moose reported from the Chena Hot Springs Road, Chena River, Eielson and Yukon Training Area in Appendix I. Declining bull ratios in the Chena drainage reflect the heavy hunting

pressure. Hunting effort by military personnel in the Yukon Training Area has been increasing and if bull ratios decline below 20 per 100 cows after the 1975 hunting season in the South Fork of the Chena, further hunting restriction should be implemented during 1976. Of all areas surveyed in 20B, only the South and East Forks of the Chena River have bull ratios in excess of 20; however, the proportion of bulls is rapidly declining in the South Fork.

Analysis of transportation types utilized by successful moose hunters in 1974 reflects hunting effort by road hunters in Subunit 20B (Table 2). Hunters with highway vehicles killed 52 percent of the moose while ATV users accounted for 23 percent. Hunters utilizing snow machines solely or in combination with another vehicle took 11 percent of the moose and hunters utilizing boats were responsible for 9 percent of the kill. No significant changes occurred between 1973 and 1974.

Table 2. GMU 20B - summary of successful moose hunters by transport method, 1973-74 season.

Transport Type	Number of Moose Harvested		Percentage of Known Transport Harvest	
	1973	1974	1973	1974
Aircraft	6	8	2	5
Boat	30	14	12	9
Snow machine	20	17	8	11
Off-road vehicle	58	37	21	23
Highway vehicle	146	83	56	52
Harvest by known transport method (includes only transport types which could be classified into above types).	260	159		

Composition and Productivity

There are some very apparent trends in sex and age composition since 1970 in Subunit 20B (Table 3). Bulls per 100 cows, yearling males per 100 cows and moose seen per hour during surveys are generally declining in all portions of the Chena drainage. Hunting pressure is great enough that the absolute number and the proportion of bulls are declining in 20B with the exception of the East Fork of the Chena where little hunting occurs (Table 3). Further decline of the bull:cow ratio with the present low density moose population may prove to be detrimental to the successful breeding of females. The bulls only season approved for the 1975 season will continue to depress the bull:cow ratio.

Table 3. Summary of fall sex and age composition surveys in Unit 20B.

Year	M:100F	Small M:100F	M in Herd	Calves:100F	Moose/Hr.	Moose
			Little Chena			
1970	25	21	13	36	47	294
1971	24	3	2	26	56	157
1972	24	2	2	32	30	191
1973	21	3	2	33	31	186
1974	15	2	1	27	26	191
			Angel-Stiles-Colorado Creeks			
1971	12	3	2	15	..	43
1972	7	0	0	33	29	100
1973	11	3	2	27	24	117
			South Fork Chena			
1970	54	21	11	48	48	105
1971	57	10	5	38	63	94
1972	42	1	1	20	32	131
1973	37	9	5	45	26	97
1974	24	0	0	36	19	120
			East Fork Chena			
1970	38	1	7	32	90	163
1971	59	9	5	22	42	125
1972	79	0	0	21	26	122
			Chena Flats			
1972	4	3	2	49	24	112
1973	2	0	0	54	21	92
			Goldstream			
1970	7	7	5	51	47	128
1971	22	3	2	27	57	137
1972	21	7	4	42	28	148
1973	22	8	6	22	21	124
1974	17	4	3	16	12	92
			20B Totals			
1970	24	15	10	36	52	1213
1971	32	5	3	28	44	694
1972	28	2	2	33	29	803
1973	20	5	3	36	25	683
1974	18	2	2	29	19	450

Population Trends

Probably our best indicator of changes in population density is the moose per hour seen during surveys. Since 1970 there has been a progressive decline in moose seen per hour and in 1974 these values were only 25 to 50 percent of those recorded during 1970 and 1971. Moose per hour values have not been shown to quantitatively describe moose abundance, however, there is little doubt that these figures reflect a very significant decline in moose numbers.

The most important factor leading to the population decline has probably been poor recruitment since 1970. Calf survival to early winter is not particularly good (28-36 calves per 100 cows),Table 3, and by the following winter yearlings have declined to an estimated 6-10 yearlings per 100 cows (calculated by doubling yearling bulls). This technique unquestionably underestimates the number of yearling cows in the population since many bulls are shot by hunters prior to the survey. However, the low recruitment of yearling bulls in lightly hunted areas (East Fork of Chena and North Fork of Salcha Rivers) confirms that survival of calves to about 17 months of age is poor. Recruitment was generally high in 20B during 1970 but since then has declined and remained at a low level. Hence, factors affecting calf mortality have changed during the past five years.

Post hunting season recruitment of yearling bulls in remote areas of 20B and adjacent 20C (Salcha River) is similar to that in areas accessible by road (Table 4). This indicates that recruitment may actually be greater in accessible than remote areas since a significant fraction of yearling bulls are killed prior to the surveys in some areas. Reasons for the differential survival between these two areas are only speculative at this time. Age composition of cow moose shot by hunters in 20B between 1972-74 indicates yearling survival was greater than that estimated by aerial surveys (Fig. 1). Comparing the age structure of cows in 20A and 20B, it would appear that recruitment was greater in 20B, although both units have declining moose populations.

Management Summary and Recommendations

The effects of shortened seasons, closed seasons and bulls only seasons on yearling bull recruitment should be closely monitored during the fall of 1975. We should reverse the decline in the bull:cow ratio and increase the proportion of bulls in the accessible areas to a minimum of 20 bulls per 100 cows. Several years and further modifications in hunting seasons may be necessary to achieve these minimum bull ratios, particularly since recruitment rates are low at this time. The closure during 1975 in the Fairbanks area should provide a good opportunity to appraise recruitment without the complicating factors of bull removal by hunting and to assess the impact of hunting. In this area recruitment is assessed by the percentage of small bulls (yearling bulls) in the population in the fall.

We must come to grips with factors causing calf mortality. Considering the high wolf population and the low moose population throughout the

subunit the Department should take an active role to limit wolf numbers to improve calf survival if the public fails to remove sufficient numbers of wolves. The impact of wolf predation can most easily be assessed by their removal.

Habitat improvement in the remote and accessible portions of 20B should be pursued with the Bureau of Land Management and the Alaska Department of Natural Resources.

PREPARED BY:

William C. Gasaway
Game Biologist II

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

Appendix I. Areas contributing the majority of the 1973 moose harvest, Game Management Unit 20B

Location	Percentage of harvest by location			
	1971	1972	1973	1974
Road System Area				
Chena Hot Springs Road	17	22	14	25
Steese Highway (includes Cleary Summit, Fairbanks Creek, Fish Creek, Gilmore Creek)	8	10	13	13
Elliot Highway	6	9	8	10
Nenana Highway	-	6	5	3
Fairbanks and vicinity (includes Richardson Highway, Steele Creek, Farmers Loop, Badger Road, Johnson Road, North Pole)	5	14	8	4
Off-Road Areas				
Eielson, Yukon-Training Area	17	12	12	25
Murphy Dome	2	5	6	3
Goldstream Valley (includes Dunbar, Standard)	5	7	7	5
River System				
Tanana (includes Moose Creek, Piledriver Slough)	0	5	3	1
Chena River	10	10	13	6
Chatanika River	5	0	11	5
Reported harvest	187	173	301	168

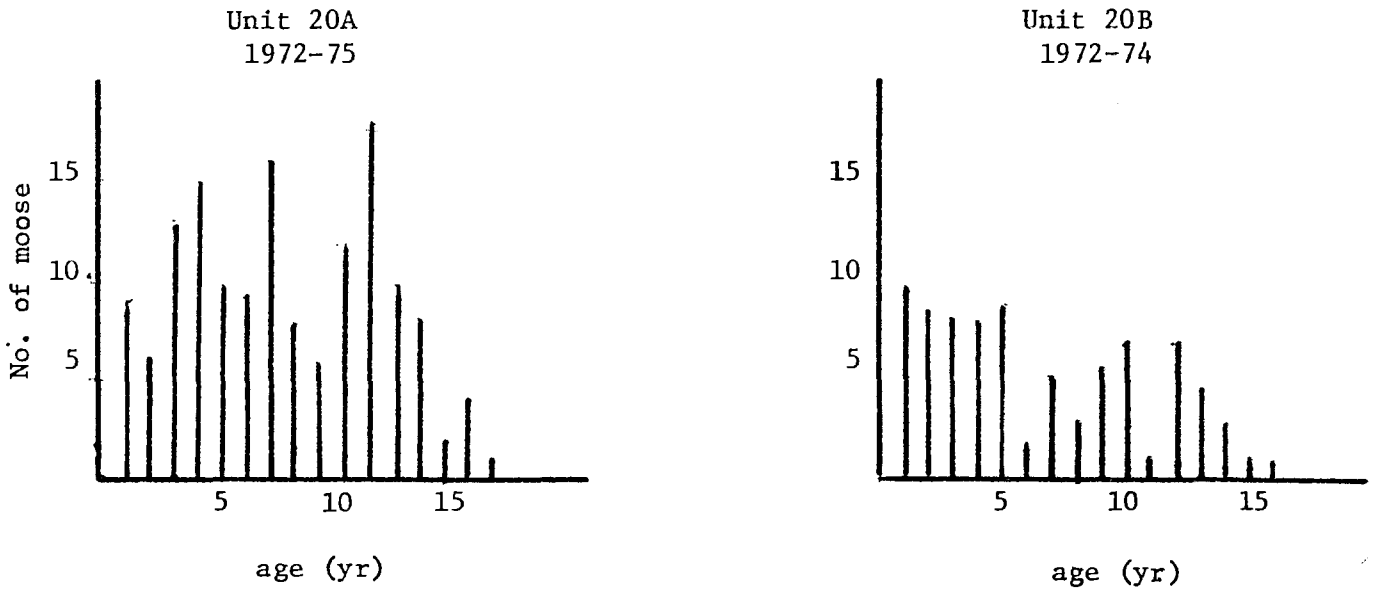


Fig. 1. The age structure of cow moose harvested in GMU 20A and 20B. Due to small annual sample sizes age values collected during several years were pooled.

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 20C - Tok, Upper Tanana, Kantishna

Seasons and Bag Limits

Aug. 20 - Oct. 7 Nov. 1 - Nov. 30	One moose; provided that bull moose only may be taken from Aug. 20 - Sept. 30 and from Nov. 1 - Nov. 30 and only antlerless moose may be taken from Oct. 1 - Oct. 7.

Harvest and Hunting Pressure

The number of hunters utilizing Subunit 20C during 1974 was the second highest on record, with 1973 recording the greatest numbers. Based on harvest ticket returns, the reported legal sport kill of moose for the 1974 season was 486 animals, down from the record high of 665 reported harvested during the 1973 season (Table 1). The decline in kill was of a greater magnitude than the decline in hunters and is reflected by the low percent success of hunters (Table 1). The poor success of hunters in 20C is likely a result of decreased availability of moose. Table 1 summarizes trends in hunting effort and success in the subunit during the past five years and reflects a substantial increase in hunting pressure. Success has averaged 30 percent since 1971, a considerable decline from relatively high success in 1969 and 1970. Despite good river, trail and road access into portions of the subunit, much of the area has poor access, resulting in heavy competition in such traditional hunting locations as the Taylor Highway, Salcha River, Goodpaster River, Yanert River, Beaver Creek, Nome Creek, Minto Flats and Stampede Trail.

Table 1. GMU 20C - Moose hunting pressure, success and harvest, 1969-74.

Year	Total Hunters	Harvest	Successful Hunter				Percent M in harvest
			Res.	Nonres.	Unk.	% Success	
1969	1411	695	506	93	96	49	80
1970	1480	605	419	45	141	41	81
1971	1681	496	436	49	11	30	84
1972*	1597	462	350	92	20	29	87
1973	2146	665	549	71	45	31	86
1974	1850	486	402	62	22	26	81

* Preliminary compilation; final program not rerun

Appendix I lists those areas contributing substantial numbers of moose to the 1973 harvest and reflects hunting effort along river systems and in off-road areas. A trend of increasing harvest is found in the Healy Lake area, Johnson and Robertson Rivers and on Hess Creek. Moose in these areas are not particularly abundant and if the harvest continues to increase and the bull ratios drop, further restrictions may be required. In other areas no clear trends are evident.

The harvest along the Taylor Highway was 78 moose, consisting of 70 bulls and 8 cows. This harvest is about average for the past 10 years. Chronology figures are not available, but it is believed that few animals were taken during November.

Figures obtained from a game checking station operated at 35-mile on the Taylor Highway during the period Sept. 14 - Oct. 7 disclosed that 359 people hunted the Taylor Highway during this time, a slight decline from last year's effort. The hunter success ratio was computed at 18 percent.

The mode of transport utilized by successful hunters was split among four major types: ORV, boat, highway vehicle and airplane (Table 2). Hunters utilizing airplanes are most efficient (51-60% success) while hunters using highway vehicles have an expectedly low success ratio (20%). The most common transportation modes utilized by hunters were, in order of decreasing use: highway vehicles, boats, ORV and airplanes. A substantial decline in 1974 of aircraft use may be a result of the no hunting the same day airborne regulation.

Table 2. The mode of transport utilized by successful hunters in Unit 20C.

Mode of Transport	Percentage utilizing mode (% success) 1973	1974
Airplane	21(65)	11(51)
Horse	2(48)	3(45)
Boat	21(30)	25(26)
Motorbike	1(21)	1(26)
Snow machine	3(29)	7(31)
ORV	26(40)	28(36)
Highway vehicle	23(20)	24(19)
Other	2(17)	1(10)
Unspecified (percent of total successful hunters)	10(29)	6(17)

Composition and Productivity and Abundance

Sex and age composition surveys flown in parts of the Fortymile River drainage during November revealed continued poor calf survival. While total moose populations appear moderate, it is believed that such populations are not increasing in size. With fall calf survival rates varying between 6 and 11 calves:100 cows (5 - 7% of the herd) it is unlikely that recruitment equals natural losses. The result is probably

Table 3. Summary of surveys conducted in the Salcha, Shaw Creek and Goodpaster Drainages.

Location	Date	Bulls/ 100 Cows	Small bulls/ 100 Cows	Percent Small bulls in herd	Calves/ 100 Cows	Percent Calves/ in herd	Moose/ hr.	Total Moose
Shaw Creek, Goodpaster R., Salcha River	10/1958	54	14	7	29	43	26	233
Goodpaster River, Salcha River	10/1959	50	17	8	63	28	..	53
Healy-Volkmar Lakes	11/1960	61	17	8	50	24	..	38
Goodpaster River Shaw Creek, Volkmar Lake	12/1962	20	5	3	49	36	..	91
Salcha River	12/1963	33	5	3	23	14	35	223
Shaw Creek	12/1963	35	9	6	39	12	26	83
Goodpaster River	1/1964	..	..	..	..	40	39	204
Goodpaster River, Healy Lake	12/1964	20	13	8	45	13	..	143
Goodpaster River, Shaw Creek	3/1968	..	..	..	..	17	9	18
Salcha River	3/1968	..	..	..	..	17	35	46
Goodpaster R.	3/1969	..	..	..	..	24	12	46
Goodpaster R.	11/1970	..	..	..	..	9	..	..
Goodpaster R.	12/1974	14	6	5	10	8	32	64
Lower Salcha River	11/1974	37	11	6	40	23	30	182
North Fork Salcha River	12/1974	36	7	4	25	16	29	172

a decreasing moose population throughout the area. Causes of continued poor calf survival are unknown, but probably relate to predation and possibly range quality as well.

The present bull:cow ratio should be adequate to insure reproduction.

Knowledge of recent changes in distribution and abundance of moose in the Salcha, Goodpaster and Shaw Creek drainages is poor (Table 3). Production and survival of calves from 1958 to 1962 appeared moderate, but since then only calves:100 cows and percent yearling bulls have remained relatively low, with the exception of the lower Salcha during 1974. Based on survey data in Table 1 and harvest data it is likely that the moose population in the lower Salcha is, at best, stable and those populations in the Upper Salcha and Goodpaster are declining. Supporting this conclusion are observations of "old-timers" from the Salcha area indicating moose numbers have declined in the past 10-15 years. They are likely to be correct since there has been a general decline in moose abundance in Unit 20 since 1965.

The bull ratios have generally declined in the Salcha and Goodpaster River areas since the 1950's and particularly so in the Goodpaster (Table 3).

Surveys were conducted in the northeast portion of Subunit 20C during February 1975 (Table 4). Moose concentrations were very difficult to find at this time. Signs of moose utilizing the area were light suggesting moose were not particularly abundant. Calf survival was very low in the area, if our small sample of moose was representative. Wolf tracks, wolves or wolf kills were seen in all drainages surveyed. It is suggested that these areas be surveyed during the fall.

Table 4. Summary of surveys conducted during February 1975, in northeastern GMU 20C.

Drainage	Total Moose	Percent Calves	Moose/ hr.	Wolf Sign
Seventy-Mile R. Charley River, Coal Creek, Woodchopper Creek	20	5	9	1 wolf, numerous tracks 2 moose carcasses
Chatanika River (20B)	8	13	11	9 wolves, 1 moose carcass
Nome Creek, Beaver Creek	20	5	18	4 wolves
Birch Creek, Preacher Creek	28	4	14	wolf tracks
TOTALS	76	5	12	14 wolves

The National Park Service conducted a fall moose survey in Mt. McKinley Park during 1974 and the following is a brief summary of their results (Table 5).

Table 5. Composition of moose in McKinley Park, 1974.

M:100F	Yearling M:100F	Percent Small M in herd	Calves:100F	Percent Calves in herd	Moose/ hr.	Total moose
57	3	2	27	15	15	624

Bull ratios in this relatively unhunted population are high and similar to those recorded in Unit 20 during the 1950's. Calf survival in the Park is low and similar to many areas of Interior Alaska outside the Park. Recruitment rates suggest that the moose population in the Park is slowly declining. A similar situation appears to exist outside the Park.

During February reconnaissance flights were made in the Kantishna, Hess Creek, Tolovana and lower Beaver Creek drainages and the Sawtooth Mountain Country to determine if moose were abundant enough to yield worthwhile survey data. It was concluded that moose were not very visible during this period of the year in these drainages.

Pooled age data collected from Subunit 20C between 1971 and 1974 show that the age distribution pattern typifies a fairly unproductive population. The low numbers of 6-to 9-year-old moose found in the sample are a result of the winters of 1965-66 and 1966-67.

Range and Habitat

In the Salcha drainage moose are abundant in recent burns (8-10 years old) and sparsely distributed elsewhere during early winter. At present only two very productive burns exist in the Salcha drainage, one located in the lower portion and the other in the North Fork. Future moose abundance will be dependent on the occurrence of wild fires. New burns must replace those now providing good winter browse. Due to increasing habitation in the drainage and pipeline construction, the Salcha drainage is likely to be on the priority list for fire suppression. Moose are generally sparse in the Goodpaster drainage. For the most part, the Goodpaster drainage contains low quality moose habitat, dominated by spruce. However, riparian and subalpine willow provides limited winter moose browse.

Population Trends

Even though population trend counts have not been conducted in many areas, various indices such as harvests, hunting success, sex and age composition and casual range observations indicate that moose populations

are probably decreasing. Significant increases in production or populations are not evident from fall or spring surveys. Populations which have been reduced because of harsh winters do not show a characteristic increase in calf survival in subsequent years. Possibly poor range conditions or increased influence of predation on smaller moose populations are preventing increases in calf production.

Management Summary and Recommendations

Fall surveys should be conducted in areas where the proportion of bulls is low to determine the effect of the shortened bull season on recruitment. Seasons should be set to allow bull ratios to increase to minimum values of 20 males:100 females in areas where ratios are lower. Short hunting seasons should continue until recruitment improves.

Surveys to determine the distribution, abundance and productivity in 20C should be undertaken on an annual basis. There are many areas in 20C we know little about other than that moose are not very abundant.

PREPARED BY:

Larry B. Jennings
Game Biologist III

and

William C. Gasaway
Game Biologist II

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

Appendix I. Areas contributing the majority of the moose harvest, GMU 20C 1970-74.

	1970	1971	1972	1973	1974
Elliott Highway (Livengood, Manley)	33	18	16	22	14
Steese Highway (Central, Circle, Baker Creek)	11	7	5	14	14
Taylor Highway and surrounding Country	67	87	72	98	81
Central 20C					
Shaw Creek	8	18	7	12	4
Healy Lake area	0	0	2	14	8
Goodpaster River	15	17	25	32	19
Salcha River	31	43	20	33	29
Volkmar River	1	0	1	6	0
Johnson to Robertson River	5	6	4	27	13
Northern 20C					
Yukon River	10	5	6	5	9
Nome Creek	6	3	7	15	9
Beaver Creek	14	6	10	20	8
Birch Creek	9	11	2	11	2
Hess Creek	0	1	2	9	10
Medicine Lake	1	2	0	3	2
Western 20C					
Minto Flats, Tolovana River	3	8	33	43	14
Kantishna River	3	13	13	23	15
Minchumina, Muddy River	10	15	6	12	10
Tanana River	30	3	6	14	11
Southwestern 20C					
Nenana River	11	4	13	20	16
Ferry, Healy, Usibelli, Otto Lake, Lignite	69	58	39	70	32
Savage River, Toklat River, Stampede Trail	12	18	19	29	11
Yanert River	0	0	18	13	14
Totatlanika River, California Creek, Seven-Mile Lake, Rex Trail	22	11	24	25	22

Appendix II. Fall sex and age composition surveys

Year	Bulls/100 Cows	Calves/100 Cows	Calf %	Moose/Hr.	Total Moose Seen
Ketchumstuck					
1968	53	11	7	57	145
1969	61	9	5	45	78
1970	52	16	9	58	155
1971	58	8	5	37	63
1972	47	15	9	69	138
1973	51	10	6	91	155
1974	42	8	5	55	248
Mt. Fairplay					
1968	36	14	9	38	76
1969	78	56	4	21	21
1970	11	29	19	47	38
1971	0	13	12	24	17
1972	23	8	6	13	34
1973	31	8	6	15	18
1974	19	6	5	20	20
Upper West Fork					
1968	186	24	8	32	77
1969	60	23	12	57	171
1970	67	40	18	70	128
1971	44	27	15	55	100
1972	33	21	13	31	143
1973	29	2	1	30	54
1974	49	11	7	25	56

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Subunit 20D - Delta Junction

Seasons and Bag Limits

Subunit 20D*	Sept. 10-Sept. 25 Oct. 1-Oct. 7	One moose by permit; bull moose only may be taken from Sept. 10-Sept. 25 and antlerless moose only may taken from Oct. 1-Oct. 7. Conditions of the hunt will be described by Commissioner's announcement.

*Except an area closed to antlerless moose hunting to be described by Commissioner's announcement.

Harvest and Hunting Pressure

The first open season for moose since the fall of 1970 was controlled with an unlimited permit system. A split season hunt was held; a bull hunt during the early season and a cow hunt for the later season. The season length did not run the full time as published in the regulations. The seasons were closed by emergency announcement when the kill reached 25 animals during each season. The bull season ran from September 10-20 and the cow season October 1-5.

Total kill was 53 animals (26 bulls, 27 cows) for Unit 20D during the 1974 season by 478 hunters for 11 percent hunter success. The registration type permit hunt appeared to be a success in terms of controlling the kill. We received good cooperation from hunters and general public acceptance. Nine percent of all animals were illegally taken during the season. Two cows were mistaken for bulls and three additional cows shot in the closed area by a hunting party of two. The following data were compiled from the permits:

Table 1. Summary of Unit 20D moose hunt permits.

	Bull Hunt	Cow Hunt	Total
No. of Permits	362	252	614
Kill	26	27	53
No. w/permits who hunted	271(75%)	207(82%)	478(77%)
Hunter Success	9%	13%	11%
Permit Success	7%	10%	9%
Permit Return	279(77%)	169(67%)	448(72%)
Jaw Return	21(80%)	22(81%)	43(81%)

Origin of Moose Hunters in Unit 20D

	Bull Hunt	Cow Hunt	All %
Military w/Res. license	31%	35%	33.0 %
Military Nonres. w/o license	7%	12%	9.50%
Total Military	38%	47%	42.5%
Nonresident Civilian	4%	0.5%	2.25%
Alaska Resident from Delta Area	40%	33.5%	36.75%
Alaska Resident except Delta Area	18%	19%	18.50

Most of the hunting pressure was concentrated along an access trail called 33 Mile Loop. The majority of the kill came from Jarvis Creek, Ober Creek and Granite Creek in the western portion of the unit along the Loop Road. Only four animals were taken in the eastern third of the unit east of the Gerstle River. Ages of moose taken during the 1974 season were as follows:

Table 2. Ages of moose taken in Unit 20D, 1974.

Age	Cows	Bulls	Total
Calf	3		3
1	2	2	4
2		4	4
3		7	7
4	2	4	6
5		1	1
6	2	3	5
7	4	2	6
8	2	1	3
9	2		2
12	1		1
14	2		2
15	1		1

Composition and Productivity

November composition counts indicate calf production was about the same for the last two years with 21.2 per 100 cows. The average for the last five 5 years is 21.6 calves per 100 cows. This year's count showed 23.4 bulls per 100 cows, average for the past five years has been 19.5:100. A summary of moose surveys in 20D follows:

Table 3. Summary of moose composition counts in Unit 20D.

Moose Numbers	Year					
	1960	1970	1971	1972	1973	1974
Bulls:100 cows	36.0	8.0	19.0	26.0	21.0	23.4
Calves:100 cows	51.0	31.0	15.0	19.0	21.6	21.2
Calf percentage in herd	27.0	21.9	11.4	13.0	14.9	14.6
Moose per hour	....	17.5	32.3	18.0	36.3	37.8

A mid-March spring survival count showed 14.3 percent calves in the herd indicating light winter mortality.

Management Summary and Recommendations

The 20D moose population appears stable. The 1974 harvest of 26 bulls and 27 cows was probably at or near the maximum sustained yield for the area (western half of the subunit) in which the moose were taken. The western half of the subunit is very accessible and the herd would be subject to overharvest without control by permit.

The eastern part of the unit received very little pressure and a resulting light kill (two bull moose); considering the number of moose present. Future hunts should be arranged to shift hunting pressure to the relatively inaccessible eastern half of the subunit.

A conservative approach, based on moose production, distribution and hunting pressure, indicates future hunts should not exceed the 1974 harvest until hunting pressure can be directed to the eastern half of the subunit.

Unless some form of meaningful habitat rehabilitation is undertaken it is not likely this subunit will support an annual harvest of more than 75 animals. The more accessible areas of the subunit, supporting human activity, should remain closed to moose hunting.

PREPARED BY:

Robert Larson
Game Biologist II

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 21 - Middle Yukon

Seasons and Bag Limits

Aug. 20 - Dec. 31	One bull; antlerless moose may not be taken prior to Oct. 1.

Harvest and Hunting Pressure

The reported 1974 moose harvest was 176 bulls, 25 cows and 3 sex unspecified, for a total of 204. This harvest showed a slight decrease over the 1973 reporting period and was probably a result of the closure on cows in the fall since the cow segment of the kill showed the largest decline. Hunting pressure continued to increase in the Holy Cross, Shageluk and Innoko River areas. Several guides are now offering moose and bear hunts on the Innoko and other commercial operators have shown interest in this area. A Bethel charter service has begun activities in this area because moose hunting in the Paimute Flats has become unprofitable. Illegal fly-in hunting of this type has been common in this part of Unit 21 for several years, but is very unpopular with local residents. Although arrests and convictions have been made, this activity has not ceased. Local residents continue to clamor for later seasons, obstensively to insure good weather to keep meat, but in reality to preclude fly-in hunting. The take of moose by aircraft hunting probably exceeds that of the local boat hunters. The estimated harvest, both unreported and reported, for Unit 21 in 1974 was about 550 moose.

Composition and Productivity

Aerial surveys of the Middle Yukon, Lower Koyukuk and Nowitna were not made in 1974. Reports from residents of the area indicated that production and survival of calves were good in 1974.

Range and Habitat

Snow depths during the winter of 1974 were generally comparable to those reported in Unit 19, but may have been somewhat deeper on the average. Moose remained on the river bars until late March before dispersing into adjacent forested habitat. This movement was early compared to previous years.

Population Trends

Moose populations in Unit 21 are on the increase, but losses of calves and adult moose to wolf predation continue to retard herd recovery, especially in the Holy Cross area. Several large wolf packs of over 10

animals each were found in this area during spring 1975. Hunters removed about 16 wolves from this section of Unit 21, but were hampered by deep snow and restrictions on aerial hunting.

Management Summary and Recommendations

Moose populations in Unit 21 are now recovered sufficiently to support local subsistence demands, but not enough to accommodate unrestricted fly-in hunting. Competition between local residents and adjacent unit residents has resulted in all-out attempts by Unit 21 residents to shorten seasons and to close the antlerless season entirely. Movement into this area by guides and air charter operators is only widening this gap between local inhabitants and persons from other units. Only the curtailment of aircraft use in this area will solve the problem. The present regulation regarding no hunting the same day airborne does not seem to be effective in this particular region.

PREPARED BY:

Peter E. K. Shepherd
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 22 - Seward Peninsula

Seasons and Bag Limits

Aug. 1 - Jan. 31	One moose; antlerless moose may be taken by permit only; dates and conditions of the hunt will be described by Commissioner's announcement.

Harvest and Hunting Pressure

The bull season in Kuzitrin River drainages was open for 6 months for the first time this year. In addition, two special antlerless seasons were held in most of Unit 22. Consequently, the reported harvest nearly doubled the previous high and was 4 times the previous 10-year average (Table 1). Antlerless moose hunters were required to obtain a special permit prior to hunting so we were able to talk with each hunter prior to going afield to explain our moose management program and to encourage their participation by providing accurate moose harvest reports and selected specimen material. The first antlerless season was from September 1 to October 31. The second antlerless season was from December 20 through January 31. Three hundred and seventy-three permits were issued during the first season and 324 of these permits were returned. Permit stipulations were made more restrictive for the second season and all 121 permits issued were returned.

The reported moose harvest in Unit 22 for 1974 was 222 and, of these, teeth were obtained from 174 (78%) moose. Hair samples were collected from 88 (40%) moose and reproductive tracts from 21 of the 24 (87%) females taken during the second antlerless season. The historical moose harvest is listed in Table 1.

Table 1. Historical moose harvest in Unit 22 (from harvest ticket data).

Year	Male	Female	Unknown	Total	Year	Male	Female	Unknown	Total
1963	68	1	..	69	1969	69	1	2	72
1964	57	..	..	57	1970	70	..	1	71
1965	55	3	2	60	1971	59	..	1	60
1966	52	1	1	54	1972	44	..	..	44
1967	56	..	1	57	1973	103	32	1	136
1968	33	1	1	35	1974	149	72	1	222

Of the 99 bull moose aged, 30 percent were yearlings and 40 percent were 3 years old or older. The oldest male taken was 8 years old. Of the 75 female moose aged, 17 percent were yearlings and 54 percent were 3 years old or older. The oldest female taken was 17 years old. The following is a breakdown of the sample of 174 moose from the 1974 harvest.

	AGE										
	Calf	1	2	3	4	5	6	7	8	9	17	Total
Males	9	30	21	13	9	8	2	4	3	0	0	99
Percent	9	30	21	13	9	8	2	4	3	0	0	
Females	13	13	9	12	10	5	3	2	1	6	1	75
Percent	17	17	12	16	13	7	4	3	1	8	1	

Over two-thirds of the bulls were taken during the antlerless seasons. No bulls were reported taken during November and the first half of December, at which time the antlerless season was closed, yet 13 were taken in late December and January in conjunction with the antlerless season. Most females were taken in September and the first week of January.

Over half of the reported harvest came from drainages of the Kuzitrin River. The following is a breakdown of the harvest by area.

Area	Males	Females	Total
Shishmaref	18	4	22
Agiapuk	6	3	9
Nome	25	1	26
Kuzitrin	63	56	119
Fish	15	6	21
Koyuk	11	0	11
Unalakleet	8	2	10
Unknown	3	1	4

Composition and Productivity

Aerial surveys of most of the major wintering areas were conducted in early 1974. Composition counts were obtained in early December. The aerial surveys and analysis of ovaries from hunter-killed cows suggest continued good calf production and survival particularly on the Kuzitrin River system.

Aerial surveys made thoughout the unit from December 3, 1974 to April 1, 1975 indicated an overall calf production of 21 percent. There were 1,471 moose observed in the surveys. Calf production within individual count areas varied from 14 percent to 30 percent. Calf production in April 1974 was 23 percent from a sample of 631 moose.

Population Trends

The numbers of moose seen on aerial surveys seem to indicate that populations on the Koyuk and Serpentine Rivers are stable while those on the Fish, Kuzitrin and Agiapuk Rivers are continuing to increase.

Range and Habitat

Surveys of the effects of winter moose browsing on willows in drainages of the Kuzitrin River indicate heavy winter browse use.

Management Summary and Recommendations

Considering the lack of significant natural predators and heavy in the Kuzitrin drainage, this population should not be allowed to increase.

The road to the Kougarok was open throughout the moose season when it usually would be closed by mid-October. Even with the greater access, an extended bull season and special antlerless season it appears that hunters were unable to harvest the entire annual increment. Continued liberal seasons and bag limits are necessary to help prevent the moose populations on the Seward Peninsula from overpopulating their winter ranges and to allow full utilization of an increasing and expanding population.

PREPARED BY:

Robert E. Pegau
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 23 - Kotzebue Sound

Seasons and Bag Limits

Aug. 1 - Dec. 31	One moose; antlerless moose may not be taken prior to Sept. 1.

Harvest and Hunting Pressure

The reported 1974 harvest in Unit 23 was 104 moose, 77 of which were bulls. This was one more moose than reported last year and was the largest harvest on record. It probably reflects both a greater harvest due to expanding moose populations and the local effort to get village residents to use their harvest tickets. Based on our village visits, it is estimated that the actual harvest was 200-300 moose. Efforts to collect lower jaws to obtain teeth for aging continue to receive little support.

The chronology of the reported harvest revealed that over 80 percent of the moose were taken by mid-September. Village residents in Unit 23 are primarily caribou hunters and moose are only of secondary importance. Residents of Shungnak and Kobuk built more fish traps in 1974 than in recent years as caribou did not pass near these villages. In October and November there was sufficient snow for travel and moose were abundant within 20 miles of each village, yet the people continued to use their fish traps and hoped that the caribou would come close by.

The lower Noatak received the most intensive hunting pressure as it was the favored area and accessible to residents of Kotzebue and Noatak. The following table is a breakdown of the reported harvest by area.

Table 1. Reported harvest by area.

Area	Male	Female	Unknown	Total
Wulik	2	0	0	2
Lower Noatak	20	4	1	25
Remainder of Noatak	5	2	1	8
Lower Kobuk	7	2	0	9
Middle Kobuk	8	3	0	11
Upper Kobuk	16	4	0	20
Kotzebue area	2	1	0	3
Selawik	5	6	1	12
Buckland	4	1	0	5
Candle	3	1	0	4
Unknown	5	0	0	5

Composition and Productivity

Only a limited number of aerial surveys were flown in Unit 23. The number of moose seen on the surveys was considered to be "minimum populations," recognizing that few areas were surveyed and that not all moose present in the survey areas were seen. Results of the moose aerial surveys are listed below:

Drainage	Minimum populations	Calf percent in herd
Buckland	55	13
Kiwalik	70	14
Kugruk	56	16
Goodhope	19	31
Pish	35	40
Pik	38	18
Pah	25	4
Upper Kobuk	29	17

Management Summary and Recommendations

Based on the limited surveys, village visits, pilot reports and harvest reports, moose in Unit 23 seem to be plentiful and increasing, especially on the lower Noatak and south of the Selawik River. Efforts to get residents to use their moose harvest tickets should be intensified.

PREPARED BY:

Robert E. Pegau
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 24 - Koyukuk drainage

Season and Bag Limit

Aug. 20 - Dec. 31	Two moose; only one of which may be antlerless.

Harvest and Hunting Pressure

The number of hunters, moose harvest and percent success for Unit 24 from 1970-1974 are shown in Table 1.

Table 1. Harvest statistics, Unit 24, 1970-1974.*

Year	Hunters	Harvest	Percent success	% bulls in harvest	Hunters(%)		Harvest(%)		% Success	
					nonres.	res.	nonres.	res.	nonres.	res.
1970	79	56	71	80	26	74	30	70	81	67
1971	101	79	79	79	31	69	32	68	80	77
1972	62	45	73	72	23	77	24	76	76	69
1973	122	97	79	78	23	77	26	74	87	75
1974	113	77	68	88	24	76	24	76	69	67

*Harvest tickets are not commonly used by native residents of Unit 24, therefore the harvest of moose indicated in Table 1 is less than the actual harvest.

The harvest of moose, as indicated by harvest tickets, has increased over the past two hunting seasons in Unit 24. The 1974 harvest was slightly lower than that of 1973, and the percent success for all hunters was the lowest ever reported at 68 percent. Although the lowest success reported for this unit, a success percentage of 68 percent is high relative to other areas.

Transportation methods of all hunters reporting from 1972-1974 are presented in Table 2.

Table 2. Transport type, moose hunters, Unit 24, 1972-1974.

	Percent of all hunters		
	1972	1973	1974
Aircraft	41	48	61
Boat	29	31	23
Snow machine	6	2	1
Horse	0	1	3
Other (some combination of above)	6	1	1
Nonspecified (no transport given)	6	5	7

The percentage of aircraft hunters has doubled in the last eight years (1967 - 31.0%, 1974 - 61.0%). As would be expected this is indicative of an increase in hunting pressure from outside the unit. The actual number of people using boats for transport has not decreased.

Calculation of success percentage by transportation type shows boat hunters to be slightly more successful than aircraft hunters (80% vs. 74%).

The residency of the hunters reporting from 1972-1974 is presented in Table 3.

Table 3. Residency of hunters by percent, Unit 24, 1972-1974.

	1972	1973	1974
Rural villages	26	20	22
Fairbanks area	39	42	38
Anchorage area	4	8	10
Other	28	28	28

No changes of significance were noted in the above data.

Analysis of the harvest information on a drainage basis indicated that the harvest was fairly well distributed throughout the Upper Koyukuk drainage with the majority of the harvest occurring in those areas at, or near, timberline.

Composition and Productivity

Composition counts for productivity and survival information have been flown in the Koyukuk drainage on an irregular basis and comparison, due to overlap of areas, is difficult. Data from the late 1950's, however, indicate a highly productive moose herd with calf:100 cow ratios ranging from 36 to 82. The percentage of calves in the herd for the same time period was in the mid to high twenties.

A spring 1974 survey in the Upper Koyukuk drainage showed much lower productivity, with calves representing only 11 percent of the total herd. The moose per hour figure was extremely low with the observer tabulating only 8.2 moose/hr. for 14.4 hours of count time. The sample of moose was quite low (118) and it is doubtful that these data are representative of the moose populations throughout the unit.

Management Summary and Recommendations

The harvest of moose from Unit 24 is likely to continue to increase as season restrictions are placed on other areas and more hunters are financially capable of getting to Unit 24.

The sustainable level of harvest from this unit is unknown.

It is recommended that annual population composition survey areas be established.

It is recommended that systematic distribution and abundance surveys be initiated.

It is further recommended that an attempt be made to gather age data from harvested moose. Contact with guides and hunters at Bettles should be initiated.

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

PREPARED BY:

Arthur C. Smith
Game Biologist II

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 25 - Chandalar drainage and eastern Yukon drainage

Season and Bag Limit

Aug. 20 - Dec. 31	Two moose; only one of which may be antlerless.

Harvest and Hunting Pressure

The number of hunters, moose harvest and percent success for Unit 25 from 1970-74 are shown in Table 1.

Table 1. Harvest statistics, Unit 25, 1970-1974.*

Year	Hunters	Harvest	Percent success	% bulls in harvest	Hunters (%)		Harvest (%)		% Success	
					nonres.	res.	nonres.	res.	nonres.	res.
1970	94	55	58	70	20	80	26	74	71	50
1971	130	74	56	71	26	74	21	79	45	61
1972	123	83	67	66	30	70	22	78	48	71
1973	221	153	69	68	20	80	20	80	57	58
1974	222	111	50	77	19	81	20	80	53	49

*Harvest tickets are not commonly used by native residents of Unit 25, therefore the harvest of moose indicated in Table 1 is less than the actual harvest.

The harvest of moose, as indicated by harvest tickets, has increased substantially over the past two hunting seasons in Unit 25. The 1974 harvest was slightly lower than the 1973 harvest and the success ratio was lower than has been reported in the past. It is not known whether or not the lowered success was due to a decreasing moose herd.

Transportation methods of all hunters reporting from 1972-1974 are given in Table 2.

Table 2. Transport type, moose hunters, Unit 25, 1972-1974.

	Percent of all Hunters		
	1972	1973	1974
Aircraft	17	23	23
Boat	71	64	66
Snow machine	1	1	1
ORV	1	1	1
Other (some combination of above)	5	5	4
Nonspecified (no transport given)	3	5	4

The transport method of greatest importance in Unit 25 is the boat. The majority of this traffic is centered on the Yukon River which has road access at the pipeline crossing downstream from Stevens Village, Circle City and Eagle. Success for this transport mode was surprisingly high at 50 percent but it had decreased from 70 percent in 1972.

The residency of the hunters reporting from 1972-74 is presented in Table 3.

Table 3. Residency of hunters by percent, Unit 25, 1972-1974.

	1972	1973	1974
Rural villages	22	5	17
Fairbanks area	26	47	40
Anchorage area	14	14	16
Other (Southeast, lower 48, etc.)	36	31	25

Rural village residents are not accurately represented in these percentages due to their nonparticipation in the harvest ticket program. The increase in the Fairbanks area and Anchorage area hunters utilizing this area is expected to continue.

The harvest is fairly well distributed throughout the Chandalar drainage and in recent years has reached into the easternmost drainage of the Upper Yukon. The Sheenjek, Porcupine, Kandik and Nation Rivers have sustained increases in hunting pressure in recent years.

Composition and Productivity

No composition surveys have been flown in Unit 25 on a regular basis and comparison between counts that have been flown is meaningless.

A spring distribution and abundance survey of the Upper Yukon from Circle to the Canadian border, including the side drainages of the Kandik, Charley, Nation, Tatonduk and Seventy Mile Rivers and Woodchopper and Coal Creeks, indicated a sparsely distributed moose herd (196 moose) with fair production (14% calves in herd). The majority of calves located during this survey were found on the islands of the Yukon River bottom-land. The sample of moose on the survey was small and may not be representative of the total moose population in the area.

Management Summary and Recommendations

The harvest of moose from Unit 25 is likely to continue to increase as season restrictions are placed on other areas and more hunters are financially capable of getting to Unit 25.

The sustainable level of harvest from this unit is unknown. Investigations are needed to accurately determine population size, productivity, survival and movement patterns of these moose herds.

It is recommended that annual population composition survey areas be established.

It is also recommended that systematic distribution and abundance survey be initiated.

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

PREPARED BY:

Arthur C. Smith
Game Biologist II

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator

MOOSE

SURVEY-INVENTORY PROGRESS REPORT - 1974

Game Management Unit 26 - Arctic Slope

Seasons and Bag Limits

Aug. 20 - Dec. 31 One moose

Harvest and Hunting Pressure

During 1974, 57 moose were killed in GMU 26 by sport hunters, compared to 31 taken in 1973 and an average of 30.5 over the preceding 6 years (Table 1). The kill was made up of 86 percent males, a negligible change from the 79 percent mean for the previous 6 years.

Although moose are taken throughout the unit most hunting in this area occurs along the Colville River.

Table 1. Yearly moose harvest by sex in GMU 27, 1963-1974.

No. moose harvested	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Male	13	13	0	12	5	15	25	26	33	17	24	49
Female	0	0	0	0	0	4	6	7	3	0	7	8
Unknown	0	0	1	0	0	1	1	2	2	0	0	0
Total	13	13	1	12	5	20	32	35	38	17	31	57

Composition and Productivity

In 1974, spring surveys were carried out along a portion of the Colville River and the Anaktuvuk and Chandler Rivers which tallied 535 moose of which 82 were calves born in 1973 ("short yearlings'") and 453 were adults. No sexual distinction was made during the adult counts since bulls were without antlers.

The summer count yielded a total of 45 moose, of which there were 12 bulls, 20 cows, 9 calves and 4 yearlings. If these summer sex ratios are applied to the spring survey results, the moose counted during the spring can be broken down in the following manner: 170 bulls or 60:100 cows, 283 cows and 82 yearlings or 29:100 cows. Also, if the proportion of calves seen in the short summer flight was representative, it would indicate that calf survival was good, with 29 yearlings:100 cows surviving from 45 calves:100 cows.

Management Summmary and Recommendations

At present moose populations on the North Slope are healthy and productive. Vegetation analysis along the Colville River shows little evidence of overbrowsing. Indications are that these moose are below carrying capacity of the winter range.

The high yearling recruitment is indicative of either an increasing population or a high population turnover. If the population is increasing it could sustain a greater harvest than now occurs. A substantially larger population is not necessarily desirable in the present situation of limited winter range and good moose-range relationships, as indicated by calf production and survival. It should be pointed out, however, that the population should be closely monitored because there could potentially be overharvest if a sizable increase in hunting pressure occurred, and other mortality factors are presently stabilizing the population.

PREPARED BY:

Harry Reynolds
Game Biologist III

SUBMITTED BY:

Oliver E. Burris
Regional Management Coordinator