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REFUGE NARRATIVE REPORT

1967

KENAI NATIONAL MOOSE RANGE

Kenai, Alaska

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KENAI NATIONAL MOOSE RANGE

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U. S. DEPARTMENT of the INTERIOR
Bureau of Sport Fisheries and Wildlife
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Kenai, Alaska

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KENAI NATIONAL MOOSE RANGE

NARRATIVE REPORT

JANUARY - DECEMBER 1967

I. GENERAL

A. Weather Conditions

A summary of this year's weather data as recorded by the Kenai FAA Station follows:

	TEMPERATURES				PRECIPITATION (in inches)		
	EXTREMES		Average Mean	10-Yr. Average Mean	This Month	10-Yr. Average Mean	Snowfall
	Max.	Min.					
January	30	-25	5.5	19.8	.84	1.23	11.4
February	39	-29	12.5	24.3	1.29	1.08	15.2
March	44	-14	21.2	22.8	1.37	.97	8.2
April	51	4	32.2	31.0	1.58	.68	6.3
May	61	30	43.1	42.9	.96	.66	0.0
June	63	39	49.3	49.5	1.42	1.47	0.0
July	74	41	53.0	53.3	2.09	2.45	0.0
August	66	40	54.6	53.2	4.69	2.63	0.0
September	62	34	48.4	46.5	2.52	3.60	0.0
October	57	10	36.9	35.0	.95	2.80	2.7
November	49	-10	28.5	22.4	4.12	1.45	3.0
December	41	-19	10.9	9.5	2.02	1.01	12.8
					23.8		59.6

B. Habitat Conditions

1. Water. Lakes became ice-free around the middle of May. Sports Lake, located near Soldotna, has become ice-free the last four years on the following dates: May 30, 1964; April 30, 1965; May 12, 1966; and May 13, 1967. Precipitation was greater than normal because of the extreme amount of rainfall in August and November. Heavy rains caused areas along the Kenai River to flood in September. Extreme mild temperatures in October and November prevented many lakes from freezing until the last few days in November.

2. Food and Cover. An abundance of sunshine in the early spring months of May and June resulted in a good growing season for vegetation. All young hardwoods produced excellent leaders, and berries were plentiful in the fall. The newly seeded roadsides at Jean Lake grew successfully without irrigation.

II. WILDLIFE

A. Migratory Birds

1. Waterfowl. The 1967 spring waterfowl migration was considered normal this year. A few ducks were seen at the outlet of Skilak Lake on the Kenai River April 7; however on April 14 no ducks or geese were present on the Kenai or Chickaloon Flats. The first Canada geese arrived on April 15, and by April 21 about 3500 snowgeese, 70 Canada geese, 400 pintails and 60 mallards were present on the Chickaloon and Kenai Flats. The spring migration peaked around the first week in May.

A flight over the Chickaloon Flats on August 3 revealed several hundred pintails, teal and widgeon. Whether these were early migrants or local nesters is not known. According to the Wildlife Inventory Plan the first fall weekly waterfowl census is to be conducted the last week in August. I would recommend making some earlier surveys to investigate the extent and status of these early birds.

By September 13 an estimated 7000 ducks and 375 Canada geese were utilizing the Chickaloon Flats. Duck numbers increased through late September and continued at fairly high levels until the middle of October. Even though extreme mild temperatures prevented many lakes from freezing until well into November, most ducks and geese had left by late October.

The vegetation of the Chickaloon Flats continues to recover. The new silt which covers the flat is firmer than when checked three years ago, but still difficult to walk on. Access to the area is limited. A few people now land planes with floats in areas where water covers the mud, but this is still rather hazardous.

Hunting pressure was considered light.

2. Trumpeter Swans

Spring Breeding Population. Trumpeter swans are usually the earliest species of waterfowl to arrive in the spring. On April 14 a few were already present. Six were seen on the East Fork of the Moose River, six below Skilak Lake, and four on the stream below Sucker Lake.

The Moose River near the Sterling Bridge is one of the favorite gathering places for swans on the Kenai. They arrive here as soon as the river is free of ice and seem to remain until the nesting lakes become ice-free.

On April 21, the Moose River was still frozen but 31 trumpeters were observed on open water below Skilak Lake. As the ice started dissipating from the Moose River on April 26, swans gathered at this location and by May 1, approximately 150 swans were on the river. This concentration was reduced to 43 by May 8 as pairs were moving onto their territories. On May 17, only 4 swans remained at the river.

Nesting surveys to count nesting pairs and total swan numbers were conducted from June 4 to June 9. A total of 98 swans were seen; 56 of which were nesting pairs. Most of the non-nesters were either in pairs or singles. Total adults seen in the June surveys in past years has been 91 adults, 1964; 132 adults, 1965; and 106 adults, 1966.

Nesting. A total of 28 swan nests were located during this year's survey (Table 1). This was considerably lower than the past two years, but about average for the past eleven years as indicated in Table 2.

A number of pairs occupied territories for a considerable period, but failed to nest. Several of these were near nest sites which had been occupied for a number of years. Pairs occupied territories at Grey Cliff Lake, Moose Pasture, Silver Salmon Lake, Bare Lake, Brood Lake, Swan Creek and Diamond Lake, but failed to nest.

A few pairs which had occupied a nest site for several years apparently moved their site some distance this year. In several cases this may have been due to disturbance. The Mackey Lake pair remained near their old nest site for several weeks then suddenly decided to nest on a small lake about 1 mile NW of the old site. It is interesting to note that this small lake had been a major feeding area for the brood for several years. The Fish Lake pair also moved their nest about $\frac{1}{2}$ mile to a smaller lake. In past years they had received considerable disturbance from fishermen.

Nests # 2, 4, 5, 7, 10, 12, 23 and 27 were known to have occupied the identical site as last year.

Nesting Period and Incubation. The Mink Creek pair were again the earliest nesters observed. They were on their site by April 19, and were apparently incubating by May 2. As indicated from the hatching dates in Table 3, swans nested later than in 1966, but similar to 1965. Incubating periods were obtained for Mink Creek and Nest Lake, both of which incubated their

TABLE 1

NEST LOCATION, PRODUCTION, AND SURVIVAL
OF 28 TRUMPETER SWAN NESTS ON THE KENAI PENINSULA 1967

NEST #	LOCATION	CLUTCH SIZE	HATCHING SUCCESS		SURVIVAL TO LATE AUGUST	
			DATE CHECKED	CYGNETS	DATE	CYGNETS
1	Gas Well Lake	5	7/6	3	8/22 & 9/6	2
2	Elephant Lake	4	7/20	4	8/22	4
3	Cow Lake	4	6/30	3	8/22 & 9/6	3
4	Mosquito Lake (1 Mile West)	4	6/30	2	8/22	2
5	Mink Creek Lake	7	6/7	6	8/22	6
6	Fish Lake ($\frac{1}{2}$ Mile West)	4	6/23	3	8/22 & 9/14	3
7	Krein Lake	7	6/23	4	8/22	2
8	Nest Lake	6	6/30	5	8/22 & 9/6	0
9	Curlew Lake (1 Mile NE)	5	7/6	3	8/22	3
10	Hook Lake (1 Mile West)	5	6/23	5	8/22 & 9/21	2
11	Moose Point	5	6/30	4	Can't Find	
12	Vogel Lake (NE)	3	Abandoned			
13	Dipper Lake	6	7/6	6	8/22	6
14	Snipe Lake (N)	5	7/6	5	8/22	5
15	Harvey Lake (1 Mile NW)	3	Abandoned			
16	Moose Lake (1 Mile NW)	6	6/27	3	8/22	0
17	Bay Lake (2 Miles NW)	6	7/7	5	Can't Find	
18	Pollards Lake	7	6/20	5	8/22	4
19	Clam Gulch (2 Miles SE)	8	7/7	4	Can't Find	
20	Fox River	5	7/7	4	8/27	4
21	E. Forelands	4	7/13	3	8/22	3
22	Nikishka	6	7/11	4	8/22	3
23	Beck Lake	7	Abandoned			
24	Tony's Lake ($\frac{1}{2}$ Mile East)	6	6/23	3	8/22	3

TABLE 2

TRUMPETER SWAN PAIRS NESTING
ON THE KENAI PENINSULA 1957-1967

YEAR	NUMBER OF NESTS
1957	20
1958	21
1959	20
1960	27
1961	30
1962	25
1963	22
1964	25
1965	39
1966	36
1967	28

TABLE 3

HATCHING DATES OF VARIOUS
TRUMPETER SWAN CLUTCHES IN 1965, 1966 AND 1967

NEST	HATCHING DATE		
	1965	1966	1967
Mink Creek Lake	June 12	Prior to June 6	June 7
Swan Creek	June 15	June 4	---
Mackey Lake	June 17	June 12	July 3
Pollards Lake	June 19	June 11	June 19
Krein Lake	June 22	June 25	June 23
Mosquito Lake	June 23	June 19	---
Fish Lake	June 26	June 17	June 23
Nest Lake	June 26	June 18	June 26
Brood Lake	June 17	---	---
Hook Lake	June 21	---	---
Quill Lake	June 22	---	---
Scaup Lake	June 23	---	---
Stormy Lake	June 24	---	---
Moose Pature Lake	June 25	June 8	---
Elephant Lake	June 26	---	---
Cow Lake	---	---	June 28
Moose Lake	---	---	June 24

TABLE 4

CLUTCH SIZE OF 25 TRUMPETER
SWAN NESTS ON THE KENAI PENINSULA IN 1967

CLUTCH SIZE	FREQUENCY
8	1
7	4
6	7
5	6
4	5
3	2
2	0
1	0
RANGE 3 - 8	
MEAN 5.4 Eggs Per Nest	

clutches approximately 35 days.

The first cygnets were observed at Mink Creek on June 7, and most clutches hatched the last week in June.

Nesting Behavior. Mr. and Mrs. Fletcher who have a home overlooking the Pollard Lake nest site recorded their observations in a daily diary. Some of these observations are:

May 5 - Two adults arrive at nest site. Lake frozen but one area has open water which swans utilize.

May 10-22. Pair always together and fly away during day for three to four hours.

May 13-20. Mating display activities observed.

May 22. Six eggs observed. Female smaller and male most aggressive. Both male and female incubate. Usually they incubate $3\frac{1}{2}$ to 5 hours at a time, but may both leave area to feed.

June 19. Cygnets hatched.

June 20. Cygnets swim near nest. Adults add material to nest.

June 22. Family left nest.

Their observation of both sexes incubating, if accurate, is quite interesting as Banko (1960), does not record this, although it is prevalent in some swans.

Clutch Size. The clutch size of 25 nests were recorded prior to hatching. The largest clutch was 8 and the smallest 3 with a mean of 5.4 (Table 4). This is considered average when compared to past years.

Hatching Success. Nests number 26, 27 and 28 were never completed to our knowledge, and nest # 12, 15, 23 and 25 were abandoned prior to hatching. Whether these were destroyed by predators or simply failed to hatch is not known. Nest # 12 located at the same site the past three years has never successfully hatched. Of the 134 eggs recorded in 25 nests, 84 were known to produce cygnets for a hatching success of 63 percent. This is considerably less than the 79 percent success last year. Only four nests

produced a cygnet for each egg incubated.

Survival and Mortality. Attempts were made to count broods in late August to determine survival to flight status. Eighteen of the 21 broods successfully hatched were located. Brood # 11, 17 and 19 could not be found but may have survived. Brood # 8 and 16 definitely lost all cygnets. The total minimum cygnets surviving to the flight stage was 55, indicating considerable preflight mortality. Eleven broods had no mortality.

No adult mortalities were recorded or reported during the past year.

Brood Movements. Periodic aerial observations of five broods during the preflight stage again provided information on movements. Figure 1 depicts the sightings made on each brood and delineates the approximate boundaries of their home ranges. Broods # 1, 2 4, and 5 were also recorded last year. All showed similar movements to last year except # 1. This brood's nest site was moved approximately $1\frac{1}{2}$ miles NW of last year's and the area utilized changed considerably. Only the western half of this year's area was utilized last year.

Molting. Some additional information on the molting information of the female was obtained. On July 24 the females at Elephant Lake, Hook Lake and Krein Lake were incapable of flight and were captured; however in all three instances the males could fly. On the same date both adults were capable of flight at Mink Creek Lake. The females were also incapable of flight on Nest Lake on July 10 and at Mink Creek Lake on June 27.

On August 14, both adults were capable of flight at Cow Lake. We still have no information on the flightless period of males but the major flightless period for females appears to be July. The Mink Creek pair are unusually early nesters and no doubt this is the reason for the earlier molting period for this pair.

The age at which cygnets fly is not known, however the Fish Lake cygnets were still incapable of flight at the age of 12 weeks.

Banding and Marking. Four adults and nine cygnets were banded in 1967 with Monel #9 BSFW bands (Table 5) All except four cygnets received red plastic color neck bands.

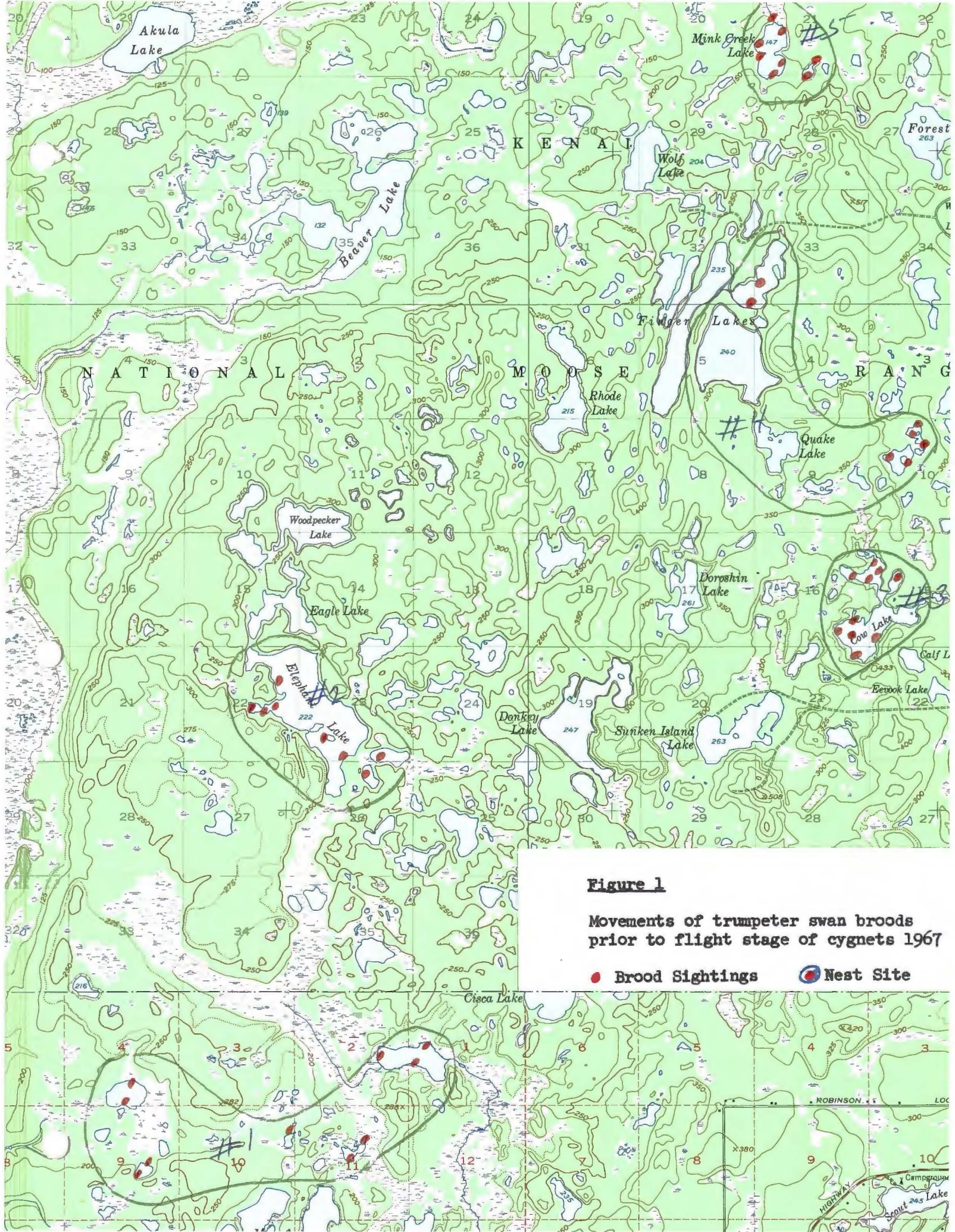


Figure 1

**Movements of trumpeter swan broods
prior to flight stage of cygnets 1967**

● Brood Sightings ● Nest Site

TABLE 5

TRUMPETER SWANS Banded ON THE KENAI NATIONAL MOOSE RANGE - 1967

DATE Banded	LOCATION	SEX	AGE	BAND NUMBER	COLOR MARK	WT.	T.L.	TAIL L.	FOOT	HEAD	BILL	WING	COMMENTS
7/10	Nest Lake	♀	Adult	569 00103	Red-neck band			8	11½		6	23	♀ of Nest # 8
6/27	Mink Creek Lake	♀	Adult	569 00102	Red-neck band B-1	23	54	8 ¾	12½	8	5 ¾		♀ of Nest # 5
7/24	Krein Lake	♀	Adult	569 00104	Red-neck band E-1	24	53½	9	10 ¾	7 ¾	5½	20	♀ of Nest # 7
7/24	Hook Lake	♀	Adult	569 00105	Red-neck band F-1	24½	55	9	12½	8½	5½	21½	♀ of Nest # 10
8/14	Cow Lake	♀	Cygnets	569 00109		7			9 ¾		4 1/8		From Nest # 3
8/14	Cow Lake	♂	Cygnets	569 00149		7			9½		3 7/8		From Nest # 3
8/14	Cow Lake	♂	Cygnets	569 00110		7 ¾			9 ¾		4		From Nest # 3
9/14	Drake Lake	♀	Cygnets	569 00112	Red-neck band	17							From Nest # 6
9/14	Drake Lake	♀	Cygnets	569 00113	Red-neck band	16							From Nest # 6
9/14	Snag Lake (2 MI. NE)	♂	Cygnets	569 00114	Red-neck band	15							From Nest # 9
9/14	Snag Lake	♂	Cygnets	569 00115	Red-neck band	14½							From Nest # 9
9/14	Diamond Lake	♂	Cygnets	569 00116	Red-neck band	12½							
9/15	Soldotna Creek Lake	♀	Cygnets	569 00111	Red-leg band								From Nest # 1

All measurements taken in inches and weights in pounds.

We are still in the experimental stage to find an adequate marker, and if the results look satisfactory, more cygnets will be color marked next year. The primary purpose of marking cygnets is to determine the location of their wintering areas.

A few adults were marked in an attempt to determine if the same pair returns to the same nest site each year. The neck markers have individual letters and we had hoped to mark both male and female, but so far only females have been marked.

Neck bands are visible from the air and some individuals were observed numerous times.

Wintering Population. This year no swans were wintering on the Kenai River below Skilak Lake.

West Side Cook Inlet Surveys

The sample area on the west side of Cook Inlet was again flown to determine if any changes occurred in number of active nests.

Unfortunately this year the surveys were not flown until July 13 and 14, and all clutches had hatched; therefore the total broods seen might be fewer than the active nesters. Only 18 broods were seen compared to 28 nests found last year. The 18 broods had a total of 58 cygnets for an average of 3.2 cygnets per brood.

A total of 144 adults were counted which is considerably more than the 83 seen last year in June. A number of groups were observed, and I am speculating that perhaps some of the swans seen earlier on the Kenai may move across the Inlet later in the summer. This area may also be a gathering place for young swans still not sexually mature.

B. Upland Game Birds

1. Spruce Grouse. Larry Ellison of the Alaska Department of Fish and Game reported his Finger Lake study area on the Moose Range had fewer breeding males this spring; however a slight increase in broods were noted. General observation indicated broods were larger than the past few years. A female with 12 chicks was observed on the Swanson River Road on August 5.

Phil Headly of the Alaska Department of Fish and Game recorded a kill of 233 grouse along the Swan Lake and Swanson River Road between October 3 - 16. This compares to 259 recorded last year in the same area between October 1 to 25. Actual

census counts along the 12 mile Swan Lake Road census routes accounted for 11.9 grouse per trip as compared to slightly over 12 last year.

From the foregoing I conclude the spruce grouse population was at a similar level to last year and would be rated fairly good.

2. Ptarmigan. Ptarmigan populations appeared to be reduced in some areas while other isolated populations seemed unchanged. Unfortunately the census area at Green Lake was not conducted due to weather and other work loads. A total of 12 ptarmigan broods were tallied August 9-15 in the Twin Lake area. These consisted of the following number including the adults: 7, 7, 5, 10, 7, 7, 6, 8, and 7 for an average brood of 7.1. All of these are willow ptarmigan.

Hunting as usual was extremely light as few people are willing to expend the effort to hike to elevations where ptarmigan populations are available.

Rock ptarmigan were observed on their breeding territories on Surprise Mountain by April 7.

C. Big Game Animals

MOOSE

1. Productivity

Productivity information of moose was obtained by calving inventories flown in June; composition counts obtained during the rutting season in various areas, and by compositions obtained in the December surveys.

June Calving Inventories

Five calving inventories were flown in the Moose and Chickaloon River Flats between June 18-27 as in past years. Two additional surveys were flown in the swamp lowlands adjacent to the Funny River. Surveys were conducted by Averill Thayer and Robert Richey between the hours of 4:00 and 8:00 a.m.

The calf-cow ratio for the first area was 63:100 and calves in the total population was 22 percent. These figures indicate the highest calf production recorded in the past eight years (Table 7). However ratio of calves per 100 cows shows a greater increase than the percent of calves in the total herd and seems unrealistic. Table 6 indicates yearlings constituted 29 percent of the total population. This is very unlikely especially since severe winter conditions caused some calf loss late last winter. It is more probable that a number of yearlings so identified were two-year-old cows. Removing these from the single cow category would inflate the calf:cow ratio but would not inflate the total percentage of calves in the herd. Twinning was also more common this year indicating better production. There is no doubt that calf production was much higher this year than last.

Two surveys were conducted in the lowland swamps, east and west of the lower portion of the Funny River. I feel this population is probably a different segment from that found along the Moose River. Only 15 percent of the 214 animals seen were calves; however bulls constituted 31 percent of the population compared to 15 percent in the Moose River area. This too would indicate a different population. I suspect many of these animals spend fall in the Funny River Benchland and thus are not subject to intensive hunting. Certainly the low production and higher percentage of bulls indicate a fairly stable population.

TABLE 6

COMPOSITION OF THE MOOSE POPULATION IN THE MOOSE
RIVER AND CHICKALOON AREAS IN LATE JUNE, 1967

DATE	SINGLE O+			TOTAL CALVES	PERCENT	TOTAL COWS	TOTAL BULLS	TOTAL YEARLINGS	PERCENT	TOTAL MOOSE	R A T I O		
	COWS	1C	2C								CALVES	COWS	BULLS
6/18	48	42	6	54	20.0	96	42	75	29.0	267	56:	100:	44
6/20	32	39	5	49	20.0	76	41	85	34.0	251	64:	100:	54
6/22	33	30	4	38	23.0	67	26	38	23.0	169	57:	100:	39
6/26	31	33	4	41	24.0	68	21	37	22.0	167	60:	100:	31
6/27	22	36	9	54	25.0	67	25	69	32.0	215	81:	100:	37
TOTALS	166	180	28	236	22.0	374	155	304	29.0	1069	63:	100:	41

TABLE 7

MOOSE CALF PRODUCTIVITY IN THE
MOOSE RIVER-CHICKALOON RIVER AREAS AS DETERMINED
FROM AERIAL SURVEYS DURING THE LAST TWO WEEKS IN JUNE 1960-1967

YEAR	CALF/100 COWS	PERCENT CALVES
1960	58:100	18
1961	41:100	14
1962	28:100	16
1963	45:100	17
1964	44:100	18
1965	38:100	19
1966	29:100	14
1967	63:100	22

Productivity Indicated from October Composition Counts

This year composition counts were conducted in selected areas the first two weeks in October. The primary reason for these counts was to determine the bull:cow ratio during the rut, however this also provided productivity information for the various areas.

Lack of snow and fairly dense vegetation made viewing rather difficult; however by flying the first hour or two after dawn and before darkness, a number of animals could be classified.

The surveys were divided into three major areas. The Swan Lake Road area consisted mostly of the dense young birch habitat in the 1947 Burn north of the Moose River. This is primarily subject to heavy aircraft hunting. The only ground access is from the Swan Lake Road and the Swanson River.

The Skilak Pipeline consisted of the 1947 Burn habitat between Skilak Lake and the Moose River. This is a mixture of aspen and birch and is subject to heavy road hunting.

Areas along the Sunken Island Road and near Dabbler Lake within the 1947 Burn were also checked but were listed in a separate category.

The timberline area in the Funny River Benchland was also included. This is a relatively unhunted population maintaining good trophy animals.

Data for these areas is shown in Table 8. Calves constituted the following: Swan Lake Road, 23 percent of the total population and 32 calves per 100 cows; Skilak-Pipeline, 25 percent and 38 calves per 100 cows; Sunken Island-Dabbler Lake, 18 percent and 30 calves per 100 cows; Funny River Benchland, 11 percent and 16 calves per 100 cows. The total lowland areas excluding the Funny River Benchland was 23 percent calves and 35 calves per 100 cows.

Productivity Indicated From Winter Composition Counts

The only winter composition counts available in that portion of the Moose Range east of Tustumena Lake were those obtained from the Square-Mile-Plot Inventory flown in December. During this period many bulls had already dropped their antlers so an accurate calf:cow ratio could not be obtained; however the

TABLE 8

MOOSE COMPOSITION COUNTS
CONDUCTED OCTOBER 3-16, 1967

AREA	SINGLE COWS	0+ 1C	0+ 2C	TOTAL CALVES	PERCENT	TOTAL COWS	YEARLING BULLS	TOTAL BULLS	PERCENT	TOTAL MOOSE	R A T I O		
											CALVES	COWS	BULLS
Swan Lake Road Area	135	42	8	59*	23.0	185	7	16	6.0	260	32:	100:	9
Skilak-Pipeline	116	45	9	65**	25.0	170	6	20	8.0	255	38:	100:	12
Sunken Is. Rd. Dabbler Lake	29	9	1	11	18.0	39	4	10	18.0	60	30:	100:	25
TOTAL LOWLAND	280	96	18	135	23.0	394	17	46	8.0	575	35:	100:	11
Funny River Benchland	267	48	1	50	11.0	316	11	91	20.0	457	16:	100:	29

* Includes one lone calf

** Includes two lone calves.

percentage of calves in the population would be valid. Nineteen percent were calves. This percentage is about equal to that of the past three years as shown in Table 10.

Discussion

Tables 6 through 10 indicate considerable variation in productivity at different periods of the year and in different areas. June calf surveys indicate slightly better calf production in the Moose River area over last year. However the winter composition counts indicate similar production to last year. Both surveys indicate approximately 20 percent of the population consists of calves.

Surveys conducted in October give considerable variation in production for the various areas. Percentage-wise the Skilak-Pipeline area shows the highest proportion of calves followed by the Swan Lake Road area (Table 8). The total lowland area was 23 percent calves and 35 calves per 100 cows compared to 11 percent calves and 16 calves per 100 cows in the Funny River area.

As indicated in the June surveys, the data again suggest different populations, especially the significant difference between the mountains and the flats. It is reasonable to assume that the heavily hunted lowland area would be more productive, percentage-wise than the lighter hunted mountain area. This will be discussed more thoroughly under Population Composition.

2. Population Inventory

The Square-Mile-Quadrat Method was again employed this year to census moose northeast of the Kasilof River and Tustumena Lake. The survey was flown December 18-21 in a similar manner to the past few years. Three supercubs piloted by Will Troyer, Bob Richey and Ave Thayer were used in the survey.

A reconnaissance flight on December 11 delineated the major population concentrations, however rain the following day prevented the survey to be inaugurated. Another reconnaissance flight on December 18 provided new information for stratifying the area. These strata were then placed on U.S. Geological Survey Maps, scale 1:63,360. Surveys were conducted in the same manner. For details see the 1965 Narrative Report or the paper "Aerial Census of Moose by Quadrat Sampling Units", Journal of Wildlife Management, October 1966.

This year the strata contained 354 low plots, 1371 medium and 225 high plots. Six low, 68 medium, and 32 high plots were flown. Counting conditions were good except heavy frost clinging to mature hardwoods made viewing difficult in dense stands.

Three moose were tallied in the low plots, 149 in the medium and 505 in the high plots for a total of 657. Table 9 shows the results of these counts and compares them with past surveys. Extrapolating these sampling units to the total area at the 90 percent confidence interval resulted in an estimated population of 6732 animals \pm 1413.

Discussion

Table 9 shows the comparison and results obtained for the past four years. The total population appears to be approximately 400 animals lower than that indicated last year and 700 less than 1965. With the cancellation of the cow season, this year the hunter take was significantly reduced and a suspected increase in the population should have been the result. However severe winter conditions late last winter resulted in a substantial loss in last year's calves and probably somewhat reduced the population increase expected. However it should be remembered that the broad confidence limits give no absolute proof that the population is as reduced as indicated.

3. Population Composition

Spring. The spring population composition was obtained during the calf surveys in June. The 1069 moose tabulated in the Moose River Flats consisted of 155 bulls, 304 yearlings, 374 cows and 236 calves, or percentage-wise this consists of 15 percent bulls, 32 percent cows, 22 percent calves and 29 percent yearlings. The 204 moose classified in the Funny River swamps consisted of 68 (31 percent) bulls; 80 (38 percent) cows; 30 (15 percent) calves and 36 (17 percent) yearlings. The two areas together had the following composition: 223 (18 percent) bulls; 454 (35 percent) cows; 266 (21 percent) calves and 340 (27 percent) yearlings.

Fall. As mentioned previously the winter counts taken in December could not be used to determine the composition of the population because many bulls had already dropped their antlers. The counts obtained in early October as discussed under Productivity and shown in Table 8 provided good composition information.

In the Swan Lake Road area the ratio was 32 calves: 100 cows: 9 bulls; Skilak-Pipeline area 38 calves:100 cows:12 bulls; and for the 575 animals sampled within the lowland area in the 1947 Burn north of Skilak Lake the ratio was 35 calves:

TABLE 9

RESULTS AND COMPARISON OF SQUARE-MILE QUADRAT METHODS FOR
CENSUSING MOOSE ON THE KENAI NATIONAL MOOSE RANGE 1964 - 1967

	1964 PLOTS				1965 PLOTS				1966 PLOTS				1967 PLOTS			
	<u>Low</u>	<u>Med.</u>	<u>High</u>	<u>Total</u>	<u>Low</u>	<u>Med.</u>	<u>High</u>	<u>Total</u>	<u>Low</u>	<u>Med.</u>	<u>High</u>	<u>Total</u>	<u>Low</u>	<u>Med.</u>	<u>High</u>	<u>Total</u>
Grid Strata	137	1498	300	1935	153	1562	226	1941	353	1354	240	1947	354	1371	225	1950
Grids Sampled	5	58	43	106	3	75	30	108	6	68	34	108	6	68	32	106
Moose Counted	6	170	348	524	1	217	380	598	2	186	472	660	3	149	505	657
Range	0-3	0-22	0-68		0-1	0-25	0-68		0-2	0-11	0-67		0-3	0-22	0-50	
Population Estimate				6979				7432				7152				6732
90% Confidence Limits				(\pm 1566)				(\pm 1593)				(\pm 1262)				(\pm 1413)

TABLE 10

COMPOSITION OF THE MOOSE POPULATION OBTAINED
FROM THE SQUARE-MILE QUADRAT SURVEY METHOD 1964-1967

YEAR	PERCENT BULLS	PERCENT COWS	PERCENT CALVES	R A T I O CALF:COW:BULL	TOTAL MOOSE SAMPLED
1964	14.0	64.0	22.0	36: 100: 21	524
1965	15.0	66.0	19.0	30: 100: 22	598
1966	15.0	65.0	20.0	31: 100: 23	660
1967	*	*	19.0	* *	657

* Survey was conducted December 18-21 and many bulls had a ready dropped antlers so bulls and cows could not be separated accurately.

100 cows: 11 bulls. The Funny River Benchland had 16 calves:
100 cows: 29 bulls.

During late October an early snowfall of about four inches provided enough cover to permit some total composition counts south of Tustumena Lake. The Alaska Department of Fish and Game did most of the counting with Assistant Refuge Manager Thayer assisting in the Coho coastal area. Rain prevented completion of the counts in the lowland. Unit I of the Caribou Hills, lies mostly within the Moose Range boundary and 1042 moose were tallied in this area. The composition was 226 (22 percent) bulls; 632 (61 percent) cows and 184 (17 percent) calves for a ratio of 29 calves: 100 cows: 36 bulls.

The lower elevations were not completed, but usually these contain a higher proportion of cows and calves.

Discussion

The various means of obtaining the composition of the population all point to considerable variation in the composition from area to area. This is apparent in spring, fall and winter counts. The major reasons for the variation is the different intensities of hunting pressure. The lowland area with its abundant road access and aircraft access caused by the numerous lakes is intensively hunted, while the mountain areas are not.

However this also indicates to a variety of sub-populations within the overall Moose Range. It would seem then that these sub-populations will have to be managed separately. A very dangerous situation exists in attempting to manage the area as one population. Considering the total moose of approximately 7,000 animals north and east of Tustumena Lake as one population we could assume that the population could sustain an annual kill of 20 percent or 1400 animals. However if there are separate sub-populations within the total and the hunting pressure is unevenly distributed, as it obviously is, over-exploitation of certain populations by hunting can in the future completely eliminate such sub-populations. This is what I believe is occurring in the lowland area. Nearly all of the early September bull season and any early antlerless season results in nearly the entire harvest being taken from the lowland area.

Presently we are also attempting to manage the mountain areas primarily for trophies and the lowland for maximum harvests. In order to accomplish this we not only need to delineate the sub-populations but know the general routes of travel of some of the sub-populations when they move from summer to winter ranges and vice versa. Once this information is obtained, hunting quota's and seasons can be set to harvest animals on a sustained yield basis from each sub-population. Even when managing for trophy purposes it becomes necessary to harvest some females in order to keep the population in balance with the range. This can easily be done by intercepting their route of migration with an antlerless season only and harvesting the desired number of females.

To obtain the information necessary for such intensive management it will be necessary to initiate a well planned, long-range movement study. Methods and means of procuring such information are available, it is a matter of initiating the study. This should be done before it is too late.

4. Movements. Migrational movements from mountain foothills to lowland areas commenced later than the past several years.

On December 11, good concentrations of moose were seen in the lowland area along Mystery Creek Road. These apparently moved in from the mountain foothills nearby. Some moose were still present along Timberline Lake, but fair concentrations were already located in the Funny River Homestead area. By December 18, only the lower portion of the Funny River Benchland had fair concentrations and greater concentrations were seen in the Funny River Homestead area. By the end of the year moose still had not crossed the Kenai River into the Robinson Loop Road area in large numbers.

An estimated 200 animals were feeding in the Slikok Range Rehabilitation area during the month of December. Later in the winter as snow deepens, they move further north.

5. Hunting Kill

Hunting regulations permitted taking one bull moose during the periods of August 20 to September 30 and November 1-20. The planned cow permit season was closed due to public opposition and a loss of calves the previous winter.

Hunting regulations require each moose hunter to obtain a harvest ticket prior to moose hunting. The hunter is required to return the ticket after the season and supply hunting kill information. The data presented was obtained from these records. A total of 31,726 moose harvest tickets were issued and as of this date 84 percent have been returned.

A total of 400 moose were reported killed on the Moose Range of which 279 were taken in the early season and 121 in November (Table 10a). Adding a 10 percent factor to the total kill to compensate for non-report gives a total of 440 bulls taken. This is the lowest kill in many years.

The reason for the low kill was the extremely mild temperatures which failed to drive mountain populations to the lowland, and a loss of calves the previous winter which eliminated most of the yearling class. The majority of the kill usually consists of yearlings and this age class was not available. Thus a notable lack of bulls in the lowland population provided poor hunting success.

This is the first year that the kill south of the Kasilof River, mostly off the Range was greater than the area north of the Kenai River. A total of 2,459 hunters reported hunting in Unit 15 and 24 percent were successful north of the Kenai River while 43 percent were successful south of the Kenai River.

TABLE 10a

DISTRIBUTION OF THE BULL MOOSE KILL
ON THE MOOSE RANGE DURING THE 1967 SEASON

	<u>Aug.-Sept.</u>	<u>Nov.</u>	<u>Total</u>
UNIT A - North of the Kenai River	190	75	265
UNIT B - Between Kenai River and Kasilof River	54	21	75
UNIT C - That portion from Kasilof River to Clam Gulch and Caribou Hills	35	25	60
TOTALS	279	121	400

DALL SHEEP

1. Population Surveys

Aerial. The annual aerial Dall sheep population survey was not completed this year due to inclement weather conditions in late July and early August. The only portion completed was the Surprise Mountain area on July 28, 1967. The Surprise Mountain survey was flown by Will Troyer with Marsh Pitzman as observer. A total of 222 sheep were counted, and consisted of the following composition: 31 lambs, 154 ewes and yearlings, 17 rams less than 3/4 curl and 20 rams 3/4 curl and greater.

Last year 237 animals were tabulated in the same area and 53 of these were lambs. It appears the reproduction rate of this population declined this year.

Ground Counts. Ground counts were conducted according to directives provided by the Wildlife Inventory Plan.

All surveys were conducted by Biological Aids Marsh Pitzman and Walter Anderson. Mr. Pitzman has had considerable previous experience classifying sheep and was well qualified. Surprise Mountain was surveyed on July 14. The Green Lake-South Fork area and the Emma Lake-North Fork area were completed between July 5-11.

A total of 714 sheep were classified (Table 11). Lambs constituted 15 percent, yearlings 12 percent, and rams 26 percent of the total classified. Assuming that half of the yearlings and lambs were males, rams would constitute nearly 40 percent of the total. This would indicate a fairly stable population with fairly low hunting pressure. Since only rams of 3/4 curl are legal this is no doubt true. It appears, however that the larger rams are hunted fairly intensively as only two full curls were seen.

Ground classification of large numbers of sheep has merits and it appears will provide reliable data in future years. This is the first year that this was accomplished in all three areas with a good degree of accuracy.

2. Sheep Transplant. The Alaska Department of Fish and Game personnel attempted to capture sheep for transplanting to Kodiak in late July and early August. A total of 16 sheep consisting of 13 ewes, 2 lambs and one adult ram were taken near the South Fork of Indian Creek.

TABLE 11

COMPOSITION OF DALL SHEEP ON THE KENAI NATIONAL MOOSE RANGE

AS DETERMINED FROM GROUND COUNTS 1967

AREA	EWES	LAMBS	YEARLING	$\frac{1}{2}$	R A M S			FULL	TOTAL RAMS	TOTAL
					$\frac{1}{2}$	$\frac{3}{4}$				
Green Lake - South Fork	137	47	37	13	40	23	1	77	298	
Emma Lake- North Fork	99	34	33	16	11	15	1	43	209	
Surprise Mountain	88	27	28	8	36	20	0	64	207	
TOTAL	324	108	98	37	87	58	2	184	714	

Thirteen of the sheep were killed due to drugs or mechanical damage of darts. Another ewe died in Homer. One ewe and one lamb were successfully released at Kodiak and it is believed the ewe died before reaching the alpine ranges.

Shall we say-----not too successful!

3. Hunting Kill

The sheep hunting season opened August 10 and closed September 20. Each hunter was permitted one ram with a minimum 3/4 curl horn. The Alaska hunter is required to obtain a sheep harvest ticket prior to hunting and return the ticket after the hunt with pertinent data. According to the record 47 rams were taken on the Moose Range. Another 21 were taken in Game Management Unit 7 nearby. In addition one illegal yearling ram and a ewe were shot and left in Marmot Pass near the North Fork of Indian Creek and three juvenile rams were left on Surprise Mountain. The take is nearly identical to last year, but higher than the eleven year average as shown below.

<u>YEAR</u>	<u>SHEEP HARVEST</u>
1957	45
1958	27
1959	22
1960	18
1961	31
1962	31
1963	38
1964	26
1965	36
1966	48
1967	47

Distribution of the sheep kill occurred in the following areas:

Tustumena Glacier to Sheep Creek	5
Green Lake to North Fork	10
North Fork to Killey River	4
Killey River to Skilak Glacier	8
Surprise Mountain	10
Unknown	10

A total of 190 hunters reported they hunted on the Moose Range; therefore approximately 25% were successful. The successful hunters, hunted an average of three days to get their sheep.

Trophy Value. Horn measurements were only obtained from 10 animals this year as shown in Table 12. In addition tag returns required hunters to record horn length measurements. The average length reported was 32 inches.

MOUNTAIN GOAT

The annual goat survey was not completed this year. Two goats were again observed on Surprise Mountain just prior to the sheep season, but apparently moved from the area as they have not been seen since.

Hunting was light. A few were taken in Twin Lakes and Green Lake, primarily by sheep hunters. It is doubtful that the total kill exceeded eight animals.

BEARS

1. Brown Bear

The brown bear population continues to be low. Only eight observations were recorded by Moose Range and Alaska Department of Fish and Game personnel. All were singles.

2. Black Bear

Black bear continue to be fairly numerous. Personnel recorded seeing 35 during the year. These consisted of 17 singles; 1 (♀ 1 yearling), 2 (♀ 2C) 1 (♀ 1C) and 2 (♀ 3C) for a total of 23 adults, 11 cubs, and 1 yearling.

CARIBOU

A number of caribou were sighted throughout the year in various areas. A band of 10 caribou spent last winter in the Moose River Flats. Presently a band of 11 consisting of two bulls, eight cows, and one calf is wintering in the marshy flats about three miles north of the Kenai airport. A single was seen on Emma Mountain in late May and two cows and a calf were observed between the two forks of Indian Creek in July.

TABLE 12

HORN MEASUREMENTS AND ESTIMATED AGES OF SHEEP
TAKEN ON THE KENAI NATIONAL MOOSE RANGE DURING THE 1967 SEASON

RIGHT HORN		LEFT HORN		Curl	Estimated Age
Length	Base Cir.	Length	Base Cir.		
34 $\frac{1}{8}$	14 $\frac{3}{4}$	33 $\frac{1}{2}$	14 $\frac{1}{2}$	7/8	6
33	14	33 $\frac{1}{2}$	14 $\frac{1}{2}$	7/8	6
32 $\frac{1}{4}$	14	32 $\frac{1}{2}$	13 $\frac{3}{4}$		6
32	13	32	13		6
31 $\frac{1}{2}$	13	31 $\frac{1}{4}$	12 $\frac{3}{4}$	7/8	6
31	13	31	13 $\frac{1}{2}$	7/8	6
31	13	31	12 $\frac{1}{2}$		7
30 $\frac{1}{2}$	13	30 $\frac{5}{8}$	13		7
29 $\frac{1}{4}$	12 $\frac{3}{4}$	28 $\frac{1}{2}$	13	3/4	6
23 $\frac{3}{4}$	12	23 $\frac{1}{2}$	11 $\frac{3}{4}$	3/4	5

D. Fur Animals, Predators, Rodents and Other Mammals

1. Coyote. Coyotes continue to be common but no change in the population has been noted for several years.
2. Beaver. The first beaver inventory as outlined in the Wildlife Inventory Plan was conducted on October 20 and 21, 1967. A sample of lakes and most streams were covered. The results of the survey are shown in Table 13.

A total of 26 active lodges and 4 active bank houses were counted in the sample. Plans called for the survey to be conducted every three years to provide trends in population fluctuation. Currently the population appears to be fairly stable and scattered. Much of the 1947 Burn, now producing an abundance of small hardwood near lakes, does not harbor the abundance of beaver that one would suspect.

3. Mink, Otter, Weasel, Lynx. No apparent changes have been noted in these animals.
4. Snowshoe Hare. The hare population continues fairly low.
5. Wolves. George Pollard of Kasilof reported he definitely heard a wolf howl in the Upper Funny River area this fall. No wolf observations were reported this year.
6. Wolverine. No report.
7. Marmots. Most colonies appeared to have good populations. Marmots on Surprise Mountain started emerging from hibernation about May 10.

E. Hawks, Eagles, Owls, Ravens, and Magpies

Only two active bald eagle nests, located on the Killey River were seen this year. A number of formerly occupied nests were checked but not occupied. Osprey again occupied the nest near Weed Lake and successfully reared two young. Several red-tailed and Harlan's hawks were observed but no nests found.

F. Other Birds

The first week in May heralded the arrival of robins, yellow warbler and golden-crowned sparrows. The ruby-crowned kinglet appeared in late April. Large concentrations of tree swallows were present by the 20th of May.

TABLE 13

BEAVER POPULATION STATUS ON SELECTED STREAMS AND LAKES

AS DETERMINED FROM AERIAL SURVEYS CONDUCTED OCTOBER 20 AND 21, 1967

	STREAMS		LAKES	
	Active	Inactive	Active	Inactive
Lodges	18	12	8	15
Feed Piles	10		9	
Bank Houses	2	1	2	1
Dams	10	33	2	2
<hr/>				
Total Active Lodges	26			
Total Active Bank Houses	4			

G. Fish

Fishing continues to be good in most of the lakes on the Moose Range. Ice-fishing is gaining in popularity and snow-machines are used to travel to relatively unfished lakes to try for rainbow trout.

Fishing effort at the Russian River between June 10 and August 15 amounted to 16,469 man-days which was about 1,000 man-days less than last year. The red salmon catch was 12,138 during this period. This continues to be one of the most important fresh water fisheries in Alaska.

Alaska Department of Fish and Game personnel sampled the Shadura Lake complex this summer. Killdeer, Plover and Akula Lakes had fair populations of rainbow and dollies but Shadura Lake was unoccupied by trout. Most of these lakes proved fairly shallow.

The lakes within the Canoe System continued to produce good fishing.

H. Disease

No report.

III. REFUGE DEVELOPMENT

A. Physical Development

The headquarters sustained some alterations during the summer. A portion of the headquarters front lawn with accompanying log work, was removed and replaced with cement curbs, gutters and the road surface was paved by the City of Kenai. Several spruce trees previously transplanted along the headquarters north boundary were removed for a planned street intersection. Following the alterations, driving and parking areas received additional gravel by Moose Range personnel.

The present Kenai municipal airport expansion program necessitated relocating the Bureau tie-down, gas pump and other aircraft support facilities. The new area provides less wind protection but is more favorably located near the active runway.

Remodeling of the bathroom and addition of two cupboards, one cabinet and a range hood-vent over the stove in the kitchen at headquarters residence one (1) was completed. During June, Quarters one (1) and three (3) each received new living room rugs. The furnace and heating duct systems in all residences, and office and shop buildings received a thorough cleaning by a professional furnace cleaning company.

Erosion control work of highway cutbanks in the Jean Lake area resumed in June. Six acres previously graded and sloped were fertilized and seeded. Additional soil and moisture work continued throughout the summer, however, not until late fall did time allow continued dozer work on the largest hillside, twenty-five percent of which was completed the previous year. Dozer work continued into December until the upper ground layers became frozen and unworkable.

Continuation of the moose pen enclosure project, a joint venture of the Alaska Department of Fish and Game and Moose Range personnel, commenced in early June. During the summer additional fence line right-of-ways were cleared of vegetation, some widened and others sloped. Except for a few marsh areas, dozer operations were completed in August and nearly six thousand (6000) posts had been set along the fourteen mile fence line. Browse production studies, continued through December, will permit the planned moose introductions of two pen enclosures during January 1968.

Foot trail construction and maintenance continued throughout the Moose Range. Several portages on the Swan Lake Canoe System were improved by the construction of wooden walkways built over wet trail areas. The lower portion of the Moosehorn Trail was layed out. A trail crew worked two days extending the Funny River Horsetrail into the open tundra area near tree line. All existing trails on the Moose Range received continued maintenance throughout the summer.

During July fifty miles of boundary posting and sign maintenance was completed along the Swanson River Road, Skilak Lake Road, and the Sterling Highway. In October some boundary posting was accomplished in the Caribou Hills.

In past years, many gravel roads throughout the Moose Range have been maintained by Alaska State highway crews. The Swanson River Road, access to the oil fields, is maintained by Standard Oil. Standard has agreed to repair work and general maintenance on the Swan Lake Road, a continuation eastward of the Swanson River Road providing access to the canoe system.

A new loop access road was constructed at Dolly Varden Campground providing an additional nine units near the lake shore. Log work, a fire grate, table and garbage facilities were provided at each unit. A new boat ramp was constructed, and the ramp and entire campground road surface area graveled, resulting in a finished appearance.

Other campground development included the installation of two double-pit seat toilets at Russian River Campground; completion of road and unit construction and surface graveling at Lower Skilak Campground; log work and fire grate installation at Lower Skilak; construction of additional fire grates and partial graveling of the Russian River Campground road system.

Construction of the access road and campground near Tustumena Lake was delayed until August. This work could not commence until the first portion of road situated on private and state lands was made passible; a Tustumena Chamber of Commerce responsibility. Continuation of this work was further delayed when vandals damaged the Bureau's heavy equipment. The primary road was completed during October except for surface graveling and final grading. Layout of the loop campground road, ten camping units, and partial campground road construction was accomplished in November.

Our new Ford pickup truck arrived in late August. Two used five-ton dump trucks were procured as excess property from GSA in Anchorage in November.

In October a portable motorized gravel screener was rented from a local contractor. Approximately 300 yards were passed through the screener daily. A supply of 3/4 minus gravel was stockpiled at two central locations for future use on campground roads and units. The gravel stockpile on Skilak Lake Road amounts to 1200 yards and the stockpile at Finger Lakes, 1000 yards.

B. Plantings

All planting was either accomplished under the Soil and Moisture Project or completed by various oil companies. These plantings are reported under appropriate sections.

C. Collections and Receipts

No plants, seeds or wildlife were collected during the year.

D. Control of Vegetation

One D-8 tractor pulling Fleco-roller choppers was used during the winter months in the 1926 Burn to eradicate spruce and increase the available hardwood browse. Five-hundred acres were treated in this manner.

This rehabilitation work has been carried out over the past five years and 6,500 acres have been treated thus far. Willow and birch have responded well, and dense stands three to four feet high are already providing good moose browse. The area in general is already one of our best early winter moose habitats, and is supporting a large number of moose this fall. In early December approximately 200 moose were using the area.

An additional 1,000 acres remain to be treated in the 1926 Burn. We believe that in a few years much of the 1947 Burn can be treated successfully in the same manner.

E. Planned Burning

No planned burning was accomplished this year. The weather conditions in June were not dry enough to allow us to proceed with an experimental burn within the 1947 Burn. However, permanent vegetation plots were established on the area scheduled for burning.

F. Fires

The Bureau of Land Management again manned the Skilak Fire Guard Station during the summer fire season. Brian F. Weatherford, Fire Control Aid, did an outstanding job both in controlling and reporting fires.

Although the fire danger was never very great four fires did occur.

NAME OF FIRE	Forest Lake	Hidden Lake	Lower Ohmer	Cabin Cove
DATE	August 11	June 14	June 23	August 3
CAUSE	Old Campfire	Old Campfire	Old campfire	Lightning
EST. DAMAGE	None	None	\$16	\$2
ACRES	$\frac{1}{4}$	$\frac{1}{4}$	4	1
MAN HOURS	2	14	119	132
COST OF SUPPRESSION	\$40	\$90.10	\$499.08	\$959.38

All suppression except the Forest Lake fire was by HLM crews under the supervision of Weatherford. The higher cost of suppression of the Cabin Cove fire was caused by heavy spruce fuel and the fact that three smoke jumpers were called in from Anchorage. The Forest Lake fire was suppressed by Refuge Manager Troyer. This fire was on a small desirable camping island and did more aesthetic harm than physical.

IV. RESOURCE MANAGEMENT

A. Fur Harvest

Trapping pressure was low as it has been for several years. Permits were issued to 18 trappers, however only four trappers actively engaged in trapping. They reported taking the following fur animals:

Beaver	10
Mink	26
Weasel	4
Coyote	1
Land Otter	2

An estimated additional 25 coyotes were taken by hunters.

B. Timber Removal

The availability of timber on the Moose Range is a good service to local users. Timber is generally not available from private land at a stumpage rate permitting profitable operation.

Twenty-seven free use permits were issued to local residents to cut timber for their personal use. These permittees cut:

Dead and down fuelwood	150 cords
Dead and down poles and posts	20 cords
Spruce house logs	40 MBF
Spruce cesspool logs	6 MBF

Six special use permits were issued to local timber operators. These permittees removed 209,000 board feet of spruce saw-timber and 400 Christmas trees.

C. Commercial Fishing

No applications for commercial fishing permits were received in 1967.

Freshwater commercial fishing ventures on the Moose Range have not been economically practical; fishing must be done during the winter to avoid taking excessive numbers of rainbow trout and salmon. The market for the lake trout and whitefish is poor.

D. Other Uses

Standard Oil Company of California, under S.U.P. # 32,905 removed

3, 175 yards of gravel at \$.05 per cubic yard for a total of \$158.75.

Marathon Oil Company, under their Plans of Operation to drill the Beaver Creek wells #A1, and # 2, paid for and removed the following amount of gravel at \$.05 per cubic yard.

DATE	CUBIC YDS.		AMT.
1/11/67	17,521	\$	876.05
7/31/67	31,040		1,552.50
7/31/67	4,930		246.50
TOTAL	52,591		2,675.05

The following commercial tent camp-site permits were issued.

DATE	PERMITTEE	PERMIT #	TENTS	AMT.
6/1/67	Alaska Air Guides	KN 16-67	4	\$ 40.00
6/7/67	Alaska Bush Carriers	KN 18-67	6	60.00
7/10/67	Jim's Flying Service	KN 19-67	4	40.00
8/7/67	Marshall Farmer	KN 20-67	2	20.00
9/25/67	Jim's Flying Service	KN 25-67	1	10.00
TOTAL			17	\$ 170.00

A special use permit KN 33-67 was issued to Kenneth Olson on January 18, 1967 for \$100.00 to operate the ferry on the Kenai River near the Sportsman's Lodge.

E. Oil Operations

Production

During 1967 the Swanson River oil field produced 13,051,420 barrels of oil and 16,000,000 MCF of gas.

Cumulative production of the field is now 74,951,420 barrels of oil and 43,000,000 MCF of gas.

At the years' end the field contained 35 oil wells and 15 gas injection wells.

Exploration

Drilling. Four wells were drilled on the Moose Range during this period. Texaco drilled one and is in the process of drilling another near Point Possession. Marathon drilled two wells near Beaver Lake.

On February 11, the Marathon Beaver Lake # 1 well suffered a gas blowout. The gas blowout occurred as follows:

During normal drilling operations a pump draws drilling mud from an open tank and injects it down the drill stock at 1500 pounds per square inch pressure. The mud leaves the drill stock from the orifice in the drill head at the bottom of the stock and returns to the surface through the annulus carrying cuttings to the shale shaker, then flows into the mud tank.

The first indication of trouble below occurred at the 9070' level when the mud tank began filling; obviously the quantity of mud in the drill stock and annulus was decreasing.

A person whose duty it is to maintain surveillance of the mud-tank level gave the alarm and the line from the annulus was diverted from the shale shaker to the drill stock, drilling was stopped and both blowout preventors were closed, thereby stopping circulation, pressurizing the system, and permitting an increase in mud volume down the hole.

At that time they were using 13.9 pounds per gallon mud; the normal weight for Kenai operations is 10.8 pounds per gallon.

They soon had all hands breaking mud bags and adding mud to the mix.

When back pressure in the annulus reached 600 p.s.i., they decided to inject what mud they had mixed --600 barrels. While this was being injected, gas and mud began appearing in the cellar--indicating a gas escape between the formation and the casing cement, although the casing was cemented to the 2,000' level.

At this development some of the crew left the pad; the boilers, drilling diesels and other equipment were shut off; only the mud injection pump and light plant remained running.

Gas began collecting in the top of the annulus and was periodically bled off through the first pressure reliever. The pressure relievers are high pressure fittings below the first blowout preventer.

When a fitting on the first pressure reliever exploded all of the mud within the annulus was ejected through the 2 $\frac{1}{2}$ " pipe on the pressure reliever in a very short time. It was this event that prompted the complete evacuation of the pad.

Later the other pressure reliever blew off and dry gas mixed with pulverized sand ejected from both openings at a pressure in excess of 6,000 pounds p.s.i.

The well blew out of control for 11 days and was finally sealed off by natural bridging. During the blowout, high velocity gas eroded the well walls and produced a large volume of sand and silt material. This material accumulated to a depth of 20 feet at the pad site and in the forest within $3/4$ mile of the well formation material accumulated to several inches in thickness. A $1/4$ inch fall of this material accumulated on Beaver Creek, which was frozen at the time. Most of this material was carried downstream by overflow water. Salmon and trout spawning beds did not appear to be damaged; however final checks of the possible damage of this has not been completed.

If the blowout had been wet gas or oil the effects would have been much more serious.

Cleanup of formation material and the well pad has been partially completed by Marathon Oil Company at a cost of \$48,000.

The Marathon Company constructed another well pad (Beaver Creek #1A) approximately 1 mile from the blowing well and began slant drilling operations intending to intersect the blowing well and seal it with cement. When the blowing well bridged and was successfully shut in from the surface, the slant drilling at site # 1A was suspended and vertical drilling commenced. A commercial quantity of gas was discovered there.

In June a development well (Beaver Creek # 2) was begun on the east side of Beaver Creek. This well also developed commercial quantities of gas. These three well pads required the construction of 8 miles of road, two gravel pits and two log-bridges on the Moose Range. The access to this road is near the town of Kenai. These increasing number of access routes continues to complicate management of this area.

The Texaco Oil Company constructed a 25-mile winter road (ten miles in the Moose Range) to an exploratory well site near Lark Lake. Drilling complications resulted in operations extending into early summer requiring their construction of a 4300 x 200 airstrip to provide access for supplies and heavy blow out and well-fire equipment. The well drilled at this site proved unproductive. The company is currently drilling another exploratory well $2\frac{1}{2}$ miles southeast of the above site.

Seismographic

Presently the following oil companies are involved with seismographic activities on the Moose Range.

COMPANY	MILES OF LINE	ENERGY SOURCE
Sunray DX	24	explosives
Phillips	38	explosives
Texaco	18	explosives
Standard	182	explosives
Continental	70	Vibroseis (T.M.)

Much of the seismic program is centered in some of our highly important recreational and future recreational use areas. The conflict grows as intensified data collection requires requests for longer, straighter seismographic trails, shooting closer to streams, and using closely paralleling lines, and other conflicting seismographic programs.

To counteract these problems and alleviate the amount of damage occurring, we are restricting companies to existing seismographic trails in certain areas. In the canoe system they must cut new trails by hand and manually transport geophones to diminish the aesthetically damaging effects of exploration.

There appears to be no end in sight and soon or later exploration will have to be completely restricted in these highly recreational use areas.

V. FIELD INVESTIGATIONS

A. Progress Report

1. Vegetative Studies - Moose Pen

Fenced enclosures number one and two, each one-mile square, were completed this fall after freeze-up when the swamp crossings were made. Plans are to stock the pens with ten moose each in January 1968. These two populations will then be allowed to increase naturally. Until now the gates have been left open and moose have moved rather freely in and out of the pens. On several occasions when counts were made the number of moose in each pen varied from five to twenty-five.

The pens are located south of the oil drilling pad on the east end of the Swan Lake Road. They are located in hardwood-spruce types, most of which burned in 1947. The hardwoods now consist primarily of regrowth birch. Presently birch stands vary in height from a few feet to 12 feet or more and most of the area is considered good winter moose range. Spruce reproduction up to 12 feet in height varies from pure dense stands to scattered trees within the hardwoods. Stands of mature timber (mostly birch and aspen with some spruce), which survived the burn, are also present. These stands contain a small amount of birch, aspen and willow reproduction. There are also small ponds, muskegs, and lakes with associated communities of sedges, aquatics and grasses within each pen.

Permanent Successional Study Plots

Permanent successional study plots were established in each vegetational type that supports a winter food source for moose. These plots were established to measure changes in the plant communities and to obtain an array of internal stand variations within and between each major type.

Cover or percentage of the total area covered by the aerial parts of plants of a species and density or number of plants per unit area were the two measurements taken. Cover was recorded for each plant species and for rocks, soil and dead material. Density was recorded for spruce, birch, aspen, and willow.

After considerable experimentation in the different types, the sampling method which finally evolved is a modification of the method

developed by Daubenmire¹. The microplots (illustrated by Figure 2) were used to measure the cover values of all species of plants, rocks, soil and dead material, and to measure the density of willows, and spruce, birch, and aspen reproduction. These were placed within macroplots (illustrated by Figure 3) which are used to measure other stand characteristics such as number of mature trees of each species.

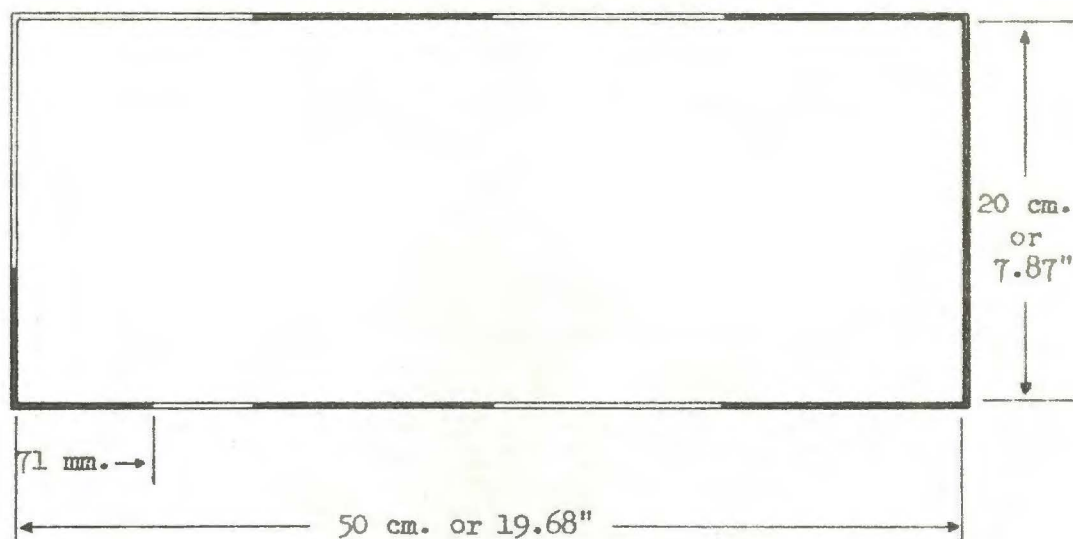
This method facilitates the use of the same size plot in all types and all stages of succession. The microplot frame, 20 x 50 centimeters (7.87" x 19.68") is painted in a manner which provides fast, accurate reading of the percentage cover categories. While experimenting with the method it was determined that fifty microplots would provide data with consistent reliability. This figure was doubled to one hundred in order to insure getting reliable data from areas which may have more variation than those used for the original design. The plots are placed at two foot intervals along a tape stretched between permanent iron stakes. If care is used in stretching the tape straight each time the plots are read, the exact location will be used each time. It is believed that cover changes of less than five percent can be detected in this manner. The macroplots are 66 x 99 feet (3/20 acre). They were designed to provide consistently reliable results in measuring the density of mature trees. As time goes on it will become necessary to take density measurements on the macroplots of plants which are presently classed as reproduction and measured on the microplots.

The plots were located subjectively after a reconnaissance of the stands was made. Five macroplots were established in each type (seven types in Pen 1 and eight in Pen 2). It would be desirable to have a larger number and have them randomly placed but a suitable type map was not available for selection of random location, and due to an excess of precipitation the field season was short. One reference plot was established in each type inside exclosures and also one in each of the same types outside the pens. The former reference plots are protected from all moose activity and the latter are subjected to "normal" moose activity in the area. They will be useful for future comparisons with the plots subjected to the moose populations in the pens.

Plans are to re-read these plots when a visibly significant change has occurred in the vegetation or every five years, whichever occurs first.

¹ Daubenmire, R., 1959. A Canopy-Coverage Method of Vegetational Analysis. Northwest Science, Vol. 33, No. 1, Pages 43-64.

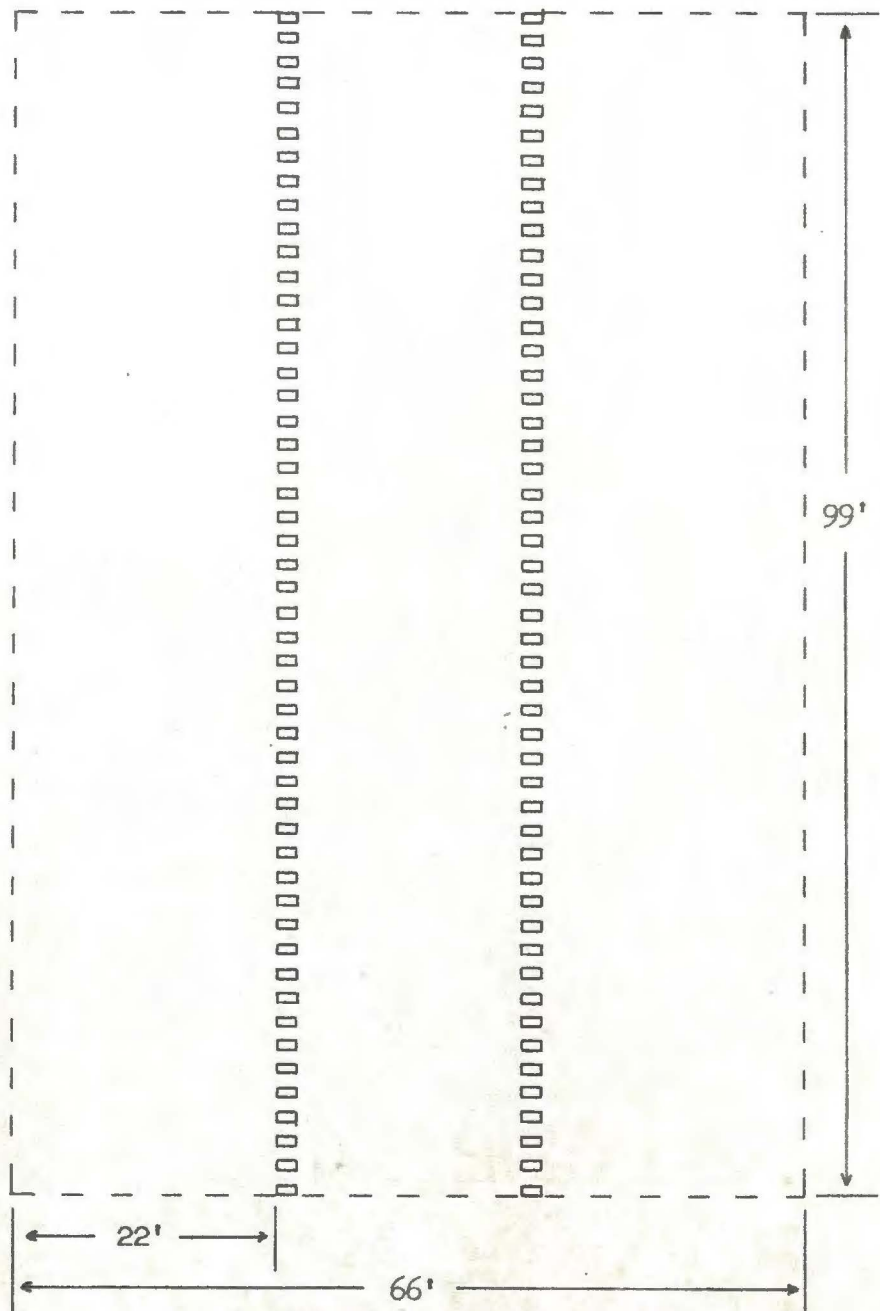
FIGURE 2



A diagram of the microplot frame used in estimating canopy coverage. The frame is made of 3/16" steel rod. It is painted so as to divide it into quarters cross-wise and in one corner two sides of an area 71 mm. square are painted. These serve as reference areas equal to 5, 25, 50, 75 and 95 percent of the frame. For ease of recording the categories or classes are assigned one digit values. The midpoint of the percentage range is used for calculations. These are as follows:

CLASS	PERCENT COVER	
	RANGE	MIDPOINT
1	0-5	2.5
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

FIGURE 3



A diagram of a macroplot showing the location of the microplots. The four corners of the macroplot and the ends of the microplot lines are permanently marked with $\frac{1}{2}$ " x 33" iron reinforcing rod stakes driven halfway into the ground.

We were fortunate to have John Crow spend a couple of days with us on the project. Mr. Crow was employed by the Alaska Department of Fish and Game and is working toward his PhD. under Dr. R. Daubenmire. He was experienced with Daubenmire's technique and made a major contribution toward modifying it for our use.

Available Browse and Annual Growth

The objectives of this portion of the study are to determine the amount of winter browse available at the beginning of the study; the utilization of winter browse by a known moose population; and the annual production of winter browse.

It has been observed that moose when hard pressed for food will eat woody portions of plants down to one half inch in diameter. Therefore in order to determine total available browse all the stems and branches one half inch in diameter and smaller were removed from the plants in the sample and weighed. The linear annual growth was then removed from this and weighed. Annual growth as it is measured does not include diameter growth on older portions of the plants.

In order to determine utilization or moose consumption of winter browse the same measurements will again be taken in the spring. The difference between the fall and spring measurements will be utilization.

In the literature there are many examples of browse sampling methods. For the most part they involve clipping or estimating, or a combination of both. In this project clipping would be very expensive, time consuming, and destructive to the habitat, and estimating or a combination of clipping and estimating seems to be open to serious question, especially in a long term study such as this one where there will no doubt be changes in personnel.

The method we developed was to categorize stems by diameter and height; obtain the weight of available browse and annual growth from randomly selected stems in each category and; randomly sample the different types in order to determine how many stems there were in each category.

Stem diameters were measured in quarter inch increments ($0 - \frac{1}{4} = \frac{1}{4}$, $\frac{1}{4} - \frac{1}{2} = \frac{1}{2}$, etc.) at one foot above ground, and heights were measured in increments of one foot ($1-2' = 2'$, $2-3' = 3'$, etc.). Stems shorter than one foot were not sampled. Examples of the categories are: $2' \times \frac{1}{4}"$, $3' \times \frac{1}{4}"$, $2 \times \frac{1}{2}"$, $3' \times \frac{1}{2}"$, $4' \times \frac{1}{2}"$, $3' \times \frac{3}{4}"$, etc.

In five randomly located points in each type the available browse was clipped and weighed from three stems in each category. After the available browse was weighed the annual growth was clipped from it and weighed. This provides us with weights for each category of stem for available browse and for annual growth. These sample can then be analyzed statistically and the mean and standard error of the mean for each category can be determined.

Thirty permanent plots eight feet by twenty-four (192 sq. feet or $1/227$ acre) were randomly located in each of the seven browse types in each of the two pens. On these plots every stem of each browse species was dot and dash tallied in its specific category on a form. The mean weight for a specific category when multiplied times the number of stems in that category on a plot will give the weight for that category on the plot. The total weight for all categories on the plot will then be the total weight for the plot. The average pounds per acre for each type will be determined from this.

The use of $1/227$ acre plots is directly related to the conversion of grams per plot to pounds per acre. The weight in grams on a plot $1/453.7$ acre (453.7 grams per pound) equals pounds per acre. We had to double the plot size in order to avoid zero's in sampling and the resultant havoc with the statistical analysis.

At this writing we only have averages for the data taken in Pen #2 and type acreage for Pen # 1. Table 14 is provided in order to present a general idea of the amount of browse involved. Annual growth accounts for about eight percent of the weights given.

Based upon these estimates (1,066,000 lbs. of browse in Pen # 1) and assuming that moose will eat an average of 40 to 50 lbs. per day and feed on woody portions of plants for 200 days a year (mid October thru April) it would take over 100 moose to completely remove the available browse in one pen. The pens will be stocked with ten moose (two cows with single calves, 5 single cows, 1 bull). These moose will probably only remove the equivalent in weight of the past years annual growth (85,000 lbs.)

2. Dall Sheep Study

The portion of the Dall sheep study concerned with lamb survival was concluded this fall. However a completion report has not yet been received from Biological Aid Pitzman. A summary of some of his findings follow:

TABLE 14

ROUGH ESTIMATE OF AVAILABLE BROWSE IN POUNDS PER ACRE - PEN # 2

TYPE	Birch	Aspen	Willow	Viburnum	Dwarfbirch	Alder	Total
Birch dense	4810	8	83	3			4904
Birch medium	2552	13	72				2637
Birch thin	2225	24	28			25	2302
Spruce birch	1087	7	15	2			1111
Spruce	296	8	17		215		536
Mature Hdwd dense	23	21		5			49
Mature Hdwd thin	193	22	2	8			225

ROUGH ESTIMATE OF AVAILABLE BROWSE IN PEN # 1

Type	Acres	Birch	Aspen	Willow	Viburnum	Dwarfbirch	Alder	Total
Birch dense	113	542,712	904	9,379	339			553,334
Birch medium	95	241,828	285	6,840				248,953
Birch thin	69	154,526	1,656	1,932			1,725	159,839
Spruce birch	40	43,132	280	600	80			44,092
Spruce	89	26,477	712	1,513		19,135		47,837
Mature Hdwd dense	52	1,197	1,092		260			2,549
Mature Hdwd thin	46	8,891	1,012	92	368			10,363
Mature Spruce	2							
Spruce ledum	16							
Grass	9							
Sedge	28							
Water	35							
Total	594	1,018,763	5,941	20,356	1,047	19,135	1,725	1,066,967

The aerial population survey conducted by Refuge Manager Troyer and Pitzman resulted in a count of 222 as reported earlier. This compares to 237 counted last year and shows the first drop in population numbers for several years. Only 31 lambs were seen compared to 53 last year, also indicating a reduced population. Grount counts revealed a minimum of 39 lambs were born this spring and at least 44 yearlings were in the population at this time.

Lambing was first observed on May 25 and the peak parturition period appears to be the first week in June. Most of the lambs were born below the Skilak Cliffs where ewes selected rocky, well protected cliffs for parturition purposes.

A total of 10 legal rams were harvested during the hunting season. Additional mortality consisted of 3 illegal juvenile rams killed by hunters, two adult ewes that died of natural causes, one unidentified sheep, a ewe and one lamb apparently died during the previous winter.

Winter range use was different than in past years. During the early winter period sheep utilized the slopes of Russian Mountain, but most of the latter portion of the winter they fed below the Skilak Cliffs, an important spring range.

3. Dall Sheep Range Studies

In the winter Dall sheep feed on wind swept slopes where most of the snow is blown away and the vegetation is left exposed. Upon examination it is difficult to understand how sheep can survive on the sparce vegetation.

The sheep population on the Moose Range has increased from about 150 animals in 1949 to over 1000 at the present time. The necessity of determining the effect of this population on its winter range is obvious. Surprise Mountain was selected as a key area in conducting range investigations because it is fairly accessible, and the population is an isolated one and can be censused accurately.

Nine vegetation transects were established and read on August 1th. The areas were located and marked during the previous winter. Each transect consists of fifty microplots (20 x 50 cm. in size) (See Figure 2) spaced at two foot intervals along a one hundred foot tape stretched straight between two permanent iron stakes. The percent cover of each plant species, rocks, exposed soil, and dead material was recorded. The plots will measure any successional

changes which may occur when remeasured periodically at several year intervals.

There is a possibility that these cover values could quite easily be related to pounds of browse in this particular type of vegetation. This study should be expanded to other parts of the sheep winter range.

VI. PUBLIC RELATIONS

A. Recreational Use

The anticipated increase in recreational use on the Kenai National Moose Range during Alaska's Centennial Year celebration failed to materialize.

Alaska's first hundredth anniversary, since its purchase from Russia in 1867, drew fewer out-of-state visitors than that predicted by the most conservative estimates. A visitor increase of only 5 percent over the preceeding year was recorded. This is a noticable reduction from the substantial yearly increases recorded since the Good Friday Earthquake of 1964. Records indicate the total number of visitors during 1967 reached 219,000 compared to the 208,000 visitors recorded in 1966 (Figure 4).

Traffic road counters strategically placed throughout the Moose Range road system were utilized for the third year. Accurate counts were recorded of all vehicles entering and departing major recreational areas. Aerial surveys and direct public contacts supplemented road counter tallies to provide thorough coverage of Moose Range recreational activity. Public contacts during the camping season disclosed an average of four passengers per vehicle, a decrease from the 4.25 occupant per vehicle reported in 1966.

Short daylight hours during January and February limited recreational activities. Skiing, both downhill and cross-country was active in the area. Several hundred skiers again utilized the ski-tow facilities at Soldotna Hill primarily during weekends and Wednesday evenings. Snow machine ownership in this area has more than doubled during the past year. A greater number of enthusiasts have been observed driving their snow vehicles to more distant rendezvous throughout much of the Moose Range.

Weekend ice-fishing activities at Hidden Lake and numerous smaller lakes increased noticably as additional daylight hours became available. Some aircraft were used to reach distant lakes not accessible by road.

A heavy snow occurred on April 14 followed by many perfect days of sunshine. During this exceptionally fine early spring period -- recreationists visited the area in great numbers, enjoying the clear sunny days even though freezing temperatures occurred overnight.

The sizable Memorial Day weekend crowds converged on the refuge just as the spring cleanup of campgrounds, hiking trails and canoe route portages was accomplished. Crowded conditions once again prevailed in many recreational areas, particularly campgrounds and nearly one

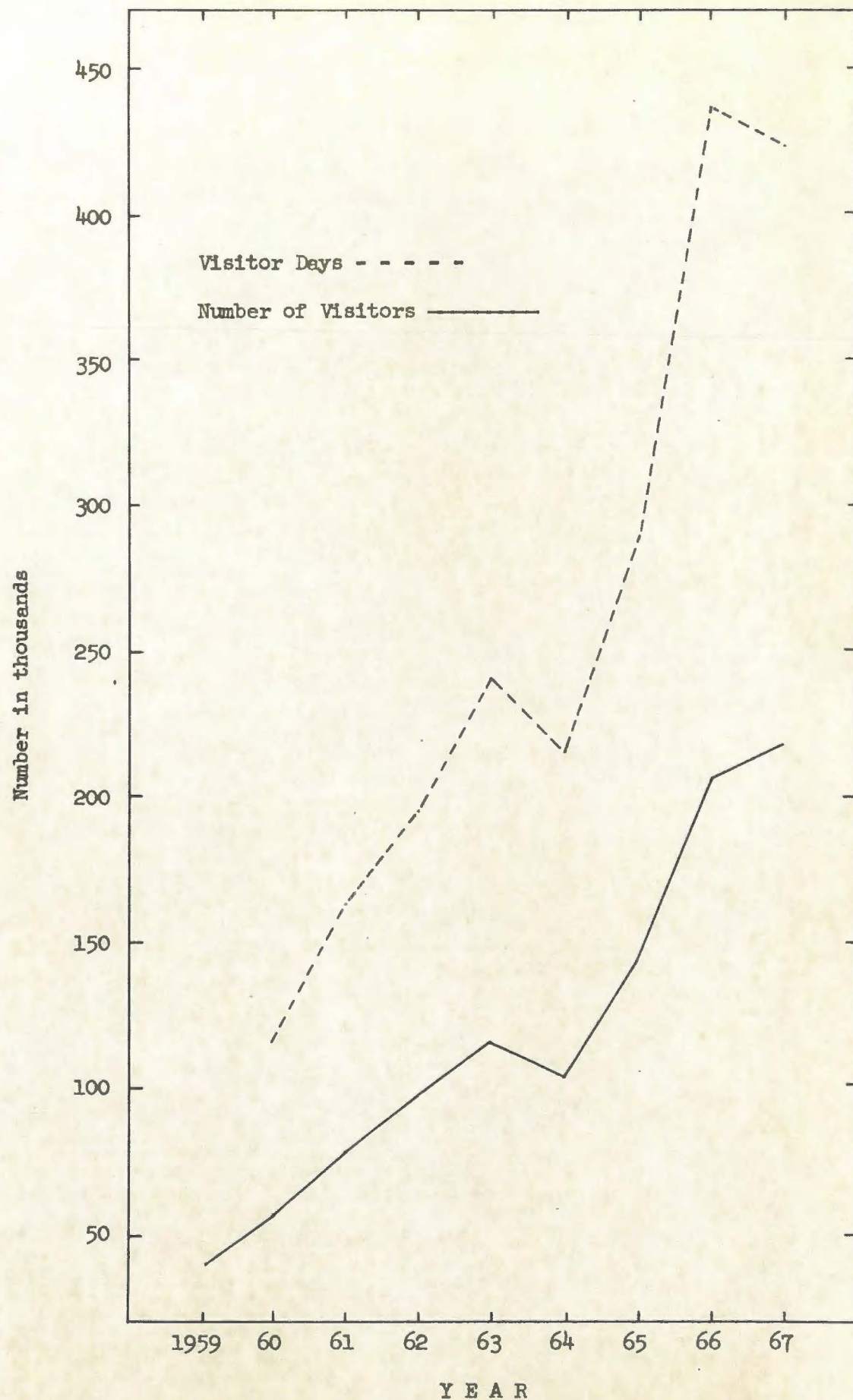


Fig. 4 . Visitor use on the Kenai National Moose Range.

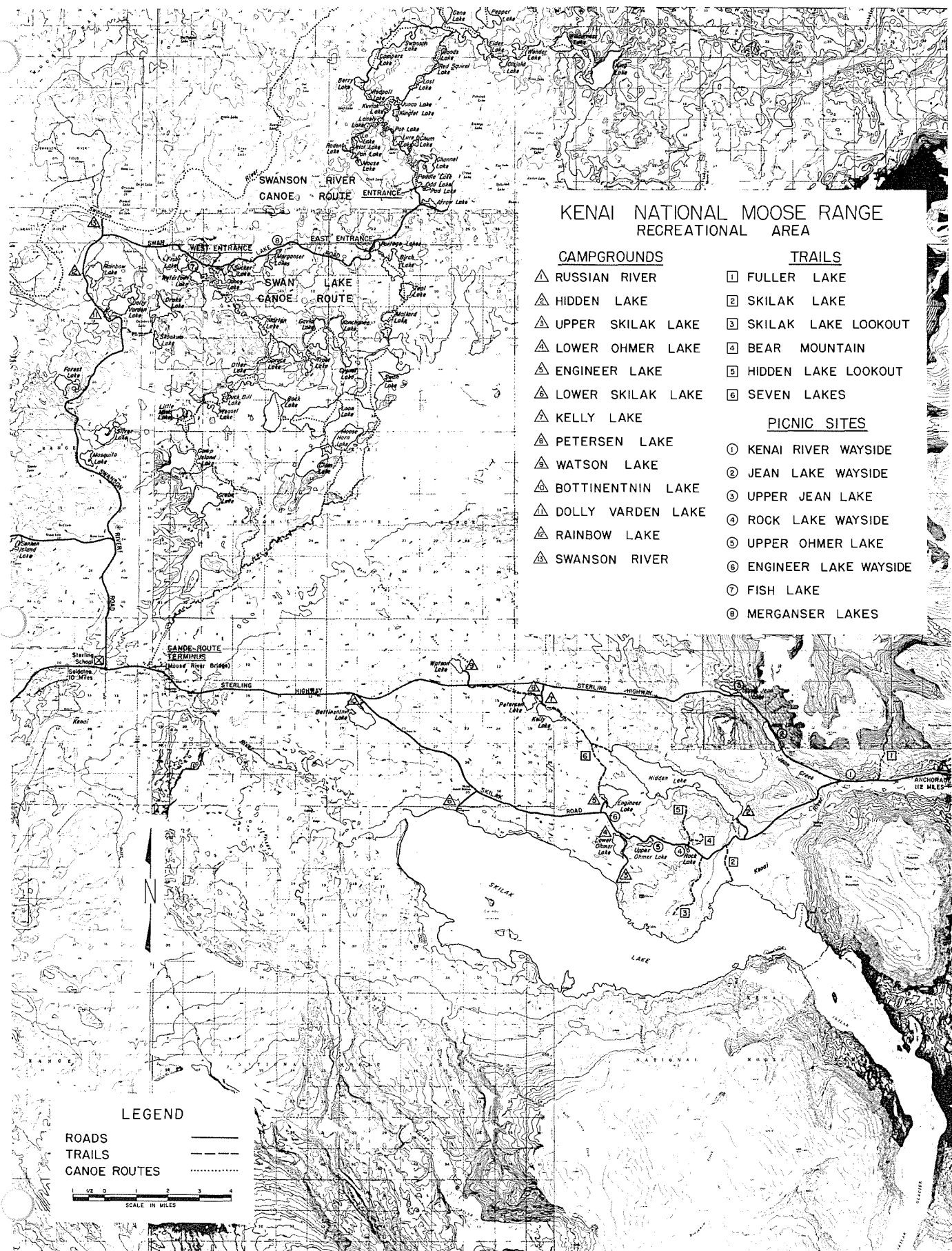


Figure 5. Kenai National Moose Range recreational areas

hundred canoeists visited the canoe system.

Once again, Russian River and Hidden Lake Campgrounds received the greatest visitor use, especially during holidays and red salmon runs. Both campgrounds were selected "designated areas" under the Land and Water Conservation Fund Act and Golden Eagle Passports were required. The majority of visitors possessed valid passports, resulting in fewer than 600 passport sales. Collected fees totaled \$376 and the cost for administering sales was \$350.

A marked increase at Russian River campground was recorded for June, July, August and September. Traffic counters indicated an increase of 35 vehicles daily above the 1966 visitation records. This 50 unit campground was saturated with an average of 336 visitors a day during the four month summer period, compared to 208 daily visitors in 1966. During peak periods 222 to 252 family camping units were recorded compared to a maximum of 190 last year.

The Russian River campground visitor use parallels the red salmon runs which usually occurs in early June through July. Several hundred fishermen could be observed along the river at various times during the day.

Although red salmon fishing pressure increased sharply, the runs peaked and passed through the area quickly. One thousand fewer salmon fishermen visited the river but fishing pressure adjacent to the campground for trout and available salmon was noticeably heavy.

Immediately following the red salmon runs, campground use at Russian River and other areas dwindled and remained poor to fair for the remainder of the season. This was partly due to an extensive period of rain which began in July and continued until September 21. The precipitation not only reduced public visitation but flooded the Russian River campground on two occasions.

The 150-mile canoe system which connects more than 70 lakes and streams, continued in popularity. More than 1500 canoeists visited the area this season, a 38 percent increase over 1966. Expansion of the Swanson River canoe route during 1966, to accommodate the many additional canoeing enthusiasts, aided in relieving the pressure on the Swan Lake route. In the past, heavy sustained use on the latter route, especially on the first few lakes and portage areas, required constant maintenance.

Registration boxes, located at each of the three entrances to the system, continued to provide valuable information concerning the length of stay, proposed route, names, addresses and remarks of canoeists. Records indicate 75 percent of the visitors use the

Swan Lake route, the balance of visitors, the Swanson River route. Surveys indicate fewer canoe route visitors are signing the registration books. Many canoeists re-visiting the area are familiar with the routes concerned and fail to check the registration box for maps and other material.

The popular canoeing months were June, July and August. July and August, however received the greater visitation. The average length of stay totaled sixty-hours for each canoeing group. This is eight fewer hours per group than that recorded during 1966. More visitor hours per group were spent on the Swanson River route than the Swan Lake route. Larger lakes, longer portages and a single entrance to the Swanson River route may account for this variance.

Access trails to fishing lakes adjacent to Swanson River and Swan Lake roads received moderate use since their construction during 1966. Fair to good fishing was provided for those willing to walk a short distance. These trails, as well as those of the canoe system, are used by hikers and snow machines during winter months to reach favorite ice fishing locations.

Completion of the Funny River Horsetrail inspired some riders to travel into the area during the hunting season. Horses were utilized to reach game and when successful, pack the meat out.

Wildberry picking, especially lowbush cranberries, was exceptionally good this season. Numerous pickers were observed along their favorite berry patches.

Temperatures continued mild until November 24, when cold winter weather arrived. As a result, ice skating was limited following lake freeze-up. Heavy snows fell on December 9 and 10, and again on December 15, curtailing many skating enthusiasts but downhill and cross-country skiing resumed in full vigor! Snow cover conditions severely limited snow traveler use on the Range during the month of December.

B. Refuge Visitors

<u>Name & Title</u>	<u>Organization</u>	<u>Purpose</u>	<u>Date</u>
Claude H. Brown, Dist. Landman	Texaco, Inc. Anchorage, Alaska	Business	1/13
Ray Morris	Alaska Water Lab. Anchorage, Alaska	Business	1/23

Name & Title	Organization	Purpose	Date
Bob Kalliveit	Pan Am. Pet. Corp. Denver, Colorado	Business	2/10
Al Mechler	Dir. of Operations Marathon Oil Co. Anchorage, Alaska	Business	2/21
M. S. Gann	Phillips Petro. Co. Denver, Colorado	Business	3/15
M.L. Collins	Phillips Petr. Co. Bartlesville, Okla.	Business	3/15
John H. Brownlow	Sun Ray Oil Co. Spokane, Wash.	Visit	3/16
Harold E. Hanson	Ill. Natural Hist. Soc. Urbane, Illinois	Business	5/19
Bailey O. Breedlove	National Park Service Anchorage, Alaska	Business	5/24
A.L. Misseldine	Assoc. Supvr., M&E, BSFW Portland, Oregon	Business	6/5
Robert A. Rausch	ADF&G, Fairbanks, Ak.	Business	6/5
Art Bratlie	ADF&G, Anchorage, Ak.	Business	6/5
B.L. Walters, Jr.	Marathon Oil Co. Los Angeles, Calif.	Business	6/9
Margaret E. Murie	The Wilderness Society Moose, Wyoming	Business	6/16
Mildred S. Capron	Photographer Laramie, Wyoming	Business	6/16
E.K. Day	Director, Alaska Water Lab, College, Ak.	Business	6/20
George M. Davidson	State Dept. Health, Welfare, Juneau, Ak.	Business	6/20
Carl T. Nadler	Alaska Water Lab.	Business	6/20
Ken Bylaine	FWPCA, Washington, D.C.	Business	6/20
Earl Kari	FWPCA, Portland, Ore.	Business	6/20
R. F. Poston	FWPCA, Portland, Ore.	Business	6/20
Thomas J. Hurd	Homer Electric Assn. Soldotna, Alaska	Business	6/22
Thomas E. Kelly	Halbouty Alaska Oil Houston, Texas	Business	6/23
Sig Olson	USFS, Juneau, Ak.	Business	7/6
John C. Crupper	Forest Supvr., USFS Anchorage, Alaska	Business	7/6
Walter O. Hanson	USFS, Washington, D.C.	Business	7/6
John Galea	USFS, Seward, Alaska	Business	7/6
William Graf	San Jose State College San Jose, Calif	Visit	7/10

Name & Title	Organization	Purpose	Date
Robert J. Gordon	Phillips Petr. Co. Bartlesville, Okla.	Business	7/12
Frank Pendergast	Phillips Petr. Co. Denver, Colorado	Business	7/12
John S. Gottschalk	Director, BSFW Washington, D.C.	Business	7/20
Bruce McAllister	Photographer FRIENDS magazine	Business	7/25
Stan Olson	BOR, Seattle, Wn.	Business	7/31
Bill Boesch	Office of Sen. Bartlett Washington, D.C.	Business	7/31
John D. Mason	District Judge Kodiak, Alaska	Visit	8/1
Vernon Ekedahl	BSFW, Portland, Oregon Refuge Supervisor	Business	8/3
David B. Marshall	BSFW, Portland, Oregon	Business	8/3
Bill Lindsey	BSFW, Portland, Oregon	Business	8/3
Richard D. Munding	BSFW, Portland, Oregon	Business	8/3
Raymond Bandar	Calif. Academy of Sci. San Francisco, Calif.	Business	8/3
Tom Wardleigh	FAA, Anchorage, Alaska	Business	8/9
Fred Dean	Alaska Co-op Research College, Alaska	Visit	8/11
Edgar Wayburn	President, Sierra Club	Business	8/12
William J.L. Sladen	John Hopkins Univ. Baltimore, Maryland	Business	8/14
M.M. Nelson	USFS, Washington, D.C.	Business	8/15
H.E. Howard	USFS, Washington, D.C.	Business	8/15
W.H. Johnson	USFS, Juneau, Alaska	Business	8/15
George F. Roskie	USFS, Juneau, Alaska	Business	8/15
John C. Crupper	USFS, Anchorage, Ak.	Business	8/15
Dick Hurd	USFS, Juneau, Ak.	Business	8/15
John Galea	USFS, Seward, Ak.	Business	8/15
Charles Hillinger	Los Angeles Times Los Angeles, Calif.	Visit	8/21
J.B. VandenAkker	BSFW, Portland, Ore.	Business	8/31
L.R. Jacoby	BSFW, Portland, Ore.	Business	8/31
R.A. Rausch	ADF&G, Fairbanks, Ak.	Business	9/19
L.C. Post	Standard Oil Anchorage, Ak.	Business	10/4
E.K. Day	Director, Alaska Water Lab., College	Business	11/7
M.A. Monson	Reg. Fish & Wildl. Adm. BCF, Juneau, Alaska	Business	11/7
Ben F. Giles	Geophysical Serv. Inc. Dallas, Texas	Business	

Name & Title	Organization	Purpose	Date
W. Paul	Texaco, Inc. Huntington Beach, Calif.	Business	12/8
C.H. Brown	Texaco, Inc. Anchorage, Ak.	Business	12/8
R.M. (Bob) Allyn	Phillips Petro. Co. Denver, Colorado	Business	12/12

C. Refuge Participation

Assistant Refuge Manager Richey presented the film BALD EAGLE at the Alaska Conservation Society meeting in Soldotna, January 14. He also showed this film to 160 military personnel at Sparrevohn, Alaska, remote site.

Assistant Refuge Manager Richey presented the movies ARCTIC NATIONAL WILDLIFE RANGE and BALD EAGLE to 200 adults and children at the Seldovia Science Fair.

Refuge Manager Troyer gave an after dinner speech and slide talk on moose management at the North American Moose Workshop in Edmonton, Alberta, March 18.

Assistant Refuge Manager Richey gave a slide talk on the canoe system and presented the movies ARCTIC WILDLIFE RANGE and THIS IS THE MALLARD to the Kenai Peninsula Sportsmen Association with about 200 in attendance.

Assistant Refuge Manager Richey spent the week of May 15, in Anchorage preparing an Alaska Refuge display. This display, along with other participants displays, was placed in one of several railroad cars and will travel the Alaska railroad from Fairbanks during this Centennial year for presentation to tourists enroute.

Assistant Refuge Manager Seemel discussed recreational facilities, plants, and animals of the Kenai National Moose Range at a Tourist Host School in Kenai, June 22.

Assistant Refuge Manager Richey and Trainee Anderson represented the Moose Range at a meeting of the Provisional Council to Stimulate and Continue Orderly Development of Outdoor Recreation Resources on the Kenai Peninsula on June 17, at Soldotna, Alaska. Sixty persons representing five federal agencies, four state agencies and other organizations attended.

The first of a series of picture articles on KNOW YOUR ALASKAN WILDLIFE REFUGES appeared in the May issue of Alaska Sportsman. The Kenai article carries 16 photos of the Moose Range. Refuge Manager Troyer also contributed photographs on the Kodiak Refuge to the magazine, and Assistant Refuge Manager Thayer submitted an article on the Arctic Wildlife Range.

Assistant Refuge Manager Thayer lead an Alaska Conservation Society hike into the Twin Lake area on July 1-4. Assistant Refuge Manager Richey led a similar hike to Juneau Lake in the Chugach National Forest the weekend of July 15-16.

Refuge Manager Troyer on July 29-30, led an Alaska Conservation Society sponsored hike up Surprise Mountain. Twelve people participated.

Refuge Manager Troyer attended the Seward Game Advisory Board Meeting on October 11. He also met with the President of the Kenai Advisory Board to discuss the implication of the cow season.

D. Hunting

BIGGAME

<u>Species</u>	<u>Season</u>	<u>Limit</u>
Moose (bulls)	August 20-September 30	1
Moose (antlerless)	November 20 (permit by lottery)	1

The antlerless season was cancelled by public demand

Caribou	No open season	
Mt. Goat	August 10-December 31	2
Mt. Sheep	August 10-September 20	1 3/4 curl ram
Brown Bear	September 1-September 30	1
Black Bear	August 10-June 30	3

UPLAND GAME

Grouse	August 20-March 15	15 ^d and 30 ^p
Ptarmigan	August 10-April 30	20 ^d and 40 ^p
Hare & rabbit	No closed season	No limit

WATERFOWL

Game Duck, geese, brant, etc.	September 1-December 14	Federal
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Public hunting for biggame begins in late March with hunters out after black bear. Black bear hunting is intensified again in October although these bears are taken throughout the biggame hunting season.

Sheep and goat hunting pressure sustained the usual annual increase. No increase in sheep kill occurred, however.

The moose hunting season was judged a failure by many hunters; weather was poor and moose scarce. During the November 1-20 season mild weather delayed the descent of moose from the highlands and precluded the use of ski planes on lakes and meadows resulting in an unusually low moose kill for this season.

A permit controlled cow moose season scheduled in November was cancelled by the State Department of Fish and Game at the demand of game protective associations and the public.

E. Violations

Shortly after the close of the moose season five (5) moose were poached at widely distributed points on the Moose Range and two were taken illegally a short distance outside the Moose Range. This poaching is attributed to poor hunter success during the past season, increased public lack of faith in State and Federal hunting regulations, a rapid increase in the local human population, and a lack of adequate game law enforcement.

The use of snow-travellers for hunting biggame is not permitted; this restriction is supported by all but a small number of snow-traveller users. A lack of snow in the lowlands eliminated trespass problems there, but in the Caribou Hills intensive boundary hunting by snow-traveller, weasel, thiakol, caterpillar, and other snow travelling machinery occurred. Ice-fog and clouds interfered with aerial patrols of this area. Two incidences of trespass with snow machines occurred but no moose were taken by the hunters as they were observed from the aircraft while a short distance inside the boundary.

Adequate boundary marking is needed to cope with trespass enforcement; more than 5000 snow-travellers are known to be in Anchorage and several thousand more are on the Kenai Peninsula.

F. Safety

Two accidents occurred during the year. Maintenanceman John Kodysz suffered 1st and 2nd degree burns on July 10, 1967 while working at the moose pen. Assistant Refuge Manager Robert Seemel injured his eye while sighting with a compass at the moose pen on August 21, 1967.

Good housekeeping procedures are continually stressed with all employees. Safety bulletins are posted as required and read by all. Preventive maintenance on vehicles and other equipment is routine. Safety procedures in handling equipment and tools is especially emphasized with temporary employees. Axe and chain saw use is demonstrated.

VII. OTHER ITEMS

A. Items of Interest

Robert K. Seemel, Assistant Refuge Manager, transferred to the Moose Range from the Tamarac National Wildlife Refuge in Minnesota on April 9. Bob will be responsible for the timber management program, vegetation investigations and the soil and moisture program. We welcome him to the staff.

Refuge Manager Willard A. Troyer has accepted the new position as Wildlife Management Biologist in charge of wilderness studies in Alaska and will be transferring to Anchorage, Alaska early in 1968.

Assistant Refuge Manager Averill S. Thayer was promoted from a GS-9 to GS-11 on 02/09/67.

The following temporaries were employed during the course of the year.

Name	Position	Dates Employed
Williams, Ray J.	Laborer	May 8 - June 16, 1967
Johnson Michael	Laborer	May 17 - September 8, 1967
Phillips, Von	Laborer	May 31 - August 30, 1967
Wolfe, Richard	Laborer	May 31 - August 30, 1967
Huskin, Ronald L.	Laborer	May 26 - May 29, 1967
Pitzman, Marsh	Biological Aid	May 29 - September 1, 1967
Hunt, Jake	Laborer	June 20- continuous
Rea, James	Laborer	June 20 - November 14, 1967
Coray, Paul M.	Laborer	June 19 - August 4, 1967
Nesbitt, Stephen	Biological Aid	June 5 - September 1, 1967
Anderson, Walter	Student Trainee	June 12 - September 8, 1967
Arness, James A.	Laborer	June 7 - July 7, 1967
Sexsmith, Jeremy C.	Laborer	June 21 - September 1, 1967
Rapier, Clarence E.	Laborer	July 12 - October 21, 1967
Segura, Victor A.	Laborer	September 11 - November 9, 1967 & November 29 - December 22, 1967

Assistant Refuge Manager Seemel and Refuge Manager Troyer attended the North American Moose Meeting held at Edmonton, Alberta March 17-19, 1967.

Refuge Manager Troyer traveled to Europe in June and early July and met with a number of European wildlife biologists in Germany, Denmark and Norway.

Refuge Manager Troyer received a \$25 Incentive Award for picking the winning title WESTERN TRUMPETER for the Regional monthly publication.

Clerk-typist Cherie Stroud attended the Clerical Workshop held at the Sheraton Motor Inn December 4-8 in Portland, Oregon

Clerk-typist Cherie Stroud was voted to the office of vice-president in the local Business and Professional Women's Club.

B. Photographs

A selection of photographs depicting Moose Range activities are included in the appendix.

Submitted by:

Will Troyer
Willard A. Troyer
Acting Refuge Manager

Approved:

David L. Spencer 16
David L. Spencer
Associate Supervisor, Wildlife Refuges

February 12, 1968

WAT:cs





4B-36 Surprise Mountain, a portion of the proposed Andy Simons Wilderness Area provides high quality recreational opportunities for hikers. Jean Lake lies below.

11B-48 The vast lake system in the lowland provides many opportunities for fishing, camping and canoeing.





5C-18 A male rock ptarmigan in breeding plumage. All three species of ptarmigan nest on the Range.

5C-19 A female rock ptarmigan in breeding plumage. Date May 20, 1967.





5E-19 The great horned owl is one of the many birds of prey which nests on the Range.



4B-38 Sport fishing the numerous lakes and streams is a major recreational use by the many visitors. These red salmon were caught at the Russian River.

4B-32 Canoeing continues to be popular with many visitors. Two canoe systems linking 72 lakes provide a variety of travel routes.





4A-32 Crowded conditions exist at several campgrounds.

4A-15 Current construction will provide better camping facilities and more solitude for the campers.





6A-17 Moose are the major wildlife species on the Range. Surveys indicate over 7,000 animals.

6B-2 Approximately 150 mountain goats utilize the Range. The goat and the Dall sheep share much of the mountain habitat.





3J-19 A joint research project between the Alaska Department of Fish and Game and the Moose Range will study moose-range relationships. Two one-square-mile pens were stocked with 10 moose each this winter.

3A-8 Moose were anesthetized from a helicopter, tagged, marked, sexed, and aged when stocked.





LM-4 Prior to stocking the moose pen permanent vegetative transects were established.



3A-10 Twenty-eight trumpeter swan pairs nested on the Range this year. A number were banded to determine wintering location and movement studies during the summer period.

11-1 A number of permanent vegetative transects were established in Dall sheep winter ranges.





2A-63 Oil exploration continues on the Moose Range. Three new wells were drilled during the period.

2A-64 Surface seismic operations distract aesthetically from the area and often damage wildlife and vegetation.





2A-61 This gas blowout occurred at the Beaver Creek well, sending rocks and silt 500 feet into the air and badly silting Beaver Creek. This is a hazard of oil operation.



2A-44 The gas blowout at Beaver Creek badly silted this excellent salmon and trout stream. Luckily most of the stream was frozen and much of the silt was washed out over the ice. Some permanent damage probably occurred.

2A-41 The entire forest area was heavily silted for a $\frac{1}{4}$ mile radius from the well site.





2A-33 This map depicts seismic lines which had been constructed on the Moose Range through 1967.



2A-45 Although seismic operators have strict instructions not to disturb sub-surface soils, cuts such as this have occurred.

THE PERMANENT STAFF OF THE
KENAI NATIONAL MOOSE RANGE



Will Troyer has been the Refuge Manager since September 1963. In addition to being manager-in-charge he conducts most of the population studies. Troyer has been with the BSWF since 1952. He served three years as Game Management Agent in Southeastern Alaska and eight years as Refuge Manager of the Kodiak National Wildlife Refuge before coming to Kenai.

Assistant Refuge Manager Ave Thayer conducting a Dall sheep count. Ave handles all oil and enforcement activities on the Range. Prior to coming to Kenai in 1962 he served nine years as a Game Management Agent in various parts of Alaska.





Assistant Refuge Manager Robert Seemel is in charge of the forestry, range and soil and moisture program on the Kenai. Bob is a newcomer to our staff, arriving in April 1967. Prior to this he served as Forester on the Tamarac National Wildlife Refuge and six months with the Wildlife Research Division in Minnesota.



Robert Richey is the Assistant Refuge Manager in charge of the large recreational program on the Kenai. Prior to coming here in 1964 he served with the National Park Service at Mount McKinley in a temporary capacity.



Cherie Stroud has been Clerk-Typist on the Kenai since April 1966. In addition to handling the hordes of paperwork she has the responsibility for pacifying the public, a job in which she is very adept. Although she has been in secretarial work for many years this is her first tour with the Bureau.



Maintenance Foreman Rex Williams is the "old-timer" on the staff. He started working with refuges on the Kenai Moose Range in 1954 and has been with us ever since. Maintaining the fleet of vehicles and heavy equipment, plus construction of recreational facilities keeps him occupied.



Maintenanceman John Kodysz was first employed on the Moose Range in March 1966. He is the all around handyman, driving "cats", mechanic, carpenter and handles much of the camp-ground construction.