

U.S. Fish and Wildlife Service  
 Anchorage, Alaska  
 Kenai National Wildlife Refuge  
 Anchorage, Alaska  
 EN 1965

US FISH & WILDLIFE SERVICE--ALASKA  
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REFUGE NARRATIVE REPORT  
 1965

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KENAI NATIONAL WILDLIFE REFUGE  
 Kenai Alaska



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David L. Spencer, Associate Supervisor  
Wildlife Refuges, Kennai, Alaska

February 23, 1966

Regional Supervisor, Division of  
Wildlife Refuges, Portland, Oregon

**Narrative Reports - Alaska Refuges**

We are pleased to receive the 1965 Narrative Reports from refuges in Alaska, and are endeavoring to review and forward them to the Central Office as fast as time permits.

It is evident that you and your staff have produced documents of excellent quality, and you are to be commended. We ask that in the preparation of future reports a place be provided on the signature page for approval by the Regional Office.

We would also like to call your attention to a photograph in the Clarence Rhode Narrative depicting construction of the addition to the service building. Comments were made to the effect that the employees were "living dangerously". It shows refuge employees perched on rather insecure footing while nailing headers to the studdings of one of the exterior walls. This certainly does not reflect good SAFETY procedures, and we have taken the liberty of removing this picture from the report. One cannot help gaining the impression that these employees were not properly trained in SAFETY insofar as use of ladders is concerned, and efforts should be made to convey our SAFETY program in detail to the man on the job. This is particularly desirable when employing unskilled or temporary help. We would suggest that you also remove this photo from your copy of the Refuge Narrative.

With our limited knowledge of on-the-ground operations of the Alaska refuges it is difficult to comment intelligently on details of the program, but from all appearances, you and your staff are doing an outstanding job with the resources available to you.

Original signed by  
VERNON EKEDAHLE

Vernon Ekedahl

AVKedahl:vt

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REFUGE NARRATIVE REPORT

1965

KENAI NATIONAL MOOSE RANGE

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Kenai, Alaska

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# KENAI NATIONAL MOOSE RANGE

## NARRATIVE REPORT

January - December 1965

### I. GENERAL

#### A. Weather Conditions.

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

	<u>Extremes</u>		<u>Temperatures</u>		<u>Precipitation (in inches)</u>		
	<u>Max.</u>	<u>Min.</u>	<u>Average Mean</u>	<u>10-Yr. Average Mean</u>	<u>This Month</u>	<u>Average Mean</u>	<u>Snowfall</u>
January	40	-25	11.3	19.8	.27	1.23	2.1
February	35	-29	9.5	24.3	.76	1.08	9.1
March	45	6	32.7	22.8	2.00	.97	4.0
April	60	15	35.8	31.0	1.40	.68	5.2
May	62	18	40.6	42.9	2.40	.66	2.6
June	59	34	46.9	49.5	11.69	1.47	-
July	76	39	52.6	53.3	2.06	2.45	-
August	70	33	51.3	53.2	2.18	2.63	-
September	67	26	50.6	46.5	6.52	3.60	-
October	53	7	29.7	35.0	1.37	2.80	7.3
November	36	- 9	17.6	22.4	1.12	1.45	18.7
December	34	-35	6.6	9.5	1.89	1.01	11.8
	76	-35	32.1	34.2	23.66	19.23	60.8

Normal subzero temperatures prevailed the first few weeks of the year. This was followed by warm "Chinook" winds with temperatures rising to 40°. Melting snow flooded many of the ice-covered streams.

The Russian River Campground was covered with water and ice flows, but little damage occurred. February was typical with additional snow and subzero temperatures. Spring breakup occurred about a month earlier than usual with smaller lakes becoming ice free around May 1. Winds to 70 miles per hour lashed the Moose Range on April 27, 28 snapping off and uprooting many trees.

The past summer on the Kenai may be characterized as cool, cloudy and rainy with a few warm days in August.

The colorful golden hue of aspen and birch leaves in September quickly dissipated into the bleakness of winter.

The heavy snowfall in late November induced the moose to migrate to the lowlands.

## B. Habitat Conditions

1. Water. Lakes became ice free in early May, and moose moved in to enjoy the succulent aquatic vegetation. Open water on the Kenai River below Skilak Lake continues to provide waterfowl and swan winter habitat. Normal water levels of lakes prevailed this summer following last years' earthquake adjustments.

Most lakes froze during late October, while Skilak and Tustumena Lakes became ice-covered in late December.

2. Food and Cover. With a 132 day growing season, May 18 to September 27, we experienced one of the longest frost free periods on record. The cool summer temperatures were compensated with a long growing season producing normal herbaceous and woody growth. Optimum moose browse production continues in the 1947 Burn. The vast areas of birch browse north of Moose River require additional cropping to prevent this valuable brush from growing beyond reach.

Blueberry and raspberry production was practically non-existent although cranberries were plentiful. The supply of spruce and birch seed throughout the Range was mediocre.

## II. WILDLIFE

### A. Migratory Birds

1. Waterfowl. The 1965 spring migration was greatly reduced as compared to previous years. The first Canada geese were observed on the Kenai River Flats April 15 and April 22. Approximately 200 lesser Canada's were seen on the Chickaloon Flats April 27. No large concentrations of waterfowl utilized the Chickaloon Flats because of damages sustained by the March 1964 earthquake. During the quake the flats sank 3-4 feet and tidal waters regularly inundate portions which previously flooded only on extreme high tides.

Examination of the flats this fall revealed most of the area is now covered with a heavy layer of silt, averaging 10-20 inches in depth. However, many higher areas closer to the beach are not silted. Erosion from the high tide run off has formed many new sloughs filled with a muddy silt, making them hazardous to cross. In early October re-examination of the flats revealed that beach arrowgrass, (Triglochin Maritima), is invading the silt and once again attracting waterfowl. Ducks started to utilize the area on September 1 and continued to do so until October 16 when cold weather caused their southward migration.

During the last week of their stay, an estimated 10,000 Canada geese and 5,000 ducks were utilizing the area. Ducks consisted of 55 percent pintail, 30 percent widgeon, and the remainder mallards and teal. A few snow geese and swans were also present. The Flats may become more productive in a few years than they were in the past.

The waterfowl migration this fall was short and sudden. Cold temperatures beginning on October 8, froze many of the small lakes and ponds, and by October 17 very few ponds remained open. A sudden exodus of birds occurred on the weekend of October 16-18. Normally a number of birds utilize the Kenai River near Skilak Lake; but this did not materialize, and very few birds remained at the end of the month. The Kenai River was higher than normal during this period and perhaps much of the vegetation normally used by dabbling ducks was covered.

Waterfowl hunting pressure was relatively light. They were found in fair numbers on the Chickaloon Flats, but hunter access was difficult. Wheeled planes are used in landing above the high tide marks, but the new layer of silt prevented this method of access. Toward the end of the season a few float plane operators were landing on shallow ponds and skidding along the silty mud . . . a precarious operation, but it was accomplished without any accidents. Many hunters will probably find some means of access by next fall.

Most cabins near the Flats have been flooded and are laden with silt; others drifted out with the high tides.

## 2. Trumpeter Swans.

Spring Breeding Population. Trumpeter swans are the earliest waterfowl arrivals on the Kenai Peninsula. During late March, a few were noted loafing near nest sites on unfrozen lakes, and by April 22, swans were numerous along the Swanson and Moose Rivers.

Tabulation of the total swans in the area was not undertaken until the first week in June when breeding pairs were incubating. The aerial survey revealed 132 swans, 78 (59 percent) were nesters and 54 non-nesters. The latter consisted of 15 pairs, 11 singles, and small groups of 3-5. This year's total adult population indicated a 31 percent increase over 1964. Last year 91 adults were counted during the June survey, and 50 were recorded as nesters, (a 55 percent increase). Unfortunately, records of total adult swans present in June were not recorded prior to 1964. However, past counts indicate a total of 85 adults present in July 1961 and 98 in August 1962.



Observers did not attempt to segregate mature adults, with all-white plumage, and those still retaining immature plumage. This division should be obtained in future surveys to provide valuable survival information

Nesting. A total of 39 swan nests were located during this year's survey. All but seven of these nests were on the Moose Range. Egg laying however was not completed in nests #11 and #25. Four other adult pairs occupied territories all summer but failed to nest. These four nests were located at Bear, Beaver, Elephant, and Stormy Lakes and all were near former nest sites. The nest on Stormy Lake may have been successful if construction of a road nearby had not caused so much harassment.

A few nest sites which had been occupied for a number of successive years were not utilized this year. Nest numbers 23, 30, 36, 37, and 39 were located quite distant from any previously known established sites. This could indicate an expansion of the population and dispersal to new nesting territories.

Nesting Period and Incubation. The beginning of the swan nesting period varied considerably. The first swans were observed on March 30 near a nest site at Mink Creek Lake. It is not definitely known whether the four seen here included a pair which later occupied the nest site. The first swan observed on a nest was at Moose Pasture on April 29. By May 15 nesting pairs were common. The pair on Forest Lake was not observed nesting until May 23. However, it was impossible to tell from intermittent aerial observations when the birds completed laying and started incubation. The hatching dates of several broods were observed, and by back-dating the average incubation period, a record of the beginning of incubation can be assumed. Both Benko (1960), and Shepherd (1962) indicate this period to be from 33-37 days. Following is a list of the hatching dates of several clutches:

<u>Nest</u>	<u>Hatching Date</u>
Swan Creek	June 4
Moose Pasture	June 8
Clam Gulch	June 9
Angler Lake	June 11
Pollard Lake	June 11
Mackey Lake	June 12
Warbler Lake	June 14
Bay Lake	June 14
Fish Lake	June 17
Mosquito Lake	June 19
Krein Lake	June 25
Forest Lake	June 28
Moose Point	June 29

TABLE I. Nest Location, Production and Survival  
of 39 Trumpeter Swan Nests on the  
Kenai Peninsula, 1965

Nest No.	Location	Clutch Size	Hatching Success		Cygnets Survival To September	
			Date	Cygnets	Date	Cygnets
1	Mackey Lake	7	6/13	7	9/20	7
2	Gagara Lake	6	6/30	6	9/20	5
3	Sunken Is. Lake	6	6/18	6	9/20	4
4	Mosquito Lake (1 mi. West)	5	6/20	4	9/20	3
5	Silver Lake	6	6/13	4	9/20	4
6	Forest Lake	4	6/30	4	9/20	3
7	Mink Creek Lake	6	6/7	6	9/9	4
8	Fish Lake	7	6/18	4	9/2	2
9	Nest Lake	8	6/20	7	9/20	4
10	Swan Creek (cygnets)	9	6/8	9	9/20	6
11	Canoe Lake					
	Chain	1	abandoned			
12	Lower Moose River	5	6/13	5	9/9	5
13	Upper Moose River	1	abandoned			
14	Brood Lake	5	6/21	4	not located	
15	Moose Pasture	6	6/14	6	9/9	6
16	Hangema Lake	6	7/3	4	9/9	2
17	Dipper Lake	5	6/30	1	9/9	1
18	Diamond Lake	6	6/30	6	9/9	6
19	Diamond Lake (1 mi. SE)	6	6/30	5	not located	
20	Vogel Lake	3	not located		9/9	3
21	Angler Lake (N)	7	6/30	7	9/9	3
22	Warblers (SE)	6	6/14	3	9/9	2
23	Swampy Lake	n/checked-nest destroyed				
24	Moose Point (S)	4	6/30	4	9/10	2
25	Hook Lake (W)	n/checked - abandoned				
26	Curlew Lake (N)	5	7/3	4	9/9	4
27	Quill Lake (N)	5	not located		not located	
28	Krein Lake	5	6/25	5	9/10	2
29	Snipe Lake (S)	3	7/3	3	9/9	1
30	Buteo Lake	7	6/30	3	not located	
31	Gull Lake (N)	6	7/6	6	9/9	6
32	Snipe Lake (N)	5	7/6	4	9/9	3
33	Daniels Lake	6	not located		9/20	5
34	Tony's Lake	7	6/13	7	9/9	7
35	Pollard Lake	7	6/11	7	9/9	7
36	Glen Gulch	7	6/14	6	9/19	2
37	Lower Killey R.	5	6/18	5	9/9	5
38	Bay Lake	7	7/5	6	9/9	5
39	Gavia Lake	4	abandoned			
204			163*		121	

\* Hatching success includes eight cygnets not found until September

Apparently incubation began as early or possibly earlier than May 1 with some pairs and not until the latter part of May with others. Hatching dates suggest a span of 25 days between nesting pairs.

Clutch Size. The clutch size of 35 nests in which egg laying was completed ranged from 1-9 eggs with a mean of 5.7 eggs per nest, (Table 2). This mean is considerably higher than the 4.3 mean recorded for the 20 nests last year. The clutch of nine was in the process of hatching when found, and is the largest ever recorded on the Moose Range. It was assumed that this clutch contained only nine eggs although the possibility exists there could have been more.

TABLE 2. Clutch Size of 35 Trumpeter Swan Nests  
on the Kenai National Moose Range, 1965

<u>Clutch Size</u>	<u>Frequency</u>
9	1
8	1
7	8
6	11
5	9
4	2
3	2
2	0
1	1

Range 1-9

Mean 5.7 eggs per nest

Hatching Success. Four of the 39 nests were either abandoned or destroyed prior to completion of incubation. These were nest numbers 39, 25, 23, and 11. The brood from nest 27 was never located. The clutch may have been destroyed prior to or after hatching. Hatching success records are available from 34 clutches. A total of 163 cygnets were recorded from these 34 nests for a mean of 4.8 and a hatching success of 84 percent. This hatching success appears extremely high and much greater than recorded by Banko (1960) and Shepherd (1962). If the nests abandoned were included, and an assumption made that clutches not checked prior to abandonment were average size, the hatching success would still be 71 percent.

Survival and Mortality. Thirty broods, consisting of 121 cygnets, were accounted for in the aerial surveys conducted in September. Brood size ranged from 1-7 cygnets with an average of 4.0. Brood numbers 19, 14, and 30, which were recorded in July, could not be located in September. These may have succumbed to mortality



or possibly been over looked in the survey. The mean number of cygnets surviving to September from the original 39 nests was 3.1. Ten broods did not encounter any losses from July to September and nine broods successfully hatched, sustained no mortality during the same period. It is interesting to note that most broods suffering no mortality were large. (Table I).

Nest #23 was destroyed during incubation. One of the adults was killed and when first observed an adult golden eagle was sitting on the carcass. However, the carcass was considerably decomposed and the cause of mortality may possibly have been a mammal.

Brood Movements. Periodic observations were recorded of nine broods in an attempt to gain insight into pre-flight stage brood movements and territories. These broods were nest numbers 1, 2, 3, 4, 5, 6, 7, 8, and 10. Planned aerial checks every three days were not always possible during the latter part of the period. Figure 1 indicates sightings made on the first seven broods and the approximate territory each brood utilized during this period. Unfortunately, the map does not reveal the extent of the movements for in some cases passage between lakes was accomplished several times. Broods 8 and 10 are not on the map.

Brood #1. This brood hatched June 12, and on June 18 when six days old, moved overland to the large lake west of the nest site. On several occasions the brood was seen moving across the relatively open marshy tundra. However on August 18, they moved to the smaller lakes northwest of the nest site where they remained the rest of the flight-less period. In order for the brood to travel to this location, it was necessary for them to move through brushy and timbered land. As flight status was attained, they extended their range slightly beyond the circle indicated and were twice seen on Sports Lake to the south. This brood consisted of seven cygnets and suffered no mortality during the period.

Brood #2. The brood consisting of six cygnets hatched approximately June 17 and remained in Gagara Lake until July 20. Numerous aerial searches in the next few weeks in the immediate area failed to reveal their location and it was assumed they had met with misfortune. However, on September 17, a brood with five cygnets appeared three miles northeast of the nest site. This brood could not be linked to another nest site of any reasonable distance. The young were capable of flight at this time and possibly may have been a brood from a distant nest site.

Brood #3. A brood consisting of six young, hatched around June 17 and remained with Sunken Island Lake for the next month. This brood was last observed on the lake June 25 but was not observed again until July 13 when it appeared on Doroshin Lake,  $1\frac{1}{2}$  miles north.

Identification was definite because of the number in the brood and size of young. The family remained on Doroshin Lake until August 18 when they moved to a small lake  $\frac{1}{4}$  mile northwest of Doroshin Lake. They remained here through August, but on September 9 moved  $1\frac{1}{2}$  miles southwest to Donkey Lake where they were last seen on September 20. Their movement involved travel through timbered areas on two occasions and crossing a graveled road.

Brood #4. This family moved so extensively it was difficult to follow. The adults produced four cygnets on June 19 and were near the nest site on June 25. The next day the same brood was observed on East Finger Lake by Larry Ellison, a biologist for the Alaska Department of Fish and Game. The brood moved a minimum distance of two miles and possibly three as an indirect route was most likely taken. They were observed two miles northeast on Middle Finger Lake on July 5. Moved on South Finger Lake July 12, and were next observed on East Finger Lake July 18. July 21 they had moved to the lake southeast of South Finger Lake. July 31 they were back on Middle Finger Lake and then moved to a small pond just off the tip of this lake where the brood remained when last observed on September 20. This brood repeatedly moved through timbered areas when traveling between lakes.

Brood #5. This brood hatched approximately June 10 and remained on Silver Salmon Lake during the entire summer never straying beyond marsh fringes. Last seen on September 9, the brood suddenly appeared in a large lake two miles southeast. It was first observed there on September 20. Since the brood was capable of flight, they very possibly flew from the territory maintained during the summer.

Brood #6. The brood did not hatch until June 28 and remained in the Forest Lake until August 18 when they moved to a small lake  $\frac{1}{2}$  mile north. They remained here until September 20 before again returning to Forest Lake.

Brood #7. This brood hatched in early June, and was one of the oldest. They spent a large portion of their time in the swampy wetland surrounding Mink Creek Lake and were often difficult to locate. The brood remained near Mink Creek Lake until early September when observed on two small lakes southeast of the nest site. However, they were probably capable of flight when seen in this area. It is interesting to note that this brood spent much time on the outlet stream and could have easily moved downstream, but never did.

Brood #8. The brood consisting of four cygnets hatched on June 17. One June 18, when two days old, they were observed at 0730 entering the heavy spruce on the southwest corner of the lake. A check at 2130 revealed they had traveled overland about  $\frac{1}{4}$  mile west to another small lake. They remained in this lake most of July. On July 31 they moved one mile west to Waterfowl Lake. During August, we failed to locate them, but on September 20 a brood was located four miles south at Little Mink Lake and appeared to be brood #8, but positive identification could not be made. There is a possibility that they may have moved to this location earlier in the summer. The area was not searched previously as it was not expected they had moved this distance.

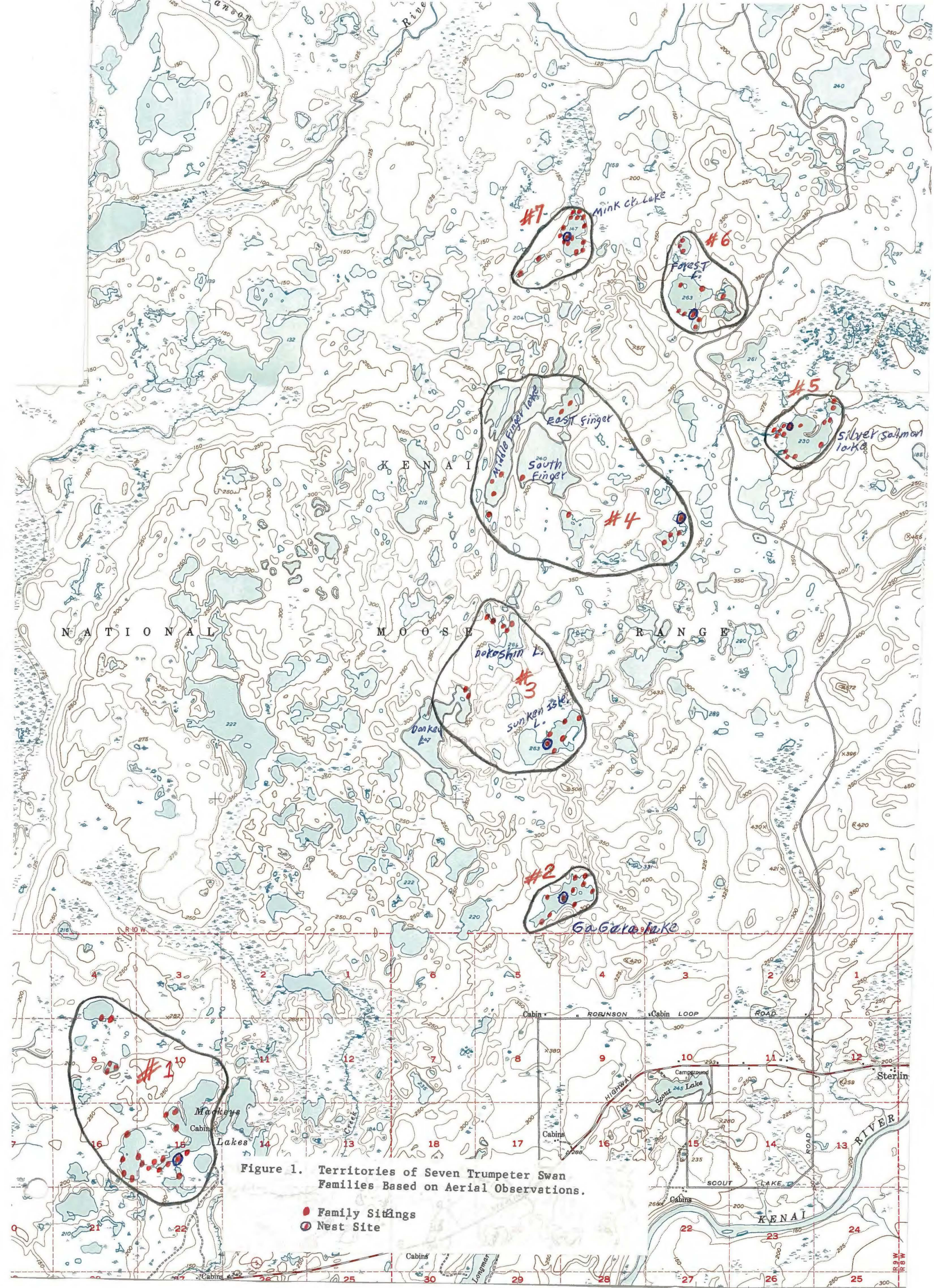
Brood #10. This nest located on Swan Creek hatched nine cygnets June 4. This portion of the creek flows through a flat swampy area. It is of interest to note that the brood could have easily moved downstream to the larger Swanson River, however, they remained within 200-400 yards of the nest site all summer. Three cygnets disappeared on September 9 and their fate is unknown.

Wintering Populations. Each year a few trumpeters winter on Kenai River at the outlet of Skilak Lake. This area usually retains some open water even during extremely low temperatures and last winter 10-13 birds remained here. Ten swans are currently residing at this location.

Miscellaneous Observations. On June 9 a trumpeter swan nesting on Krein Lake was observed attacking a moose. The nest was located at the end of an island about 50 yards from a point on the mainland. A cow and calf moose were observed swimming from this point to the island. As they approached the island they came within 10 feet of the nest. When about 20 feet away, the swan jumped from the nest and attacked the moose, beating its hind quarters rapidly with its wings. The moose immediately ran past the nest and the swan ceased the attack.

On several occasions cygnets were left with one adult for a considerable length of time. In all instances the disappearance of an adult occurred after the cygnets were nearly mature. After August 18 only one adult was observed with the Mackey Lake cygnets. During the latter part of August only one adult was observed with the Mink Creek cygnets, but in September both adults were again present. During the first half of September six of the nine Swan Creek cygnets remained alone near the nest site, but two adults were observed with these six during the last aerial check of September 20.







A lone cygnet was observed on Nest Lake from August 19 through September 20. It remained in a relatively confined location and apparently was successful in feeding and maturing on its own. However it is not known why or at exactly what age this cygnet became an orphan.

On June 23 a pair of swans nesting in Forest Lake were not incubating. On June 24 they were both sitting on a bank approximately 100 yards from the nest site. We assumed the nest was abandoned. However, on June 27 two eggs were pipped and the entire clutch of four successfully hatched on June 28.

#### B. Upland Game Birds

1. Spruce Grouse. Spruce grouse populations were considered somewhat higher than the past two years, but not as high as three or four years ago.

Quite a number of hunters harvested birds along the roads but a snowfall in early October reduced the hunting period on grouse.

Larry Ellison of the Alaska Department of Fish and Game continued an intensive study of the grouse near the Finger Lake Road. A summary of his findings are reported under Field Investigations.

2. Ptarmigan. Ptarmigan were observed along the Sterling Highway in the 1947 Burn area through January, February, and March and again in December. During this period they were available to hunters, but few participated in the sport.

The last week in May, numerous breeding pairs of rock and willow ptarmigan were present on Bama Lake Mountain. During this period the rock ptarmigan were still in their white winter plumage except for the head breeding plumage of the males. Willow ptarmigan still retained about half their winter plumage. Males were actively pursuing females and defending territories at this time.

In July coveys were numerous along willow patches in the Twin Lakes, Bama Mountains and Green Lake areas. Most coveys consisted of three to seven young. On October 26, a flight through the mountains revealed large concentrations of ptarmigans around Green Lake. Numerous ptarmigan were also observed at timberline on Surprise Mountain on November 2 and 3. They were feeding on willow buds protruding above the snow.

C. Big Game Animals

MOOSE

1. Calving Inventory

Five early morning aerial moose population counts were flown during the last two weeks in June to determine calving success. These were flown in the Upper Moose River and Chickaloon River drainages in a manner similar to past years. Data from previous years indicated that the peak of the calving period had passed at this time and the counts would indicate productivity of the current year. Table 3 shows the results of each survey. All surveys were conducted in the early morning daylight hours by Refuge Manager Troyer using a Piper Supercub. A total of 1200 moose were tabulated of which 222 (19 percent) were calves. The calf:cow ratio was 38:100.

As displayed in Table 4, the calf:cow ratio shows a reduction over the last two years but the percentage of calves in the total herd has been relatively constant in recent years. A failure to classify yearlings and bulls properly could cause this discrepancy.

Some calves may be born after initiation and completion of the surveys but it is believed to be a minor percent. Perhaps a better criterion for evaluating productivity would be conducting the surveys in early July after all calving was completed and the initial early mortality had occurred. This proposed criterion needs further investigation.

2. Winter Population Inventory

The square-mile quadrat method was again used this year to census the moose north of the Kasilof River and Tustumena Lake. This survey was conducted from November 30 to December 4, in a similar manner to last year. Three supercubs piloted by Abe Thayer, Will Troyer and Chuck Evans were used. Observers were Bob Richey, Bob Wade and Ray Morris. Chuck Evans and Ray Morris, of the River Basin staff, based in Anchorage and flew the northern portion of the Range. The other two planes were based at Kenai.

A reconnaissance flight on November 26 revealed the major population concentrations. The entire area supporting moose was then gridded into square mile plots on U.S. Geological Survey maps, scale 1:63,360. The plots were then divided into three moose density strata; low, medium, and high. These strata were based on past knowledge of moose concentration and on the reconnaissance survey. The 1,941 grids were then consecutively numbered and classified as 153 low, 1,562 medium, and 226 high.

TABLE 3. COMPOSITION OF THE MOOSE POPULATION IN THE MOOSE RIVER AND CHICKALOON AREAS IN LATE JUNE, 1965

Date	Single Cows	♀1C	♀2C	Total Calves	Percent	Total Cows	Total Bulls	Total Yearlings	Total Moose	Ratio . Calves Cows Bulls
6/18/65	90	38	5	48	19.0	133	45	31	257	36 : 100 : 34
6/20/65	44	32	2	36	23.0	78	29	16	159	46 : 100 : 37
6/21/65	58	29	2	33	18.0	89	27	31	180	37 : 100 : 30
6/24/65	101	40	5	50	17.0	146	52	51	299	34 : 100 : 36
6/25/65	89	49	3	55	16.0	141	52	57	305	39 : 100 : 37
	382	188	17	282	19.0	587	205	186	1200	38 : 100 : 35

**TABLE 4. MOOSE CALF PRODUCTIVITY AS DETERMINED FROM AERIAL SURVEYS  
DURING THE LAST TWO WEEKS IN June 1960-65.**

<b>YEAR</b>	<b>CALF: 100 COWS</b>	<b>PERCENT CALVES</b>
1960	58: 100	18
1961	41: 100	14
1962	28: 100	16
1963	45: 100	17
1964	44: 100	18
1965	38: 100	19



The plots were selected from a table of random numbers, and consisted of 3 low, 75 medium, and 30 high for a total of 108 plots.

Census of each plot was conducted in a similar manner to last year. The plot grid lines were located by the pilot from the map and the perimeters were flown until the grid lines were well established. The plots were then searched by a series of overlapping circles until the surveyors felt every moose in the plot had been found.

One moose was tallied in the three low plots, 217 in the medium and 380 in the high plot as shown in Table 5. Again as last year several plots fell within extremely high moose concentrations, causing considerable variance. One high plot contained 68 moose. Extrapolating these sampling units to the total area at the 90 percent confidence interval resulted in an estimated population of 7,432 animals  $\pm$  21.4 percent of the mean or a true population between 5,839 and 9,025 moose. The standard error (SE) equaled .4941.

The total flying time was 62  $\frac{2}{3}$  hours with 33  $\frac{3}{4}$  hours spent searching the plots. This was considerable more time utilized in searching than the 22  $\frac{1}{2}$  hours flown last year. Perhaps the major reason for more searching time was that a greater number of medium plots were flown. A large portion of these are heavily forested and demand more flying time.

A total of 598 moose were tallied in the plots and 15 percent of these were bulls, 66 percent cows and 19 percent calves.

### Discussion

Tables 5 and 6 shows the comparison of 1964 and 1965 surveys by population numbers and composition. The readers may note that the data given for 1964 does not completely follow the 1964 narrative report. In re-checking last years data, several errors were found which reduced the calculated population. Data in Table 5 has been thoroughly checked and is accurate.

The total populations of 6,979 last year compared with the 7,432 estimated in 1965 appears reasonable as the population should show some increase. It is encouraging to note that the surveys covering identical areas during two different years show such close results in both numbers of moose and confidence limits obtained. Presently it appears this may be a very feasible and practical means of determining the total moose populations on the Kenai. We believe the confidence limit could be reduced by increasing the number of plots flown. Perhaps flying plots until desirable confidence limits have been achieved is in order. Certainly this method bears additional trials.

TABLE 5. RESULTS AND COMPARISON OF SQUARE-MILE QUADRANT METHODS FOR CENSUSING MOOSE ON THE KENAI NATIONAL MOOSE RANGE 1964-1965

	Low Plots		Medium Plots		High Plots		Total	
	1964	1965	1964	1965	1964	1965	1964	1965
Grid Strata	137	153	1498	1562	300	226	1935	1941
Grids Sampled	5	3	58	75	43	30	106	108
Moose Counted	6	1	170	217	348	380	524	598
Range	0-3	0-1	0-22	0-25	0-68	0-68		
Total Population Estimate							6979	7432
90% Confidence Limits							(±1566)	( <sup>+</sup> 1593)

TABLE 6 COMPOSITION OF THE MOOSE POPULATION OBTAINED FROM THE SQUARE-MILE QUADRANT SURVEY METHOD 1964-1965

	Percent Bulls	Percent Cows	Percent Calves	Calf:Cow Ratio
1964	14.0	64.0	22.0	36:100
1965	15.0	66.0	19.0	30:100

### 3. Hunting Kill

This year's hunting regulations permitted taking one bull moose between the periods August 20 to September 30 and November 1-30. In addition, either sex could be taken from November 27 to November 30.

Hunting regulations in Alaska require each moose hunter to obtain a harvest ticket prior to hunting moose. At the end of the season the ticket must be returned giving the following information: successful or unsuccessful, date of kill, location and sex. Refuge personnel obtained this information for Game Management Unit 15 and the data reported here is based on these returns. However, of 32,500 tickets issued in Alaska, only 3,800 were still unreturned when this report was written.

This year the either sex season was again preceded by a few days of heavy snow which caused a sudden migration of moose from the mountain areas to the lowland where they became readily available to roadside hunters. Local and Anchorage hunters were again patrolling roads in mass and the success ratio during this period was high.

A total of 1,068 moose has been reported killed to date of which 530 were cows and 538 bulls. Only 209 bulls were taken during the August and September season and 318 during the November season as shown in the kill chronology (Figure 2). One-hundred-ninety-three of the late season bulls were killed during the last week of the season. Thus over half (723) of the 1,068 total reported kill were taken the last week of the 73 day season. This compares favorably with the 1,205 moose reported taken last year.

Since 3,800 ticket holders are still unreported and considering a certain amount of violations, a ten percent factor is added to the kill making the total take 583 cows and 592 bulls for a total estimated kill of 1,175 animals. This is a 151 reduction over the 1,326 estimated kill in 1964. However this years cow kill shows a slight increase over last year -- 539 to 583.

Records indicate a majority of the hunters now await the arrival of the either sex season before exerting much hunting effort. In fact, it is apparent from general observations that hunting effort was primarily confined to the first opening week of the season in August and the last week in November.

The kill was well distributed during the early moose season. Hunters utilized both rivers and roads for access purposes and aircraft were used extensively in the northern portions of the Range where many lakes provide landing areas. However, during the late hunting season most of the moose are killed adjacent

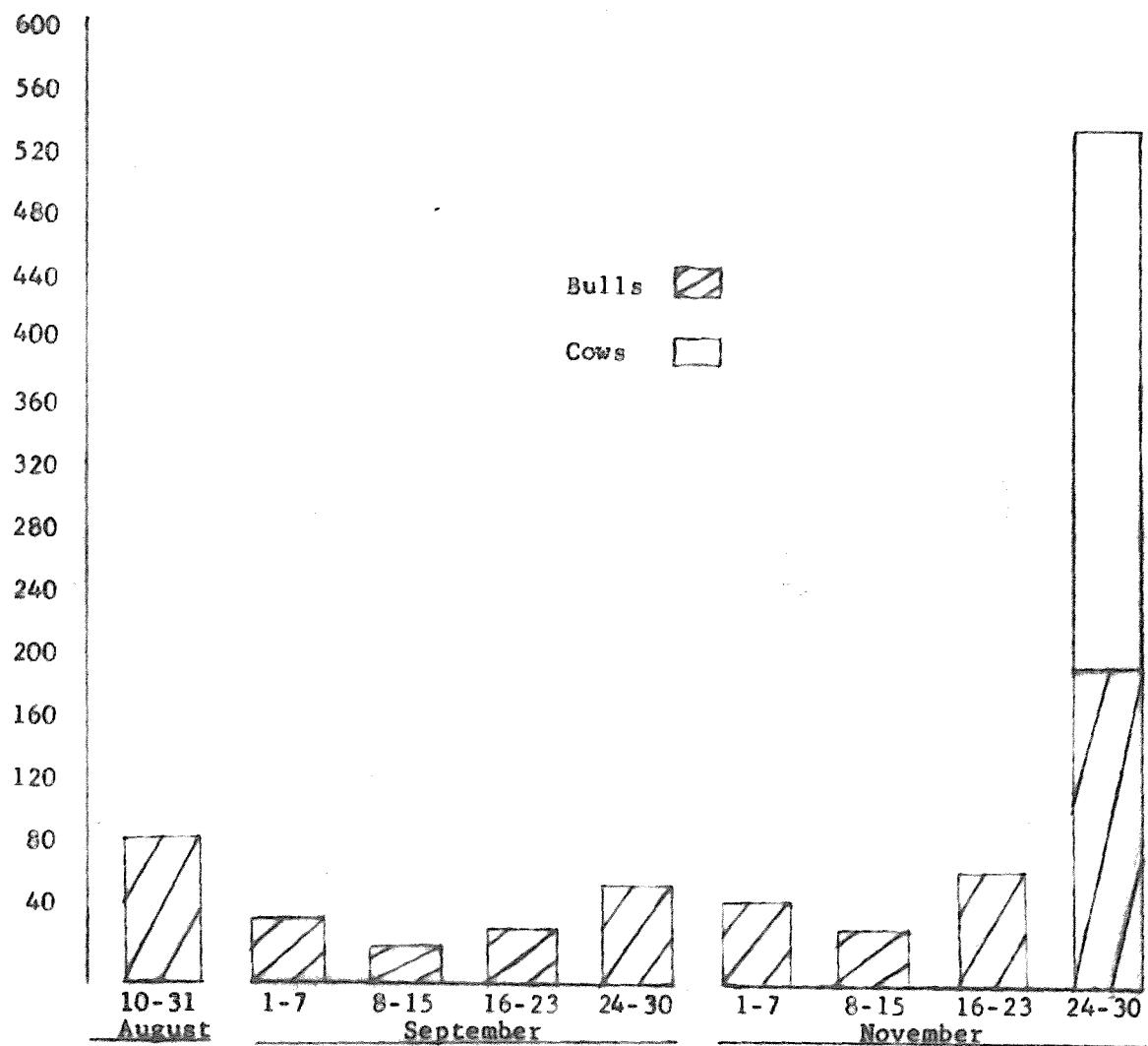


Figure 2. Chronology of the Moose Kill on the Kenai National Moose Range in 1965.

to roads as they migrated to winter ranges. Table 7 and Figure 3 show the distribution of the kill. Considering the size of the areas involved, the greatest kill occurred in the Kasilof and Funny River Road areas. The kill along Swan Lake Road was reduced because the road was closed during the either sex season. Browse, especially birch, is very dense and growing out of reach in this general area. It is therefore desirable to increase the moose population in an attempt to reduce the height of the browse and keep it within reach of moose.

#### Movement and Distribution

A sudden movement of moose from the mountains to the lowlands occurred again this year. Heavy snows starting November 23 apparently induced the movement and large concentrations of moose into the Funny River Road and Kasilof areas as the cow season opened November 27. Extensive movement of animals into the Skilak-Sterling Highway area did not occur until a few days after the season closure. Snow conditions at that time were much deeper than last year when the major migration started. Last years snowstorms were accompanied by strong winds and general blizzard conditions causing a more rapid movement.

On December 27, a large concentration of moose were observed near the junction of Kenai River and Skilak Lake. Animals did not move into the homestead area around Robinson Loop and Scout Loop roads until mid-December.

TABLE 7: DISTRIBUTION OF THE MOOSE KILL DURING THE 1965 SEASON

AREA	<u>BULL KILL</u>		COW KILL	TOTAL
	Aug. & Sept.	Nov.		
Kasilof to Clam Gulch	17	40	156	213
Funny River Road	10	45	69	124
Swanson River Road	15	30	60	106
Swan Lake Road	14	8	2	24
Pipeline and Mystery Creek Road	15	26	41	82
Skilak-Sterling Highway on				
Moose Range	18	44	77	139
Other kills south of Kenai River	40	50	50	140
Other kills north of Kenai River	91	74	75	240
<b>TOTAL</b>	<b>220</b>	<b>318</b>	<b>530</b>	<b>1068</b>

#### Miscellaneous Information

Thirty-one road kills and miscellaneous moose mortalities were investigated compared to eighteen in 1964. Meat recovered was distributed to the needy through the Kenai Ministerial Association. The thirty-one mortalities consisted of ten calves, four yearlings, and seventeen adults. Other than normal road kills, a few deaths were attributed to: tanglement in abandoned oil field telephone lines; exposure in an oil sump pit; and one suicidal jump from a highway bridge.

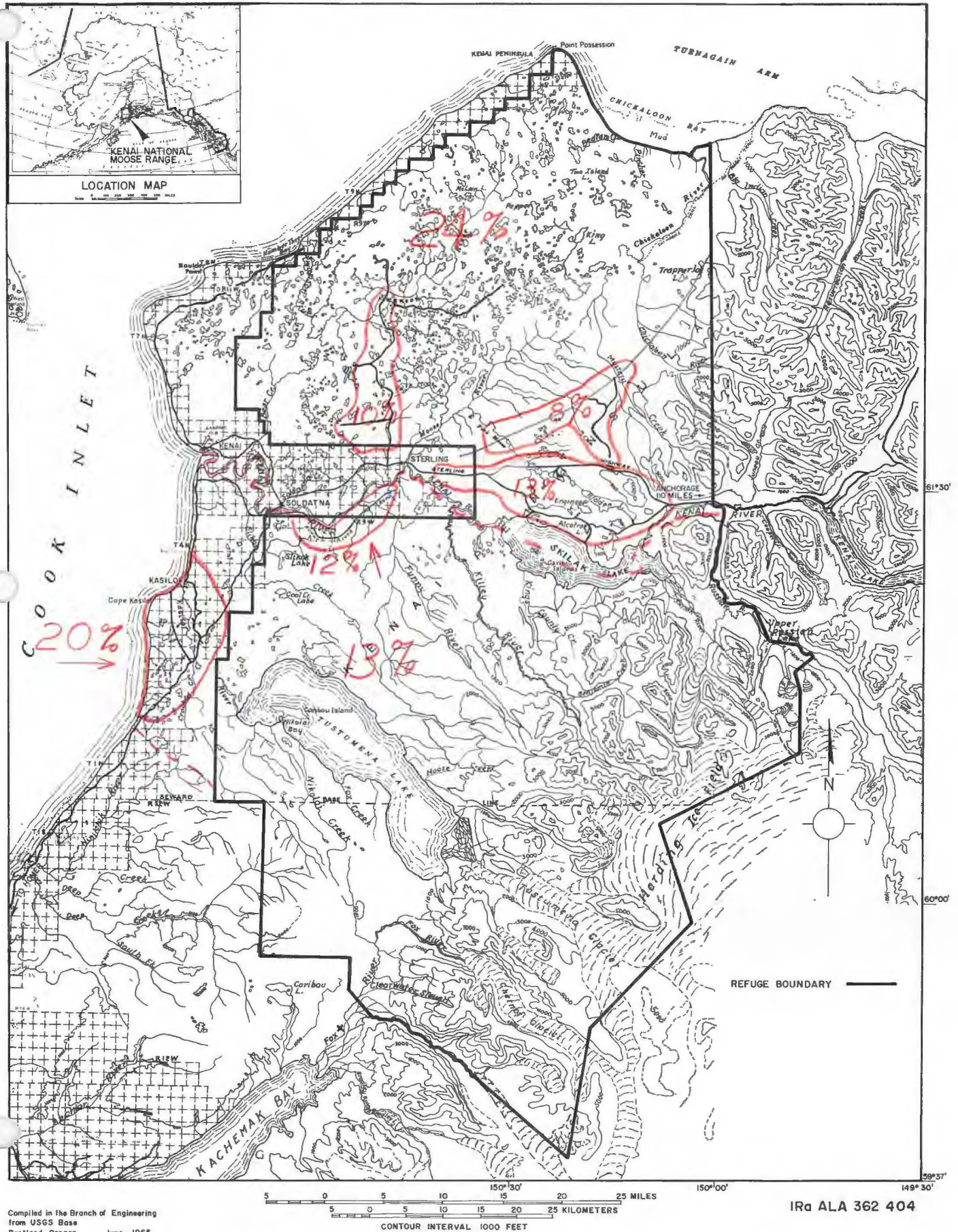


Figure 3. Major Moose Kill Concentration Area During the 1965 Season.

# KENAI NATIONAL MOOSE RANGE ALASKA

UNITED STATES  
DEPARTMENT OF THE INTERIOR

U. S. FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE



## DALL SHEEP

### 1. Population Surveys

Aerial. The annual aerial dall sheep population survey was conducted on August 4-6. All sheep habitat, except Surprise Mountain, which had been previously surveyed July 12 was included. A total of 914 sheep were tabulated during this survey (Table 8). The distribution of sheep during the survey are shown in Figure 4. The total count is slightly below the population tallied last year and could indicate a leveling off of the gradual rise since 1949. We may have overlooked a few bands or perhaps a temporary reduction may have occurred due to winter mortality.

The 175 lambs observed were greater than the number recorded last year and constitutes about 18 percent of the total population. A total of 211 rams were identified of which 88 were classified as legal. However it is impossible to identify rams in the younger age class and no doubt a portion of the 204 unclassified sheep were also rams. It is interesting that the greatest proportion of lambs occurred on Surprise Mountain and between Killey River and the North Fork of Indian Creek. These areas also harbored the least number of large rams. They have long been noted as good wintering and spring habitat.

Ground. Ground counts were conducted on Surprise Mountain July 2 and 3, near Green Lake July 22, and from Emma Mountain to the Killey River on July 27 and 28. (Table 9) A composition of the population can be obtained more accurately from ground observation than aerial survey, however they were not extensive enough to be representative of the total population. This has been true in past years and in order to get reliable data a higher proportion of the total population will need to be classified. It is also essential that in the future only experienced individuals conduct these surveys. Observers not familiar with dall sheep are incapable of identifying yearlings or judge the degree of horn curl in rams.

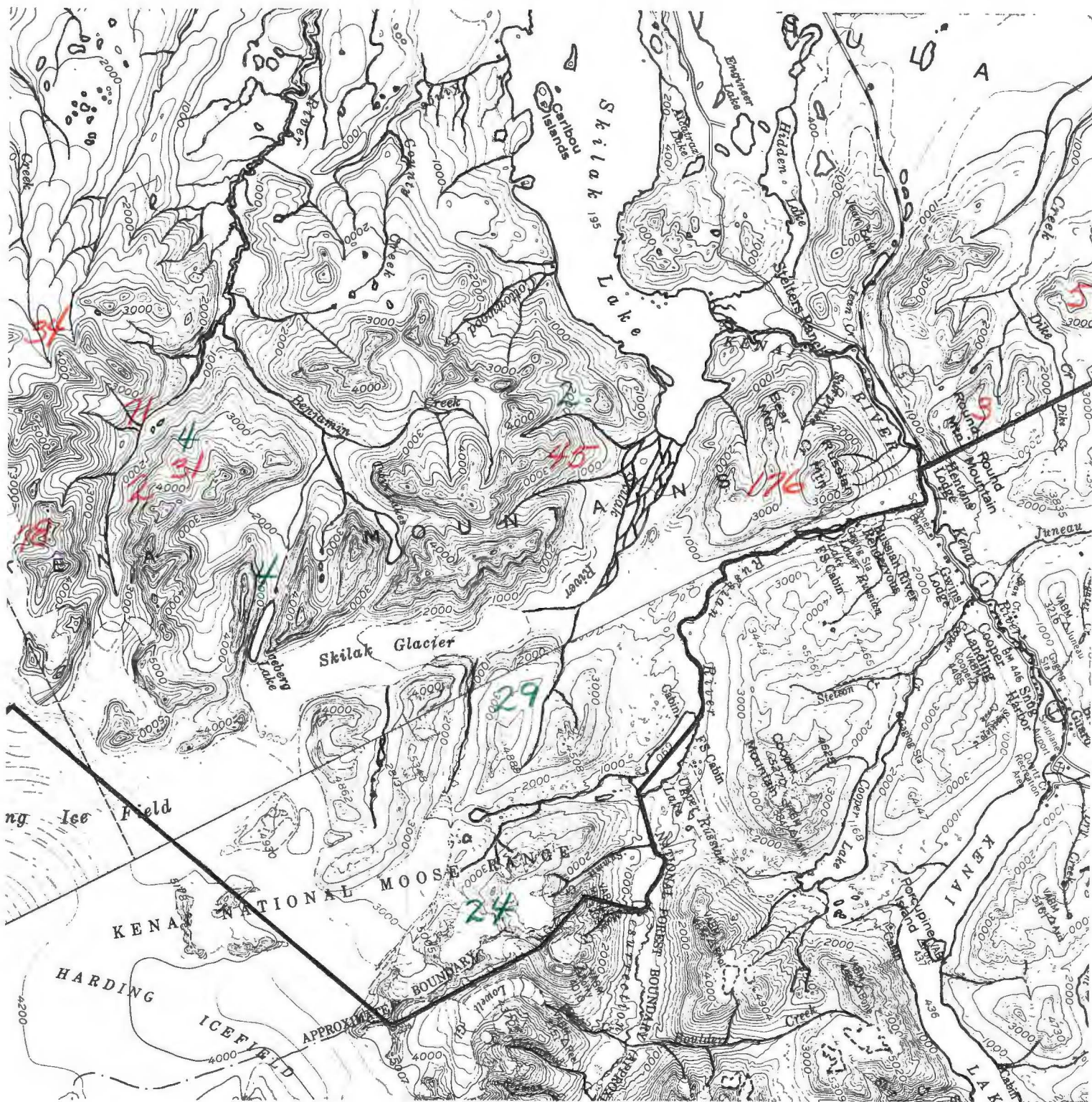
The aerial and ground counts conducted on Surprise Mountain were relatively similar both as to total numbers and composition. This would indicate that aerial observer can make a fairly accurate identification of the population with the exception of young rams and yearlings. Good yearling counts are greatly desired as they provide a good index for assessing the survival of lambs through the first winter.

### 2. Lambing

Several checks were made of the major sheep ranges in late May and June to determine the period of lambing. Weather conditions and other factors prevented sufficient coverage of these areas to completely evaluate the lambing period. On May 13, an aerial check of Surprise Mountain and the Indian Creek areas failed to reveal



Figure 4. Distribution of Sheep and Goats During the 1965 August Aerial Surveys.



Sheep ■  
Goats ■

TABLE 8. COMPOSITION AND DISTRIBUTION OF THE DALL SHEEP POPULATION ON THE KENAI NATIONAL MOOSE RANGE AS DETERMINED FROM AERIAL SURVEYS - August 4-6, 1965

AREA	EWES	LAMBS	RAMS		UNCLASSIFIED	TOTAL
			<sup>3+</sup> 4	<sup>3-</sup> 4		
Surprise Mountain	111	39	0	26		176
Skylak Glacier - Killey River	17	10	18	22	9	76
Killey River - N. Fork Indian Cr.	71	45	0	22	63	201
Between Forks	48	23	40	36	28	175
S. Fork to Tustumena Glacier	42	29	13	3	71	158
Tustumena Glacier - Sheep Creek	35	29	17	14	33	128
TOTAL	324	175	88	123	204	914

TABLE 9. COMPOSITION OF DALL SHEEP POPULATION ON THE KENAI NATIONAL MOOSE RANGE AS DETERMINED FROM GROUND COUNTS IN July, 1965

AREA	EWES	LAMBS	YEARLINGS	RAMS				FULL	UNCLASS	TOTAL
				<sup>1</sup> 4	<sup>1</sup> 2	<sup>3</sup> 4				
Surprise Mountain	83	44	16	17	13	0	0	0	6	179
Green Mountain	49	12	12	4	7	3	0	0	0	87
Blue Mountain - Killey River	93	34	19	7	5	2	0	0	0	160
TOTAL	225	90	47	28	25	5	0	0	6	426



any lambs. The first lambs were sighted near the North Fork of Indian Creek on May 28. A ground check in this area revealed two lambs with a total of 35 ewes. Both lambs appeared several days old.

On June 4 an aerial survey of both Forks of Indian Creek and Green Lake accounted for 282 adult sheep and 31 lambs. Most of the lambs were in ewe bands numbering from 2 to 15. On the same date 132 sheep were checked on Surprise Mountain without any lambs. It was assumed that a very poor lamb crop had occurred in this area; however, on June 18 another flight revealed 136 adults and 23 lambs, indicating that possibly parturition was quite late on Surprise Mountain. The total population was never tabulated in these early flights so the possibility exists that lambing had occurred earlier than indicated or ewes with lambs may have been missed because of their location. Much more flying time will be needed to determine the period and peak of lambing.

### 3. Winter Distribution

Aerial surveys on February 17 and 18, and again on April 15 revealed that sheep were quite scattered and broadly distributed over many portions of the Range. Most bands were found along the wind swept ridges of the North and South Fork of Indian Creek, and near Green Lake as well as on Surprise Mountain. The majority of sheep were well distributed in bands of 2-15 animals. Surprisingly the wintering areas were also major summer ranges. The exception being the lower elevation North of the North Fork to Killey River.

The area above Emma Lake is an important winter and spring range. Sheep remained in this location until about July 1 when they started moving toward the headwaters of the North Fork and toward Killey River. The hills east of the Upper Fanny River airstrip near Killey River are also important winter and spring ranges but rarely utilized in the summer. Areas utilized in the summer but very little in the winter are the headwaters of the Killey River and headwaters of the South Fork of Indian Creek. It appears then that many areas are both important winter and summer ranges. However, in the winter, only the wind swept ridges are utilized as the draws and depressions are covered with deep snows. These snow-covered areas will supply good feed in the summer as the snow melts.

### 4. Range Transects

Three transects were established on Surprise Mountain. These were placed at the southeast end of the valley draining Surprise Creek near the ledge overlooking Russian River.

Transects should be established throughout major wintering areas; however establishing these sites would be more feasible during



winter months. This will be accomplished this coming winter.

5. 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 Alaskan hunter is required to obtain a sheep harvest ticket prior to hunting. According to the records 36 rams were taken on the Moose Range. Three of these were below the  $3/4$  curl requirement and were seized. In addition one illegal ewe was taken.

The kill is considered average. Since the opening of the sheep season in 1957, the kill for each year has been the following:

<u>YEAR</u>	<u>SHEEP HARVEST</u>
1957	45
1958	27
1959	22
1960	18
1961	31
1962	31
1963	38
1964	24
1965	36

These are minimum figures and some years the harvest ticket was not required and a few no doubt remain unreported.

Six of the sheep were taken between the Tustumena Glacier and Sheep Creek; seventeen were taken between Green Lake and the North Fork of Indian Creek - mostly along the South Fork; four were taken from the North Fork to Killey River; four near Twin Lakes; one on Surprise Mountain and one near Fuller Creek. Another sheep was taken in Unit 15 south of the Moose Range boundary.

Green Lake again proved the most popular access area. Biological Aide Olson checked 45 hunters through this area the first week of the season. Other major hunting access points were Upper Funny River Strip, Twin Lakes, and Iceberg Lake. Three horse parties hunted between Tustumena and Skilak Lakes and one guide from Homer operated horses in the Fox River area.

Twenty-four of the successful hunters were residents of Alaska and the remainder non-residents. Two were from Germany.

Trophy Value

The Dall sheep of the Kenai are smaller than most of the sheep in the Wrangell and Chugach Mountains, however they are still of

high trophy quality and are hunted primarily for this purpose. The Kenai sheep usually have a tighter curl and less flare than the northern sheep.

Since sheep are hunted for trophy purposes it is imperative that we maintain a population supporting a fair percentage of good trophy animals. To evaluate the trophy quality as many heads as possible have been measured the past two years. Tables 10 and 11 give the length and base circumference of horns taken during the 1964 and 1965 season. Last year measurements were obtained from 11 sheep out of 24 killed, and this year 21 measurements were obtained from the 36 harvested. This year 70 percent of the sheep measured had horns of more than 30 inches in length compared to less than 40 percent last year. As can be noted in Table 10, quite a number of rams taken in 1965 measured over 35 inches, indicating a fair number of full curl trophy rams are still present in the population.

#### 6. Miscellaneous Information

Ground checks were made on Surprise Mountain on November 3 and 4. Most of the area was well covered by snow. Sheep moved freely between ridges. When passing through deep snow, sheep followed in single file, thus only the leading individuals encountered difficulties in moving.

During this period rams were exhibiting considerable rutting behavior; with head extended rams made short runs to ewes. Ewes did not appear receptive and actual copulation was not observed indicating the rutting period had just begun.

The Alaska Department of Fish and Game captured eighteen sheep from the Moose Range in May for transplanting to Kodiak. Six of these died soon after capture and reports indicate very few survived on Kodiak. Biologist Durris reported most were in fairly poor condition as green vegetation had just started appearing. This may have been the reason for poor survival.

Sheep were captured by use of a helicopter. One was taken from Surprise Mountain, seven from Benjamin Basin, and ten just south of the Killey River. Data obtained from some of the sheep captured is listed below:

DATE CAPTURED	LOCATION	SEX	AGE	EST. BODY MEASUREMENTS				HORN		RIGHT	
				WT.	SH.	HT.	T.L.	LEFT LENGTH	CIR.	LENGTH	CIR.
5/14/65	Surprise Mountain	F	2	57	30		50	5 1/8	-	5 1/4	
5/17/65	Killey River	M	4	110	31 3/4		53 1/4	21 1/2	11 1/2	21 1/2	11 1/2
5/17/65	Killey River	M	2	105	32 3/4		58 1/2	11 3/4	6 7/8	11 3/4	6 1/2
5/17/65	Killey River	F	8	110	32		57	11 1/2	-	11 1/2	-
5/18/65	Killey River	M	1	60- 65	-		-	-	-	-	-
5/18/65	Killey River	M	4	100- 110	-		-	-	-	-	-
5/18/65	Killey River	F	5	125	-		-	-	-	-	-
5/18/65	Killey River	M	2	54	28		50	5	-	-	4 3/4
5/18/65	Killey River	F	6	124	34 3/4		99 1/2	12	-	12	-
5/19/65	Killey River	F	2	-	29		50 1/2	-	-	-	-
5/19/65	Killey River	F	1	46	26		48	1 1/2	-	2 1/2	-

One dead lamb was found on Surprise Mountain July 3 near the steep slopes facing Skilak Lake. Only the legs remained and it was impossible to determine whether the lamb was killed by a predator or died naturally.

TABLE 10. HORN MEASUREMENT AND ESTIMATED AGES OF SHEEP TAKEN DURING  
THE 1965 SEASON ON THE KENAI NATIONAL MOOSE RANGE

RIGHT HORN		LEFT HORN		Estimated Age
Length	Base Cir.	Length	Base Cir.	
21 1/2	12 1/8	22	12 1/8	4
21 5/8	11 6/8	21 6/8	11 5/8	4
23 5/8	12	23 2/8	12	5
25 3/4	12 1/2	25 1/2	12 1/2	5
26	13 1/2	25 1/2	13	5
26 7/8	13	26 5/8	13	5
30 7/8	13 2/8	30 6/8	13	-
32 1/2	12 3/4	33 1/2	13 1/8	7
33 1/4	13 1/8	33 1/4	13 1/8	9
33 3/4	13	33 5/8	12 5/8	7
33	13	33 1/2	13 1/4	7
34 3/4	13	34 3/4	13	7
34 7/8	12 2/8	37 4/8	12 4/8	10
35 2/8	13	35 2/8	13 1/8	8
35 1/2	13	35	13	8+
36 2/8	13 4/8	33 6/8	13 4/8	11
37	13 3/8	37 1/4	13 4/8	9
37 4/8	12 5/8	36	13	9
37 4/8	12 5/8	38 1/4	12 5/8	9
38 2/8	13	35	13 3/8	8
39	13	36 3/8	13 1/8	8

TABLE 11 HORN MEASUREMENT AND ESTIMATED AGES OF SHEEP TAKEN DURING  
THE 1964 SEASON ON THE KENAI NATIONAL MOOSE RANGE

RIGHT HORN		LEFT HORN		Estimated Age
Length	Base Cir.	Length	Base Cir.	
27 1/4	12	27 1/4	12	6
27 1/4	12 1/2	27 1/4	12 1/2	5
27 5/8	11 1/8	27 3/4	11 1/4	7
28 3/8	11 1/2	28 3/8	11 5/8	-
28 5/8	13	28 1/8	13	6
28 1/2	12 1/4	28 1/4	12 1/4	5
29 3/4	13	29	13 1/2	5
31 3/4	12 3/4	32 1/2	12 1/2	8
34 3/4	12 3/4	31 1/8	12 3/4	-
35 1/2	12 1/4	35 1/2	12 1/4	-
36 1/4	13 1/2	36 1/4	13 1/2	7

### MOUNTAIN GOAT

The annual aerial mountain goat survey is conducted concurrently with the sheep survey. (Figure 4) Goats observed during the 1965 count, consisted of 25 kids and 94 adults for a total of 119. Most of the animals were again concentrated at the extreme south and northeast portion of the range. The area east of the Skilak Glacier contained 53, 6 were observed between Iceberg Lake and the Killey River, 2 in Benjamin Basin, 11 in the South Fork of Indian Creek, 33 between the Tustumena Glacier and Fox River, and 14 south of the Fox River.

Very little hunting pressure is exerted on the goat population, however most goats taken are killed near Iceberg Lake or Green Lake where they are more accessible. Goat numbers in these areas are very limited and the population should be closely managed. Possible hunting closure around Iceberg Lake would be justified in an attempt to increase the population.

Several individuals at Coho reported seeing goats near the Coho Road in September. Enough of these reports were received to indicate some reliability. In addition one goat was shot this fall near the mouth of Tustumena Lake. The area is nearly 30 miles from any mountain goat habitat. Extensive wanderings such as this have been previously reported. Several years ago two goats were killed along the Funny River Road.

No good data is available on the number of goats taken each year as harvest tickets are not required. However, goats were taken in the following places: Iceberg Lake 4, Green Lake 2, Tustumena Lake 1.

### BEARS

#### 1. Brown Bear.

The brown bear population on the Moose Range continues to be low with scattered numbers through the foot hills and the lowlands and a fair population near Upper Russian Lake. Several were sighted in the alpine areas above Funny River and the Caribou Hills.

During the spring moose calving season two single adults remained in the Moose River area, where they were seen feeding on calves. A sow with three yearlings was also sighted in this area.

A sow nursing four cubs was killed by Joe Paa in June near the junction of the lower Kenai River and Skilak Lake. He claimed self-defense. Biological aide Fleming and Protection Officer Bill Martin of the Alaska Department of Fish and Game were dispatched to the scene where they spent three days capturing the cubs. They were shipped to the Arctic Health Research Center in Anchorage for studies.



Each year more brown bears are killed on the Kenai in self-defense than are taken during the legal one-month September season. Only three bears were reported legally taken in Unit 15 during 1965.

## 2. Black Bear

Black bear continue to be fairly numerous throughout the Moose Range. Most are observed above timberline where the abundant berries provide ample food. Some bear are utilized for food purposes and a few for trophies but not significant portion of the total population.

## Caribou

Prior to the latter part of the last century the Kenai Peninsula was one of the important Stone caribou ranges in Alaska. During the 1890's a series of fires reduced much of the caribou habitat. A reduction of the caribou population ensued as the moose increased. By 1910 the caribou were considered nearly extinct. In that year, Andrew Berg of Kenai reported seeing two caribou. In 1912 Mr. Berg shot thirteen animals near Ptarmigan Head in the Caribou Hills. These are the last authentic reports of caribou on the Kenai Peninsula.

For the past fifteen years a re-introduction of caribou to the Moose Range has been considered and received some study. Areas which were considered potential sites for transplants were the foothills of the Kenai Mountains between Tustumena and Skilak Lakes, the Caribou Hills and the Mystery Creek area. In the past year additional checks of these areas were made. Because of accessibility and a few other factors, the Mystery Creek area was selected as a transplant site. A cooperative agreement between the Bureau of Sport Fisheries and Wildlife and the Alaska Department of Fish and Game was completed.

On May 2, 1965, fifteen caribou consisting of twelve females and three males were released at the Mystery Creek airstrip. Seven of the cows were pregnant when released and all but one yearling were over two years old.

Since the release date several reported observations have been received.

May	Large female, tideflats, Chickaloon River
June 24	Large bull and cow seen near Moose Point on several occasions
July 14	Two cows and calf reported at head of Devils Creek
August	Four reported near mouth of Swanson River
September	One lone caribou near Kalfonisky Beach Road.
September	One lone caribou two miles east of Kenai near River

Plans are to release additional caribou this spring.

D. Fur Animals, Predators, Rodents and Other Mammals

1. Coyote. Coyotes are common on the Moose Range and are often heard and seen in the Skilak Lake area. There appears to be a slight increase in population numbers.

Hunting for coyotes is popular and is both a recreational and economic use. Aerial shooting of these animals is no longer permitted on the Moose Range. The State of Alaska pays a \$30 bounty on coyotes. They reported a considerable increase in coyote bounties this year but no figures are available or actual number of coyotes bountied.

2. Beaver. The fall beaver survey was not conducted this year: It is a biannual survey.

We are still receiving reports regarding beavers killed during the 1964 earthquake. One person reported finding a beaver house that ice had pushed more than 30 feet from the lake.

3. Mink, Otter, Weasel, Lynx. Little is known about population changes of these animals. Variances in the number caught primarily reflects differences in the trapping effort.
4. Snowshoe Hare. No change is noticeable in the snowshoe hare population in general; however tracks appear more abundant near Skilak Lake. The hunting of these animals is a popular form of recreational use on the Range.
5. Wolves. Pilots occasionally report sighting a wolf on the Moose Range. Assistant Refuge Manager Thayer observed an animal on the ice while flying over Tustumena Lake in December. Two low passes over the animal revealed the positive identification of a wolf. Possibly these will now inhabit the Kenai.
6. Wolverine. Wolverines are not numerous but are common enough to be seen occasionally from the air. No change in the population of these interesting animals is apparent.
7. Marmots. The colony of marmots on Surprise Mountain seemed to be larger than in past years with a higher percentage of young in the population. Good colonies were also noted near Twin Lakes and southwest of the Upper Funny River Airstrip.

The first major exodus of marmots from their winter dens was noted on May 17 in the Twin Lakes area. Previous checks on April 27 and May 13 failed to reveal any marmots.

E. Hawks, Eagles, Owls, Crows, etc.

Usually 10 or 12 bald eagles winter along the Kenai River near the mouth of Skilak Lake. One active bald eagle nest was found about four miles up the Killey River, another on the Kenai River across from Dr. Fair's residence. An active nest was also observed on Two Island Lake by Thayer.

An osprey nest was active just north of Weed Lake along the Swanson River Road. Two young were observed in the nest on several occasions.

F. Other Birds

The usual number of small song birds were present in the spring and summer. Bank swallows seem to be increasing as the road cuts and gravel pits provide nesting habitat. The first yellowlegs and phalarope were observed on May 7. On May 18 an unusual number of robins were observed on the Engineer Lake feeding on a small black worm. The first loons were heard calling on April 29 and also the first wilson snipe was heard on this date.

Winter residents which are numerous are the boreal chickadee, black-capped chickadee, redpolls, and grayjays.

G. Fish

Sport fishing is one of the major recreational attractions to the thousands of visitors who enter the Kenai National Moose Range each year. Ice fishing was popular during the winter months with Hidden Lake receiving the most constant and intensive use. Watson Lake, Jean Lake, Forest Lake, Dolly Vardin Lake, and Rainbow Lake were also ice fished. Regulations now permit lake fishing throughout the year thus allowing fishing to continue through April, when ice conditions permit.

The lakes in the Canoe System were fished quite intensively with Canoe and Sucker Lakes receiving the most pressure.

Silver salmon fishing was good in August on the Swanson and Kenai Rivers; however most fishing effort during the summer was directed toward catching rainbows and dolly vardin trout.

A cooperative program with the Alaska Department of Fish and Game was undertaken this year to survey a number of lakes in proposed recreational areas to determine their sport fishing potential. Biological aide Olson employed by the Refuge and Dave Wasfall spent June 15 to July 15 in the proposed Swanson River canoe area sampling lakes. The results of these surveys were used to help determine canoe routes. Canoe trails are

routed through the better fishing lakes when possible. Alaska Department of Fish and Game personnel also sampled several lakes near the Swan Lake Road and Swanson River Roads. The results of these surveys are shown in Table 12.

#### H. Disease

No report

### III. REFUGE DEVELOPMENT AND MAINTENANCE

#### A. Physical Development.

Beautification of the Kenai Headquarters Site received special attention this summer. A row of well formed spruce trees, 8-12 feet tall, were placed along the northern boundary of the Kenai site. Six additional trees were strategically planted near the dwellings and office. Driving and parking areas received additional gravel. Heavy, sturdy log work was installed along roadways. A new graveled storage yard was created with the old one being cleaned up and seeded to grass. The project resulted in many favorable comments from local people. Installation of incandescent yard lights provides safety and illumination during the many hours of darkness.

Erosion control of highway cut banks was one of the major projects again this year. Prior to spring breakup, the timber and brush on two slopes near mile 60 on the Sterling Highway were cleared. This allowed the ground frost to dissipate earlier. Before and during breakup the two cut banks, repaired the previous year, were damaged by thawing action. These slopes were repaired in June. Resurfacing of the earthquake-damaged Sterling Highway deterred our erosion control work this summer. Our efforts were diverted to correcting the silting of Hidden Creek where slopes were cut to a 3:1 gradient before applying fertilizer and seed. A nice stand of grass emerged by the end of the season. In the fall, the State of Alaska, Division of Highways and the Refuge graded one of the largest cut banks near Jean Creek on the Sterling Highway in preparation for early seeding next spring. Just prior to freeze-up grading of the cut bank on the Skilak Road near Jean Creek was begun. Figure 5 and Table 13 shows a sketch and gives a summary of erosion work concluded.

Work was partially completed on repairs to the Kenai Headquarters wash house. A cement block foundation was constructed along with replacing many of the heavy wood sills and joists. Some interior modernization and exterior sheathing was begun.

A new side band radio for Service frequencies was installed September 8. With similar equipment at other stations radio communications should improve considerably.

**TABLE 12. LAKES SURVEYED ON THE KENAI MOOSE RANGE IN 1965 BY FEDERAL AND STATE PERSONNEL**

LAKE SURVEY RESULTS -1965							
Lake	Surface <sup>1</sup> Acres	Max depth (Ft.)	Species	No. fish	Fork Length (mm)		Catch/hour <sup>2</sup>
					Range	Mean	
Woods	48	26	Char	11	269-524	369	0.24
			RB	5	314-380	344	0.11
			SS	2	216-217	216	0.04
House	9	20	RB	12	177-390	274	0.59
			SS	1		182	0.05
			SK	8	264-414	344	0.40
Redent	18	16	RB	10	233-478	362	0.43
			SK	5	160-260	215	0.22
Hat	28	18	RB	17	164-406	276	0.85
			SK	8	386-510	425	0.40
Lo	20	30	RB	10	190-434	275	0.49
			SK	7	218-284	258	0.35
Lonely	53	47	Char	25	204-370	289	0.52
			RB	3	202-297	244	0.07
Kuvinsk	70	52	Char	9	195-357	272	0.21
			RB	4	332-499	380	0.09
			SS	1		212	0.02
Paddle	105	40	Char	55	196-401	307	0.42
			RB	35	155-335	249	0.27
			SK	5	428-490	438	0.04
			SS	1		181	0.01
Yagok	30	35	RB	2	550-634	592	0.04
			SK	6			0.13
Channel	98	50+	RB	22	199-361	279	0.48
			Char	21	287-394	315	0.45
Lure	43	37	Char	12	230-414	323	0.49
			RB	2	325-395	360	0.08
			SK	1			0.05
Pot	10	20	Char	5	321-409	229	0.21
			RB	4	194-261	382	0.17
			SK	6			0.25

TABLE 12. (continued) page 2

Lake	Surface Acres	Max depth (Ft.)	Species	No. Fish	Fork Length (mm)		Catch/hour
					Range	Mean	
Pond	23	30	Char	4	206-442	344	0.17
			RB	1		315	
			SK	4			0.17
Lost	48	65	Char	7	218-392	305	0.14
Chum	8	23	RB	4	262-282	274	0.17
			SK	2	420-485	452	0.08
Odd	5	25	RB	3	266-537	383	0.13
			SS	1		157	0.04
Drake	165	105	RB	24	175-328	224	0.37
			Char	1		305	0.02
Arctic Loom	30	23	RB	9	209-505	377	0.09
			RB	9	130-260	181	0.09
Alva	38	40	RB	7	158-390	227	0.10
Waterfowl	77	46	SS	17	149-180	164	0.26
			Char	15	270-470	368	0.23
			RB	6	200-344	270	0.10
Spinner	13	27	RB	30	174-335	237	1.25
Wyrob	27	60	RB	19	163-374	283	0.41
			Char	1		405	0.02
Lemon	15	27	RB	1		428	0.04
Pad	8	16	SS	8	173-251	212	0.38
Falcon	238	56	Char	29	206-400	301	0.32
Olafjord	48	29	Char	6	262-468	433	0.23
Eider	113	58	Char	19	249-370	301	0.38
			SK	7	245-540	398	0.14
Pepper	430	42	SK	7	136-407	271	0.47
			SS	3	168-200	184	0.04
			SK	19	160-450	343	0.28
Campers	103	23	RB	23	216-483	351	0.29
Gee	310	41	RB	32	172-361	270	0.50
			Char	3	355-436	398	0.05
			SS	2	183-205	194	0.03
			SK	26	173-442	329	0.41



TABLE 12. (continued) page 3

Lake	Surface Acres	Max depth (Ft.)	Species	No. Fish	Fork Length (mm)		Catch/hour
					Range	Mean	
Swanson	320	41	Char	9	340-510	449	0.16
			RB	8	178-348	220	0.14
			SK	18	166-458	312	0.33
Dog	23	57	Char	7	290-448	343	0.31
			RB	2	235-450	342	0.08
Polaski	15	35	RB	2	327-367	347	0.09
Skookum	45	60	RB	46	156-493	252	0.47
			Char	24	190-412	312	0.25
Silver	153	40	RB	34	180-465	305	0.46
			SS	6	142-170	156	0.08
			Char	1		200	0.01
Breeze	23	30	RB	13	276-420	344	0.27
Amerta	33	26	Char	24	282-445	342	0.46
			RB	15	164-379	238	0.29
			Char	14	215-385	330	0.20
Sabaka	75	58	Not sampled - same species as Rodent and Hat				
Pan	10	17	Not sampled - same species as Lonely Lake (Rainbow & Char)				
Ballon	10	21	Not sampled - same species as Hot and Pond Lakes (Rainbow & Char)				
Gourd	10	22	Not sampled - same species as Hot and Pond Lakes (Rainbow & Char)				
Antler	123	53	No fish taken				
Wonder	92	24	No fish taken				
Snowshoe	190	84	No fish taken				
Otolith	7	20	No fish taken				
Kalun	46	26	No fish taken				
Redpoll	30	23	No fish taken				
Berry	53	19	No fish taken				
Leaf	65	23	No fish taken				
Lilli	62	28	No fish taken				
West Lilli	13	14	No fish taken				
Alum	18	14	No fish taken				
Echo	28	43	No fish taken				

<sup>1</sup> Acreages were determined by map grids from U.S.G.S. maps (1:63, 360

<sup>2</sup> Catch/net hour - 125 ft variable mesh (3/4 to 2 inches)

Fig. 5 SOIL & MOISTURE PROJECT  
JEAN LAKE AREA

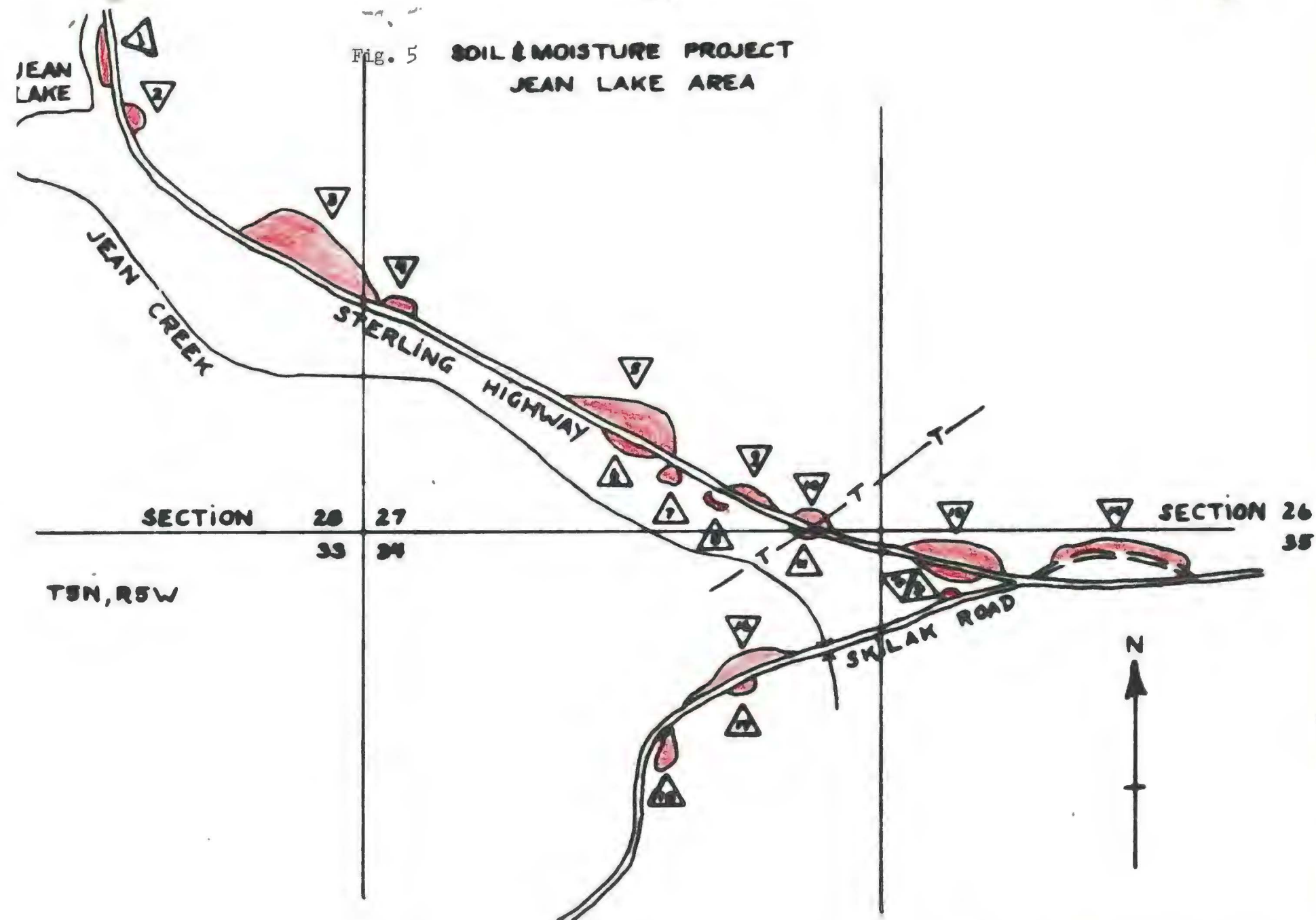


TABLE 13. SUMMARY OF EROSION WORK COMPLETED ALONG HIGHWAY CUTBANK  
NEAR JEAN LAKE

Project Number	LOCATION		Work Done or required
	Mile Post	Sterling Hwy.	
1	60.4		Log cribbing installed. Experimental browse planted. Needs to be stabilized by planting.
2	60.3		Cut bank graded, fertilized and seeded in 1964. Repaired in 1965 with jute mesh added.
3	59.9		Same as above.
4	59.7		Trees removed under contract 1965. Needs sloping, fertilizing and seeding.
5	59.2(N)		B.S.F.&W. and State Highway Dept. sloped hill fall 1965. Needs fertilizer and seeding.
6	59.2(S)		Needs sloping, fertilizing and seeding. Two days work completed in fall 1965.
7	59.1		Spoil pile from #5. Needed fertilizing and seeding
8	59.0		Spoil pile seeded and fertilized 1964.
9	58.9		Cutbank requires sloping, seeding and fertilizing
10	58.8 (N)		B.S.F.&W. removed trees in 1965. Needs sloping, fertilizing and seeding.
11	58.8 (S)		Cutbank requires sloping, seeding, and fertilizing.
12	58.5		Same as above
13	58.6		Same as above
14	58.3		Spoils from #3. Requires leveling, fertilizing, and seeding. Make into trailer park.
15	58.6	Skilak Rd.	Cutbank requires sloping, fertilizing, and seeding.
16	59.1(N)		Same as above. Major part of sloping completed fall of 1965 under contract.
17	59.1(S)		Fill from #16 - required fertilizing and seeding.
18	59.3		Barrow area requires leveling, fertilizing and seeding.



The Refuge Headquarters was connected to the Kenai City Water System in October.

Neighborhood Youth Corpsmen were utilized on major projects in our shop during December.

Extensive improvement to our present campgrounds continued throughout the summer. The enlargement and upgrading of the Hidden Lake campground was completed. A number of new individual camping units were constructed at this site, graveled and furnished with picnic tables, fire grates, and garbage facilities. The new units and adjacent road system were separated with appropriate log work. This forty unit campground also provides parking facilities for additional campers during crowded weekends and holidays.

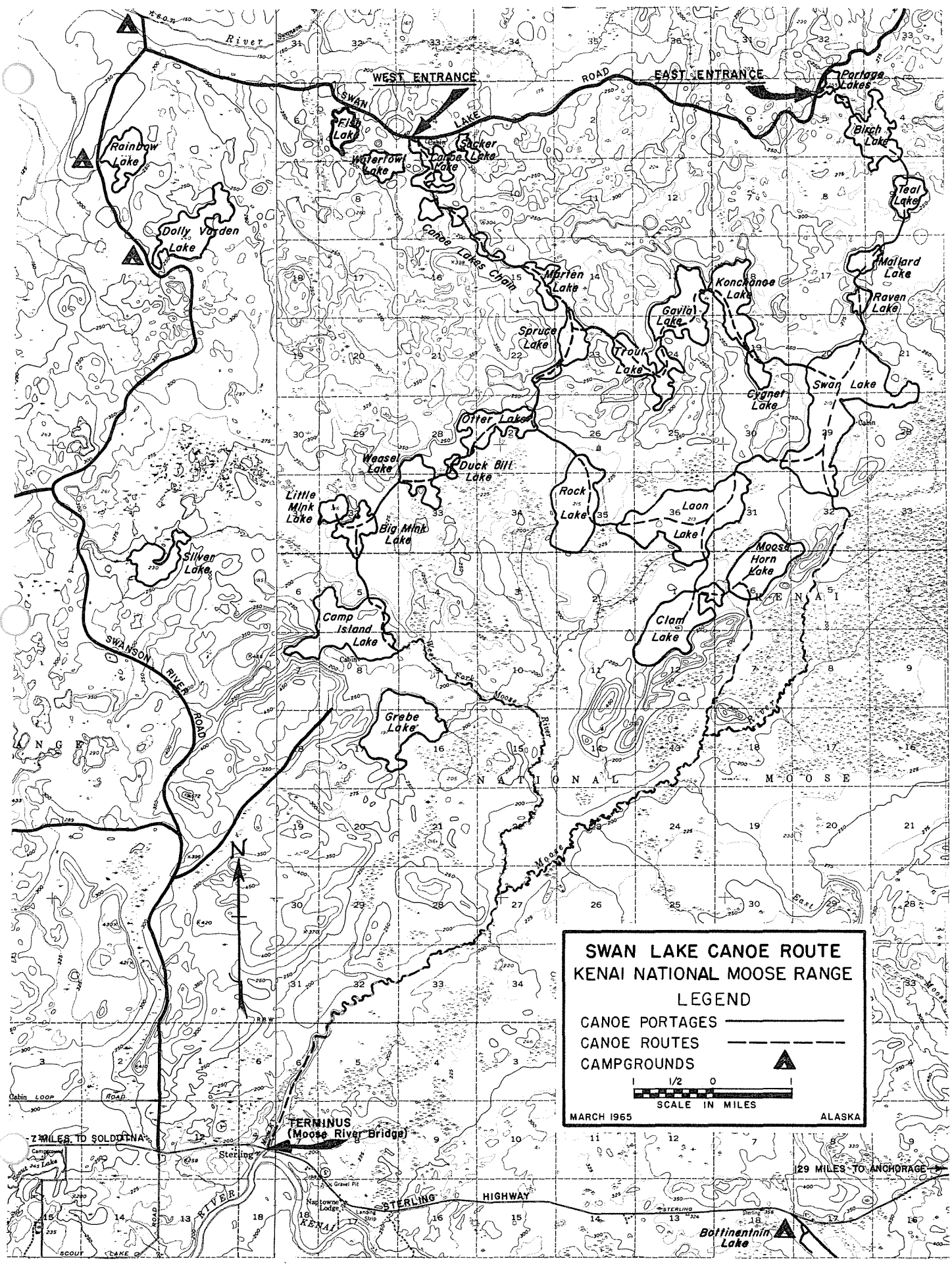
Fire grates were constructed by the staff and a contract let for the fabrication of thirty picnic tables. These additional tables and fire grates were installed as needed at campgrounds and picnic sites.

Bill's Garbage Service of Kenai was contracted for weekly campground garbage collection during the summer season. The garbage truck with a hydraulic bin lift provided removal of garbage from twenty campgrounds and waysides at a cost of \$100 per trip.

A horse trail originating at Funny River road, six miles east of Soldotna, was constructed a distance of 12 miles to the Upper Funny River area. Access to this upland wilderness was enjoyed by numerous hikers and horse riding enthusiasts. Upon completion, this trail will provide travelers access to the vast treeless areas high in the Kenai Mountains.

A 15 mile addition to the existing Swan Lake Canoe Route was constructed and all new portages marked. This 60 mile canoe system now connects twenty-nine lakes with portions of the Moose River and provides excellent outdoor recreational opportunities for the sport fisherman and canoeing enthusiast. A map is provided as a handout for canoeists. (Figure 6)

A half-mile spur road to Paddle Lake from the Swan Lake Road was begun in late fall. Cold weather prevented its completion, therefore graveled will commence next spring. This access road to the new Swanson River Canoe Route will also provide a parking and lookout area. The canoe route will connect a minimum of thirty lakes and 72 miles of waterways and portages. When completed, canoeists may travel through a series of lakes and portages to the headwaters of Swanson River and float downstream to the river terminum 50 miles distant.



**SWAN LAKE CANOE ROUTE**  
**KENAI NATIONAL MOOSE RANGE**  
**LEGEND**

CANOE PORTAGES ————▲—————  
CANOE ROUTES - - - - -  
CAMPGROUNDS ▲

1/2 0 1  
SCALE IN MILES

MARCH 1965 ALASKA

#### ADDITIONAL INFORMATION

Excellent fishing is found in all lakes of the Canoe System with the exception of Birch, Teal, Mallard, Raven, Otter, Big Mink, and Portage Lakes.

Rainbow, Dolly Varden, and steelhead trout; red, silver, king, chum and pink salmon are found in the lakes and streams.

One day's canoeing is required to reach Gavia Lake by either the East or West Entrance. This particular lake furnishes excellent rainbow fishing and a fine island campsite.

The entire Canoe System (60 miles in length) can be traveled in less than one week, however, leisurely travel will provide many additional days of excellent fishing and camping.

Portages are usually short and over level ground, the longest is about one-half mile in length.

Rough water is seldom a problem as most lakes are small and sheltered by surrounding trees.

Camping sites are available in wilderness-type surroundings, with no restrictions other than "good-housekeeping" required. Please ~~burn and bury ALL cans and trash or~~ carry refuse to sites provided.

Campfires are dangerous, especially in moss or peat areas which allow fire to creep underground. Be certain every portion of your fire is extinguished before leaving a camping site.

Hunting and fishing must be conducted in accordance with Alaska State Fish and Game regulations.

PLEASE DO NOT DESTROY BEAVER DAMS. They maintain proper water levels in the lakes and streams.

For additional information, write or contact:

Refuge Manager  
Kenai National Moose Range  
Box 500  
Kenai, Alaska 99611

Trails were constructed to four lakes bordering the Swanson River Road. These lakes, several miles apart and seldom visible from the road, now provide fishing enthusiasts access to lakes seldom before visited. Ample parking areas and sign markers are planned for each lake entrance.

In mid-November several local youths, personnel of the Neighborhood Youth Corps, were used to assist in construction of portages throughout the canoe system. These youths also assisted in the construction of numerous wooden signs required for use in campgrounds and along canoe routes.

### B. Plantings

Fifty freshly cut willow, aspen, cottonwood, and birch shoots were planted on a gravel-sand highway filled September 1964. The leaves had turned to fall colors the week prior to planting. Twenty-five plants of each species were also planted on a silt outback. The results this summer were:

#### SURVIVAL OF FALL PLANTINGS OF HARDWOOD SHOOTS

	Gravel-Sand Area (percent)	Silt Area (percent)
Willow	30	0
Cottonwood	54	16
Aspen	0	0
Birch	0	0

Indications are that the survival rates of cottonwood and willow on the gravelly area are sufficiently high to warrant extensive plantings.

Many gravel fills and cuts along the Refuge road system, particularly those now devoid of vegetation, may benefit from this type of fall planting. Wind erosion of finer soil particles would be reduced. An additional benefit of this work would be the beautification of roadsides.

On May 17 about one hundred pounds of birch seed were aerielly distributed using a Super Cub. Areas seeded were:

- (1) Alaska Natural Gas Pipeline from Naytowns boundary eastward to No Name Creek.
- (2) North half of the Engineer Lake Burn. Seed was collected in the fall of 1962.

### C. Collection Receipts

Seed and Fertiliser purchased for soil and moisture erosion control work is reported on NR-7.



#### D. Control of Vegetation

Two D-8 tractors pulling Flesco roller choppers within the 1926 burn, near Slikok Lake, rehabilitated about 527 acres. Work was completed from January through March. Approximately six thousand acres have now been improved using heavy tractors with various attachments in the past several years. Costs using the roller choppers averaged about \$3.50 per acre. Less than one thousand acres remains to be treated in the 1926 Burn.

##### Chemical

Experimental herbicide plots in the Naptowne area of the Moose Range were established in June 1964. This is just one of numerous studies to economically create and maintain moose habitat. The main objective this time was to eliminate young spruce trees competing with desirable hardwood browse in the 1947 Burn area.

Common weed killers, 2,4-D and 2,4,5-T used separately and in a mixture at various concentrations were sprayed on twenty four plots. Water or diesel fuel was used as a carrier for the herbicide. The plots were 1/100 acre in size. (Table 14)

Evaluating the effect on vegetation was accomplished a full growing season later, in September 1965.

The herbicides were manufactured to control broad leaf plants. Personal knowledge indicated that it would also be useful on the narrow leaf spruce, especially if applied during the peak of the growing season. By applying a stronger concentration of the chemicals than recommended, a top kill of the hardwoods was achieved. This prevented translocation of the herbicide to the root system, which insured resprouting of the desired broad leaf browse.

A 50-50 mixture of the herbicide at a concentration of 4 pounds of acid equivalent per acre proved most feasible. Using a water carrier provided a 64 percent mortality on spruce. Cost of materials amounts to \$2.40 per acre. Aerial spraying, depending on the acreage covered, is estimated at \$5 per acre. This is comparable to mechanical treatment costs using heavy tractors. A season's work using chemical treatment could be completed in a few days, certainly is an added benefit.

#### E. Planned Burning

No planned burning was accomplished. Several areas received aerial reconnaissance in anticipation of doing some experimental control burning in 1966. The nearby U.S. Forest Service offered aid in such experimental burning, which will also be of help in training fire fighters. Re-burning

Table 14.

Percentage of Plants Killed by Herbicide

<u>Plot No.</u>	<u>Acid EquiVlant Per Acre</u>	<u>Percent 2,4-D</u>	<u>Percent 2,4,5-T</u>	<u>Carrier</u>	<u>Percent Mortality</u>		<u>Cost Herbicide &amp; Carrier</u>
					<u>Hardwood</u>	<u>Spruce</u>	
1.	1	100	0	W	0	0	\$ .40
2.	2	100	0	W	0	0	.80
3.	3	100	0	W	73	0	1.20
4.	4	100	0	W	100	0	1.60
5.	1	75	25	W	50	0	.50
6.	2	75	25	W	43	0	1.00
7.	3	75	25	W	43	0	1.50
8.	4	75	25	W	67	0	2.00
9.	1	50	50	W	29	0	.60
10.	2	50	50	W	100	0	1.20
11.	3	50	50	W	60	29	1.80
12.	4	50	50	W	75	64	2.40
13.	1	100	0	DF	3	0	5.40
14.	2	100	0	DF	63	10	5.80
15.	1	75	25	DF	2	0	5.50
16.	2	75	25	DF	20	13	6.00
17.	3	75	25	DF	94	45	6.50
18.	4	75	25	DF	80	25	7.00
19.	3	100	0	DF	27	13	6.20
20.	4	100	0	DF	0	26	6.60
21.	1	50	50	DF	33	18	5.60
22.	2	50	50	DF	33	40	6.20
23.	3	50	50	DF	67	26	6.80
24.	4	50	50	DF	32	59	7.40

W - Water

DF - Diesel Fuel

of selected areas may be the most economical means of promoting moose browse within the 1947 Burn.

F. Fires

Skilak fire guard station was manned by Bureau of Land Management personnel Charles Holcomb from April 10 to June 20 and Mr. and Mrs. Willbanks from June 20 to September 1. No fires occurred on the Range, though there were several on private lands nearby.

IV RESOURCE MANAGEMENT

A. Fur Harvest.

During the 1964-65 trapping season seventeen trapping permits were issued. Six of these trappers were active and reported a total catch of seventy-five animals:

Beaver	6
Mink	15
Coyote	11
Lynx	24
Otter	3
Weasel	10
Wolverine	6
TOTAL	<u>75</u>

Two trappers did not report their catch. Extremely cold weather interrupted by occasional thawing conditions was partly responsible for the reduced effort and fur catch this year. Last year 333 fur animals were reported taken.

B. Timber Removal

Timber harvest data is reported on NR-11. The Kenai Timber Management Plan was completed and is awaiting approval. Several meetings were held with representatives of a proposed Japanese pulp chip mill in Homer. Construction of the plant is scheduled for the summer of 1966. Pulp timber from the southern part of the Range may help supply this mill.

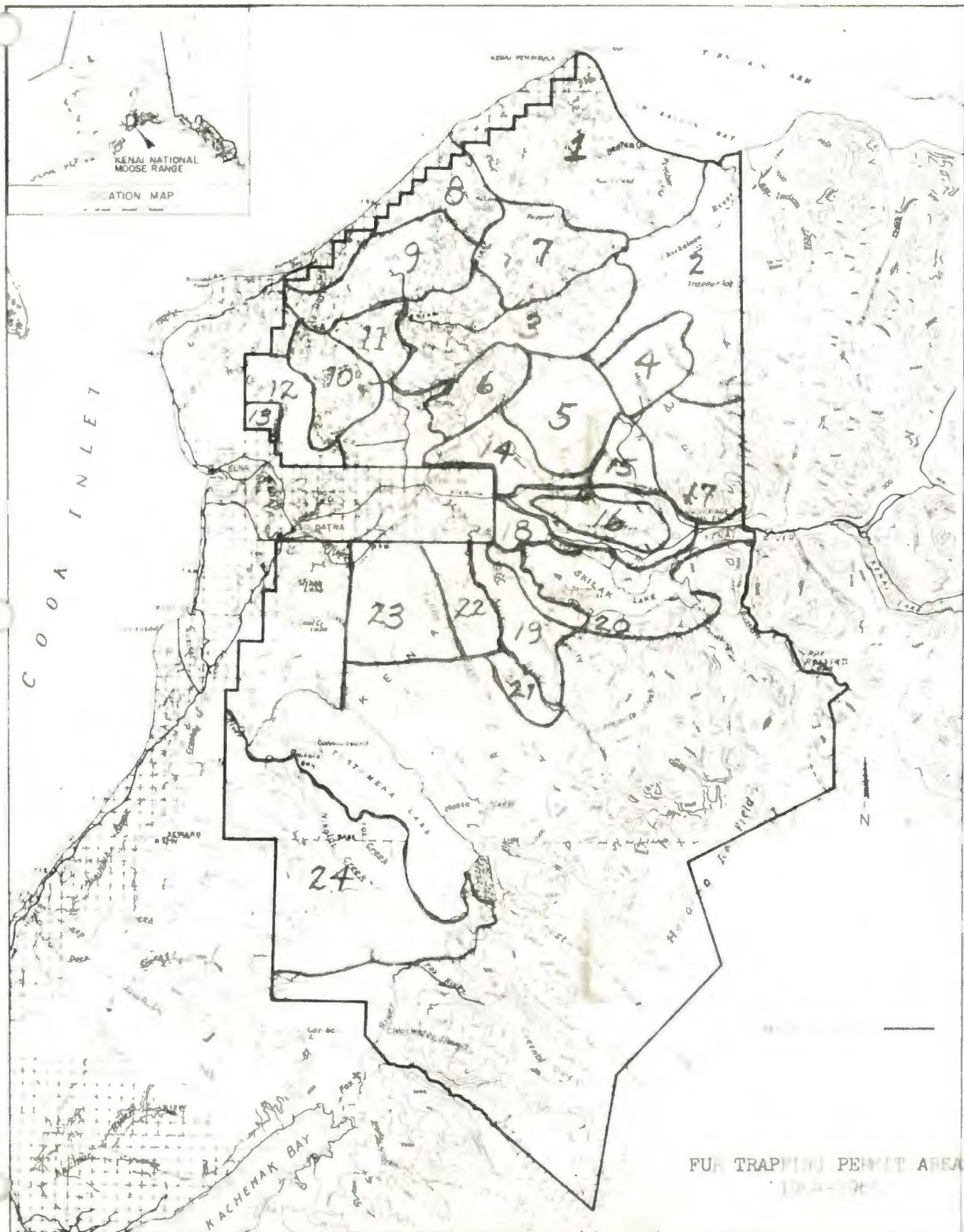
For the first time in several years, Christmas trees were sold on the Range. This helped supply the local and Anchorage areas.



# KENAI NATIONAL MOOSE RANGE

ALASKA

U.S. DEPARTMENT OF AGRICULTURE  
BUREAU OF LAND MANAGEMENT



FUR TRAPPING PERMIT AREA

1964-1965

Drawn by the Bureau of Engineering  
Base map from 1964  
Projection: Albers

Scale: 1 inch = 10 miles  
MEASURES  
INTERNAL: 1000 FEET

1964 ALA 367 474



C. Commercial Fishing

Two commercial fishermen conducted a commercial fishing venture in Skilak Lake from November 1 through December 17.

Using eight 50 fathom gill set nets, they took 2,254 lake trout, 1,323 white fish, and 910 char. These fish were sold to Anchorage markets at seventy-five cents per pound.

Approximately 150 rainbow trout and 135 salmon were also taken. These fish were donated to charity.

D. Other Uses

Standard Oil Company of California, under S.U.P. #32,905, paid for and removed the following amount of gravel at 5 cents per cubic yard:

DATE	CUBIC YARDS	AMOUNT
3/10/65	7,171	\$358.55
4/19/65	5,667	283.35
5/27/65	2,527	126.35
7/6/65	492	24.60
8/13/65	527	26.35
9/7/65	360	18.00
11/5/65	452	22.60
<b>TOTAL</b>	<b>17,196</b>	<b>\$ 859.80</b>

On January 14, H. I. Campbell was issued S.U.P. #32,938 to operate a ferry near the Kenai - Russian Rivers for a fee of \$100.

The following commercial tent camp site permits were issued:

PERMIT NO.	DATE	PERMITTEE	NO. SITES	FEE
65-03	6/1/65	Alaska Bush Carrier	5	\$50.00
65-06	6/10/65	Lloyd E. Samsel	1	10.00
65-02	6/23/65	Wm. Cunningham	5	50.00
		Alaska Air Guides		
65-01	6/25/65	Marshall Farmer	3	30.00
65-02	7/14/65	Jim's Flying Service	4	40.00
			<b>18</b>	<b>\$180.00</b>

Special Use Permit - KEN 3-66 was issued to Joe Blackard on November 15 to use lands near Tustumena Lake to salvage a sunken aircraft. No fee was assessed.

### E. Oil Operations

The U.S. Supreme Court upheld the actions of the Secretary in the *Talman vs Ull* case early this year. This decision cleared oil and gas leases previously issued to unit operators on the Moose Range. Oil companies halted exploratory operation on the Range for over one year waiting for the decision. Following these favorable results, Standard Oil Company of California drilled a successful gas well about 5 miles north of the Swanson River Oil Field. Birch Hill Unit #22-25 well was capped and application made for a discovery well in this new gas field.

Standard contracted with Union Oil Company, operators of the gas field south of Kenai, to supply approximately 100,000,000 cubic feet of gas daily to repressurize the Swanson River Oil Field. This will prolong the life of the field and also permit a greater percentage of oil recovery from the sand and gravel structure. To accomplish the delivery, a pipeline was laid from the Kenai gas field to Nikishka and then an additional line was installed following the Kenai Pipeline to the oil field. After an intensified summer construction program the pipeline became operational in late fall.

To utilize the gas in the Swanson River field, a several million dollar compressor plant is nearing completion; this is in addition to the plant constructed in 1964. Converting oil wells on the edge of the field for gas injection along with the accompanying heavy pressure pipelines has provided a busy construction season.

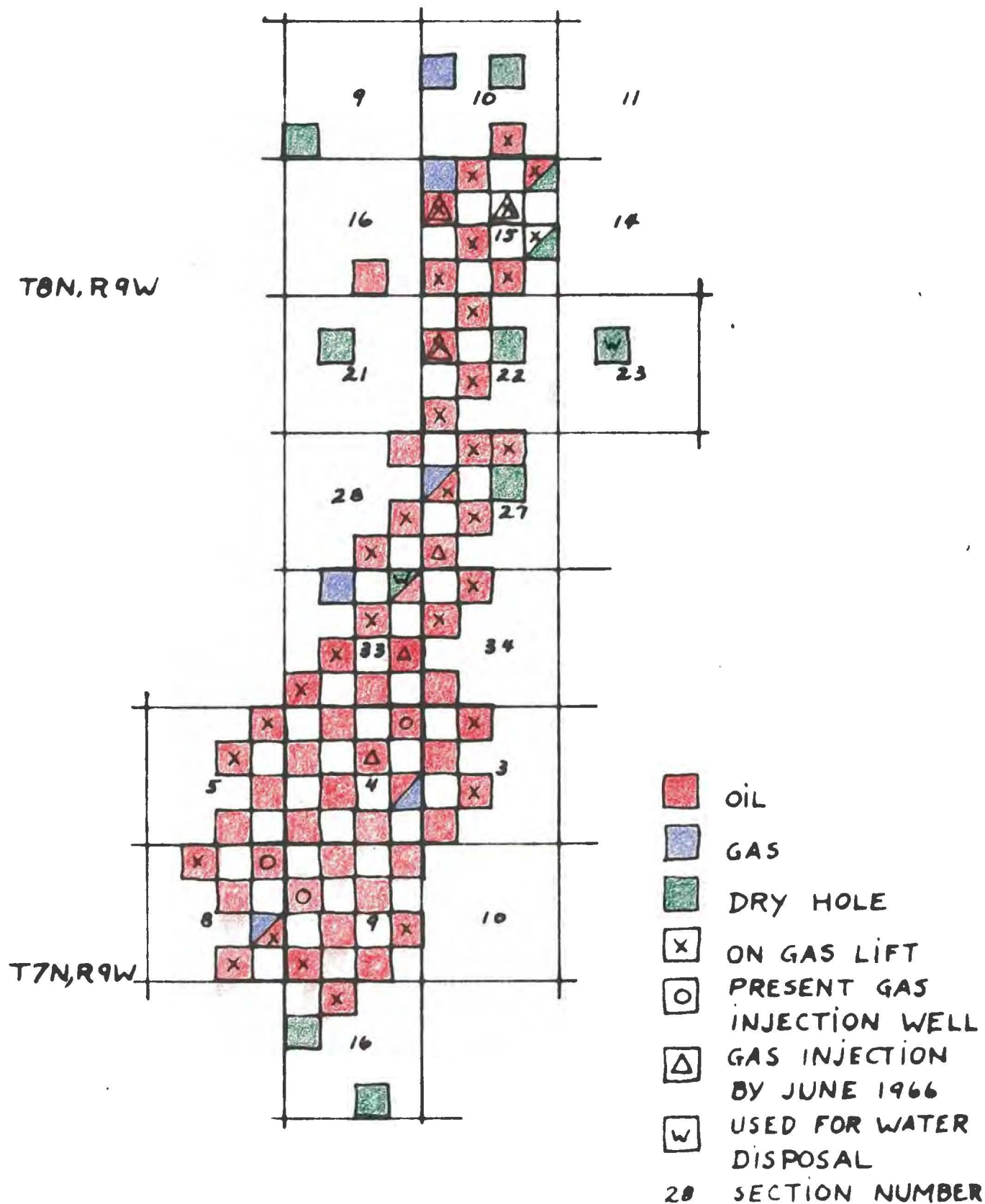
Gas production from six wells in the Swanson River Field has gradually decreased from 22 million cubic feet daily in 1963 to 13 million in January 1965 to 10 million this past November. On November 24, Standard Oil Company started purchasing gas to boost their reinjection rate to 30 million. With the completion of the new plant this coming spring, they will be pressurizing the field at a rate close to 100 million cubic feet daily.

Crude oil production is stabilized at 30,000 barrels daily. Wholesale value of this crude oil is over \$36 million dollars annually.

An oil drilling rig, late in December, moved into Naptowne Unit #24-8. This site is approximately 10 miles southeast of the present oil field.

Standard Oil Company completed about 48 miles of seismic lines utilizing heavy bulldozers to build these trails prior to spring breakup. The

# SWANSON RIVER OIL FIELD ON THE KENAI NATIONAL MOOSE RANGE



seismic exploration work was centered about seven miles east of the present oil field and near Gray Cliffs, paralleling Cook Inlet. Clean up work on the trail was completed in mid-summer by Walt Peterson. Several areas along the trail required fertilizing and planting of willow shoots. The unearthing of trash near winter seismic camps by bears was a problem. Exploration companies are now required to remove their trash from the Range.

On April 1, a large oil storage tank overflowed, but oil spillage was contained within the surrounding dike. Clean up and replacement of faulty valves, with signal devices, was accomplished quickly. On May 27, the exhaust pipe of a large gas compressor caught fire. Damage to the building amounted to several thousand dollars.

Standard Oil Company of California, Unit Operators of the Swanson River Oil Field, continued our recommended program of revegetation for the third year. All areas previously seeded were refertilized using 400 pounds of 8-32-16 per acre. This involved about 400 acres. An additional 180 acres were graded, fertilized and seeded on abandoned areas. Much of the new seeding was on the Swanson River Road right-of-way. Approximately \$40,000 was spent this year by Standard Oil. Their cooperation and quality of work were excellent. A visit to the oil field is quite impressive, when compared to the condition of the area four years ago.

## V. FIELD INVESTIGATIONS

### A. Progress Report

#### 1. Permanent Browse Plots

Moose browse utilization is indicated by measuring annual growth of permanently tagged sample plants after the growing season and by following browsing during the winter. Spring measurements were made on April 19 and 20.

Species	PERCENTAGE OF BROWSE USED ON PERMANENT PLOTS			
	YEAR			
	1962	1963	1964	1965
Willow	98	23	65	94
Kennel Birch	92	7	71	92
Dwarf Birch	71	14	3	40
Aspen	31	0	0	10
Cottonwood	0	0	0	14
Average	69	9	40	63

Table 15 summarizes the spring measurements on permanent plots, while Table 16 covers the fall period.



TABLE 15

Browse Utilization - Permanent Forage Plots

Plot No.	Species	Location	Inches of Forage		Forage Used (Inches)	Percentage of Use	
			Nov. 1964	April 1965		1965	1964
1.	Willow	Kasilof	68	0	68	100	0
3.	"	"	28	0	28	100	0
4.	"	"	200	30	170	85	86
5.	"	"	370	22	348	94	90
8.	"	Skilak	848	52	796	94	94
10.	"	"	782	30	752	96	43
13.	"	Sterling	24	12	12	50	21
14.	"	"	36	2	34	94	71
15.	"	Skilak	100	8	92	92	86
4.	Kenai Birch	Kasilof	1,350	50	1,300	96	79
5.	"	"	1,468	172	1,296	88	80
6.	"	"	802	64	738	92	32
9.	"	Kenai	0	0	-	-	-
9.	Dwarf Birch	Kenai	86	14	72	84	15
13.	"	Sterling	144	142	2	1	0
14.	"	"	286	154	132	46	0
5.	Aspen	Kasilof	62	0	62	100	0
7.	"	Skilak	578	578	0	0	0
8.	"	"	442	442	0	0	0
10.	"	"	186	184	0	0	0
11.	"	"	216	216	0	0	0
12.	"	"	162	162	0	0	0
14.	"	Sterling	116	10	106	91	0
15.	Cottonwood	Skilak	1,578	1,352	226	14	0

TABLE 16

Permanent Forage Plots - Annual Growth  
Measured October 29 and November 1-2, 1965

<u>Plot No.</u>	<u>Species</u>	<u>Location</u>	<u>No. of Leaders</u>	<u>Total Length (inches)</u> <u>Annual Growth</u>
1.	Willow	Kasilof	11	56
4.	"	"	37	132
5.	"	"	66	236
8.	"	Skilak	85	764
10.	"	"	137	536
13.	"	Sterling Hwy.	6	12
14.	"	"	1	2
15.	"	Hidden Lake	37	220
4.	Kenai Birch	Kasilof	122	852
5.	"	"	140	962
6.	"	"	64	312
9.	Dwarf Birch	Kenai	11	24
13.	"	Sterling Hwy.	25	54
14.	"	"	13	26
5.	Aspen	Kasilof	15	54
7.	"	Skilak	97	320
8.	"	"	70	210
10.	"	"	40	134
11.	"	"	61	130
12.	"	"	17	58
14.	"	Sterling Hwy.	32	150
15.	Cottonwood	Hidden Lake	239	954

Utilization presented in Figure 8 shows the use by areas as well as the average. Kasilof area has been over-browsed for many years and is still being utilized to the fullest. In 1963, mainly due to mild weather, the moose did not migrate into these lowland areas.

Table 17 summarizes the annual growth for tagged plants since established in 1952. Two transects containing mostly dwarf birch were added in 1961 and a cottonwood transect was established the following year. Climatic conditions have a minor effect on the amount of leader growth. Age of the browsed plants shows a gradual decline in growth over a period of years, which is illustrated in Figure 9.

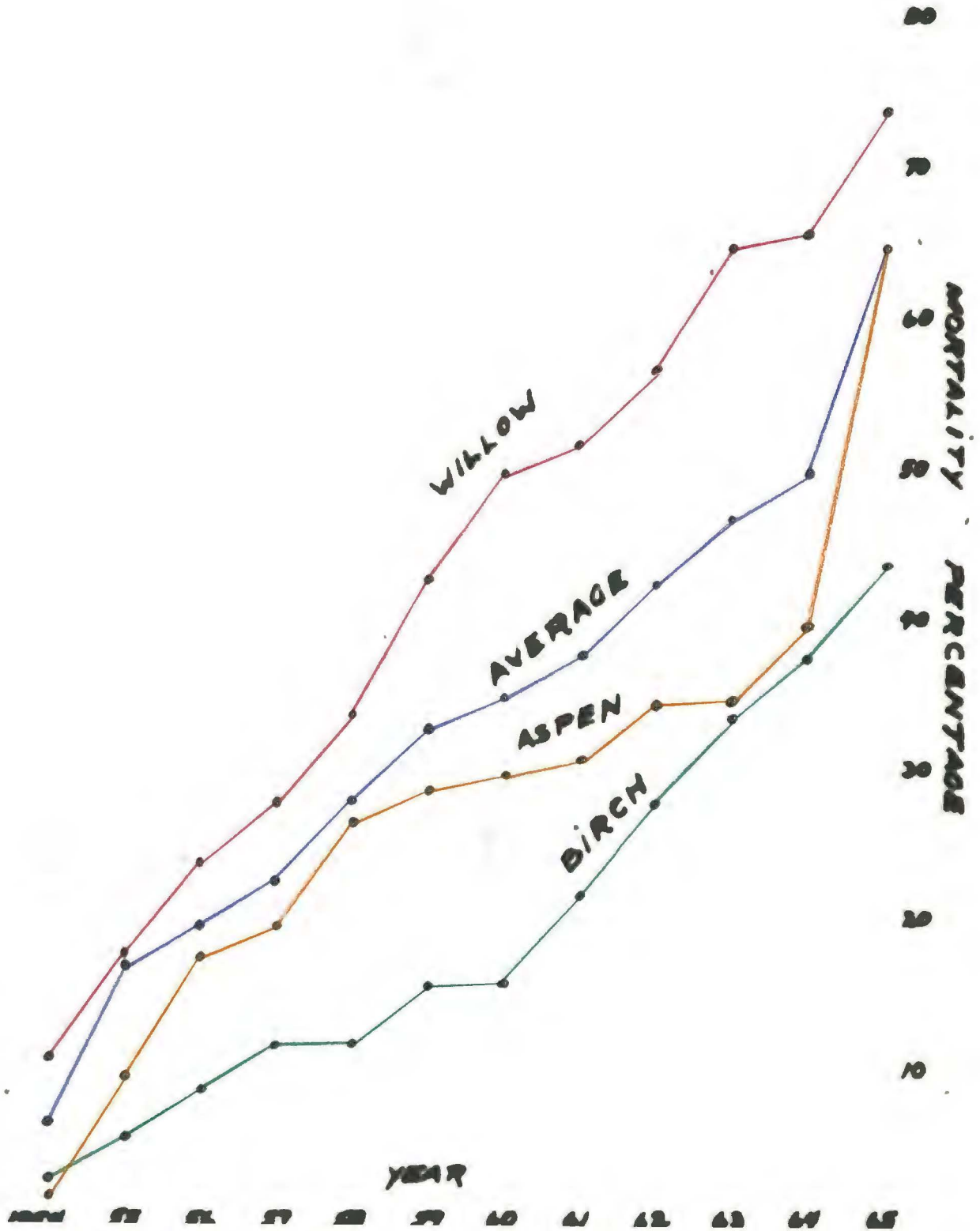
## 2. Succession Plots

Succession plots established in 1950 are checked every five years. The fourth evaluation of these plots located in the 1947 Burn was completed this summer. Interesting succession data is summarized in the following narrative.

Plot #1. Moose utilization has been consistently high on the scattered, increasing numbers of willow. Black spruce snags are gradually falling down and decaying with less than half the original number still present. Black spruce seedling numbers did not change during the last four years. Photographs of spruce height growth (up to 6 feet) is impressive between 1950 and 1965. Lupine numbers decreased sharply this year, while nearby roadsides had a profusion of purple flowers. Fireweed and bunchberry continued to increase gradually since 1950. Jacobs ladder increased steadily since 1955, but still has not reached its high numbers immediately following the fire. The large amount of grass cover has slowly increased throughout the years. Cranberry plants have more than doubled in fifteen years. Blueberry, lichen, and one species of grass have recently established themselves within this plot.

Plot #2. Moose utilization became almost nil as the aspen trees grew out of reach in the late 1950's. The gradual reduction, from 442 to 158, aspen trees from 1950 to 1965 was caused mainly by plant competition and not over browsing. The invasion of black spruce on this plot has been slow and they remain in a suppressed state. Two birch seedlings noted in 1961 still survive under the thick aspen canopy. Bunchberry showed a marked increase after being on the decline for the

FIGURE 7  
MORTALITY PERCENTAGE OF TAGGED PLANTS  
ON PERMANENT BROWSE PLOTS  
ESTABLISHED IN 1952





# UTILIZATION OF PERMANENT BROWSE PLOT

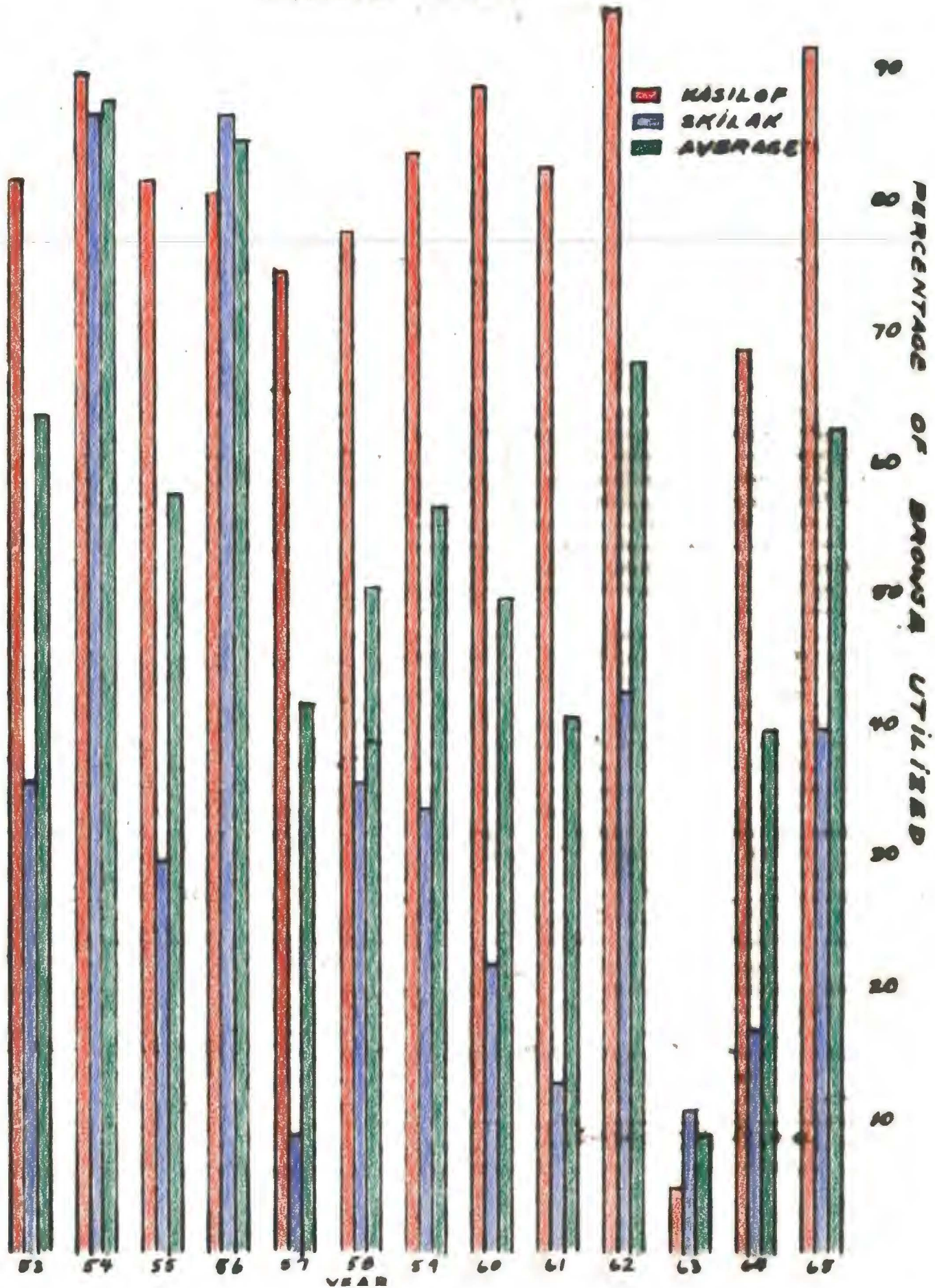


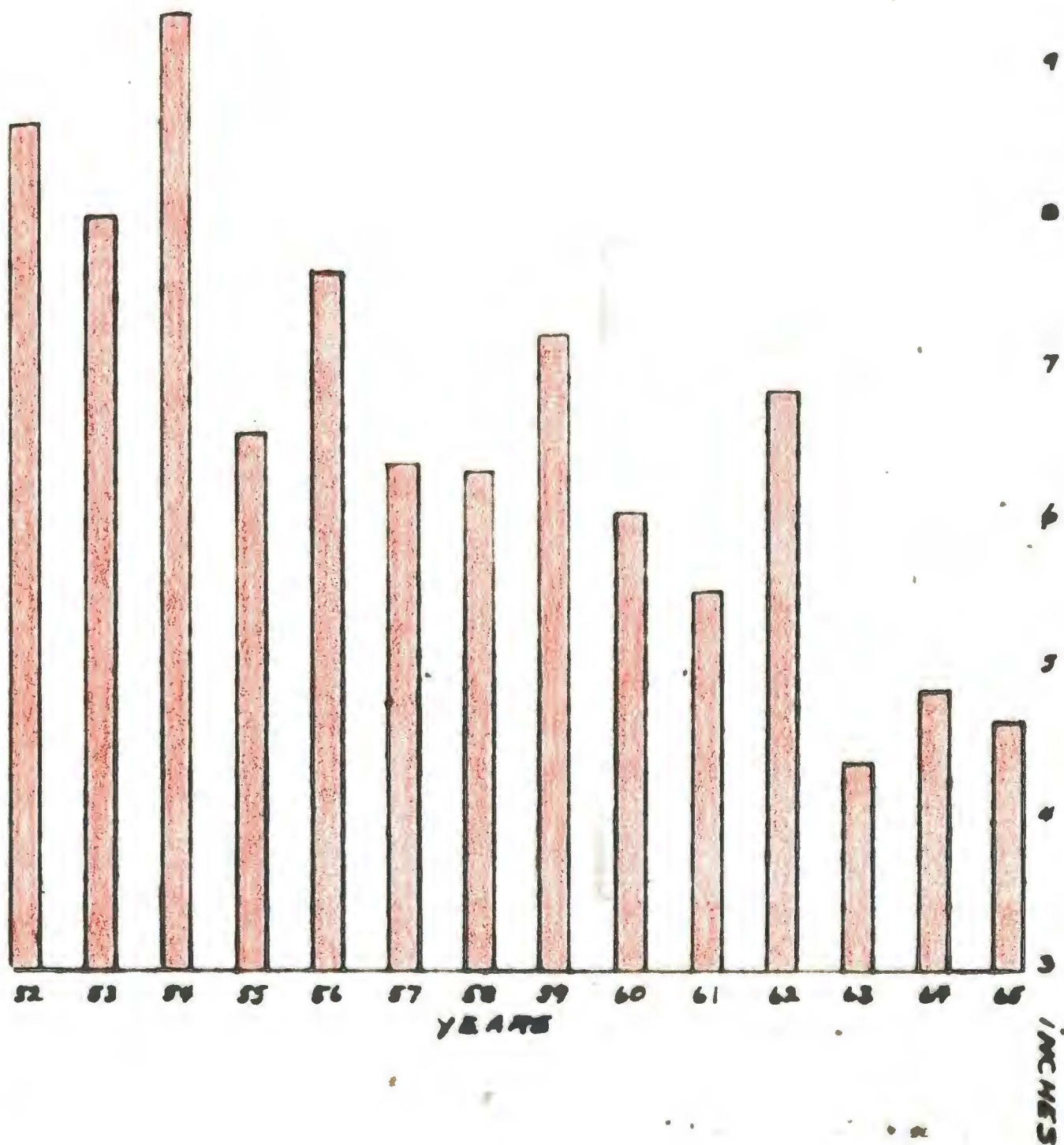
TABLE 17

Average Annual Growth Per Twig (In Inches)  
On Permanent Browse Plots

<u>Year</u>	<u>Willow</u>	<u>Kenai Birch</u>	<u>Dwarf Birch</u>	<u>Aspen</u>	<u>Cottonwood</u>	<u>Average</u>
1952	8.65	10.24	5.42	7.96	4.64	8.62
1953	9.53	10.16	0	6.26	6.21	8.02
1954	8.48	9.78	3.81	11.23	6.64	9.38
1955	8.81	9.44	6.30	4.78	5.74	6.59
1956	6.83	9.22	3.68	7.86	6.19	7.66
1957	6.13	9.29	4.55	5.84	5.15	6.39
1958	5.53	9.08	4.00	5.84	4.90	6.33
1959	7.03	8.40	2.56	6.85	5.71	7.23
1960	6.32	8.53	2.40	5.20	2.00	6.06
1961	5.91	8.36	3.15	4.62	0	5.53
1962	7.81	7.72	3.19	6.59	8.54	6.86
1963	4.07	5.51	2.66	3.72	5.31	4.39
1964	4.38	6.91	2.73	3.71	5.33	4.86
1965	5.15	6.52	2.12	3.18	3.99	4.67



FIGURE 9  
AVERAGE ANNUAL BROWSE GROWTH PER TWIG  
ON TAGGED PLANTS - PERMANENT FORAGE PLOTS



past decade. Fireweed numbers are increasing slowly. Previously raising lupine numbers dropped over 50 percent this period. Cranberries now cover almost 60 percent of the ground surface. A few blades of grass are scattered throughout the plot and no apparent change is indicated. Wild rose numbers are the same as when last checked. Lichens appeared for the first time since the fire. The one-sided pyrrola flower also is a new-comer to the plot. The low growing ground willow made its first showing on the sunnier parts of the plot. Moss cover exceeded over 25 percent in 1955 is now reduced below 10 percent.

Plot #3. After complete moose utilization of the aspen and willow in 1955, the use in 1965 is now non-existent. The tall, spindled, closely-spaced aspen makes travel difficult even for moose. The numerous brush size aspen, following the fire, have been thinned out by plant competition and over-browsing, but the remaining trees are still too closely spaced. Aspen 10-11 feet high are common following 18 years of growth, even after being browsed for several years during their early development.

Spruce have not yet invaded this plot. The fire killed spruce, have fallen down and are slowly being decomposed. Bunchberry has increased to over three thousand plants. Fireweed are again as numerous as they were following the fire, though they never were thick. Lupine is showing a slow increase throughout the years, though there was a slight reduction during this cool season. The number of cranberry plants now exceeds twenty seven hundred and occupies over 9 percent of the ground cover. Grass clumps are widely scattered and appear to be slowly replaced by other vegetation. Moss cover that exceeded 40 percent in 1955 is now reduced to under 10 percent -- this also occurred on many of the other succession plots and suggests a definite ecological pattern. The few Jacobs Ladder plants noted in 1950 have not been observed since. Twin flowers were recorded only in 1955. Species new to this plot are: Pedicularis labradorica, mushroom and lichen.

Plot #4. Exposed mineral soils are now less than 1 percent. It was about 5 percent when the plots were established. Though moose browsed this area extremely heavy in the mid-fifties, its present use is practically non-existent. Aspen numbers increased through 1961. Competition reduced this number in this early age group, and now a few seedlings and suckers are again appearing. Black spruce are slowly invading this plot, from one in 1950 to forty-three. Bunchberry numbers over three thousand plants. One more willow was recorded this year in addition to the five previously present. Birch remained the same, at six bushes and grew an average of 5 inches in height the last four years. Fireweed



lightly scattered on the plot are slowly declining in numbers. Cranberry plants have increased from a few hundred to over eight thousand in the last fifteen years. Moss that covered almost 60 percent of the ground in 1955 is now down to 10 percent. Sparse lichen growth has been sporadic in the amount of area covered since the plot was established. Only one mushroom was noted this year, as compared to the five that first appeared in 1961. Lupine originally recorded in 1961 has shown a slight increase. On most other areas away from the roads there was a decrease in lupine.

Plot #5. The amount of exposed mineral soil has decreased from about 70 percent to under 2 percent since the plot was established. Little or no use of this plot was made by moose until this past year when over 25 percent of the twigs were browsed. Aspen are scarce, but increasing. The average height is still only 2 feet, but the vast array of jumbled snags reduces the accessibility of forage. Willow numbers varied slightly, but average height has risen from 5 inches to 31 inches in fifteen years. Birch numbers and average height have gained steadily since 1950. Moss cover is still over 60 percent. Fireweed continues its decline which bunchberry increases. Lupine numbers which almost reached two thousand in 1961 have dropped to under nine hundred. Twin flowers noted through 1955 were not seen on the last two surveys. Cranberries, grass, and pyrola flowers, though few in numbers, are increasing. Lichen first observed in 1961 is spreading. Species recorded for the first time includes: cottonwood, mushroom, and Labrador tea.

Plot #6. Exposed mineral soil not evident in either 1950 or 1955, became so after visits from burrowing animals. Utilization by moose increased as willow became better established. Birch continues to improve in both height and numbers. Fireweed declined steadily from twenty-eight hundred to about five hundred in fifteen years. Lichen prevalent in 1950 died out by 1961, and is now becoming re-established. Flower of Parnassia, grass, and one-side pyrola decreased in numbers the last four years; white moss, bed-straw, purple fleabane, and mushroom increased slightly. A large increase is noted for alder and common horsetail. New plants invading this plot are: rose, violet, and four-parted gentian.

Plot #7. Minor areas of mineral soil are still exposed. Moose utilization dropped this period, though it was never high on this plot. Black spruce and birch continue to encroach at a fairly steady rate. Aspen and cottonwood numbers did not change. Bog

birch showed a strong increase. Labrador tea, cranberry, spirea, willow, mushroom, and blueberry increased their numbers. Plants on the decrease are: horsetail, raspberry, grasses, and fireweed. Moss provides about 45 percent of the ground cover.

Plot #8. Exposed mineral soil has dropped from about 35 percent to less than 1 percent in fifteen years. Moose utilization has varied in the past, but presently is considered mediocre. Aspen and birch numbers decrease with added plant competition, while willow and white spruce increased. The following plants increased in numbers: bunchberry, fireweed, cranberry, twin flower, rose highbush cranberry, and alder. Pyrola is the only herb on the decrease. Moss cover has dropped from 25 percent to less than 5 percent in the last ten years. Soapberry was the only new herb encountered.

Plot #9. Light moose utilization occurred in 1965, which is an improvement over past useage. Alder continues to increase in size and numbers. It is the dominant feature of this plot. Plants increasing in numbers are: lichen, moss, nettle, bunchberry, devils club, and elderberry. Those decreasing are: raspberry, fireweed, bed straw, white spruce, gooseberry, birch, rose, willow, violet, and pyrola. Species occurring for the first time includes: goldenrod, western columbine, starwort, mushroom, bluebell, and large-leaf pyrola.

The following pages show the changes in species, plant numbers, and growth occurring on Succession Plots in the last fifteen years. Figures 10 and 11 emphasize variation occurring on the Succession Plots.

### 3. Sheep Range Study

Three vegetation transects were established on Surprise Mountain August 4, 1965. Evaluation of sheep range conditions and flora utilized are the major purposes of this study. Density and occurrence of plants along the transect were recorded. At each 1 foot intercept along the 100 foot transect the plant species were noted and densities recorded on .0001 acre plots at each 20 foot interval. The write-up and notes of the vegetation survey in alpine-tundra country are filed in Kenai. Additional transects may be created in other parts of the sheep range in the next few years. Table 18 summarizes observations of the sheep range study.

## SUCCESSION PLOT #1

	1950	1955	1961	1965
Moose Utilization - Percentage	0	30.6	20.5	20
Salix sp.	9	9	22	27
Picea mariana - No. Dead	36	-	15	14
- No. Live	0	15	34	34
- Average Height	0	-	-	21.6"
Lupinus nootkatinsus	724	435	2,092	268
Epilobium angustifolium	285	235	395	455
Cornus canadensis	768	643	1,109	1,210
Polemonium coeruleum	231	48	105	147
Poa sp. (grass #1) - Clump	288	-	-	222
Percentage	-	20	48	54
Calamagrostis canadensis - Clump	8	-	-	3
- Percentage	-	-	-	0.1
Vaccinium vitis-idea - No.	1,524	-	-	3,870
- Percentage	-	1	1	2
Ceratodon purpureus - Percentage	20	53	1	8.8
Vaccinium uliginosum - No.	-	24	-	390
- Percentage	-	-	-	1.9
Cladonia sp. - Percentage	-	-	-	4.3
Agrostis scabra - Clump	-	-	-	7
- Percentage	-	-	-	.1

## SUCCESSION PLOT #2

	1950	1955	1961	1965
Moose Utilization - Percentage	23.5	100	0.5	0.1
Populus tremuloides - No. Dead	9	-	68	65
- No. Live	442	313	179	158
- Average Height	20"	-	5.3'	7.8'
Picea mariana - No. Dead	43	-	12	9
- No. Live	1	-	4	4
- Average Height	-	-	-	11"
Betula Keniaca - No.	-	-	2	2
Cornus canadensis	1,021	868	636	1,910
Epilobium angustifolium	99	72	92	165
Lupinus nootkatinsus	80	492	633	294
Vaccinium vitis-idea - No.	2,390	-	5,200	10,000+
- Percentage	-	30.3	-	59
Calamagrostis canadensis - Clump	20	-	-	-
- Percentage	-	-	1.2	1
Moss - Percentage	13	27.5	10.2	9.7
Rosa acicularis	2	20	7	7
Poa sp. - Grass (wire) - Percentage	-	-	0.1	0.1
Lichen - Percentage	-	-	-	3.1
Pyrola secunda	-	-	-	20
Salix sp. - ground willow	-	-	-	23



## SUCCESSION PLOT #3

	1950	1955	1961	1965
Moose Utilization - Percentage	0	100	0.1	0
Populus tremuloides - No. Dead	4	-	23	34
- No. Live	370	213	191	169
- Average Height	19"	-	3.6'	5.2'
Salix - No.	3	2	1	1
- Average Height	-	-	-	8'
Picea mariana - No. Dead	53	-	-	-
- No. Live	0	-	0	0
- Average Height	0	-	-	-
Cornus canadensis	820	779	1,057	3,287
Epilobium angustifolium	318	176	218	325
Lupinus nootkatinsus	82	348	590	552
Poa sp. - Grass - Clump -	186	234	-	-
- Percentage	-	-	10	5.4
Moss - Percentage	13.8	42.5	5.6	8.7
Vaccinium vitis-idea - No.	146	-	375	2,746
- Percentage	-	8.3	-	9.1
Polemonium coeruleum	9	0	0	0
Linnaea borealis	0	5	-	-
Pedicularis labradorica	0	0	0	4
Mushroom	0	0	0	1
Lichen - Percentage	0	0	0	3.5

## SUCCESSION PLOT #4

	1950	1955	1961	1965
Mineral Soil - Percentage	5	0	2.1	0.4
Moose Utilization - Percentage	0.3	96.5	0.6	1
Populus tremuloides - No. Dead	1	-	-	36
- No. Live	62	87	114	84
- Average Height	33"	-	5.6'	6.6'
Picea mariana - No. Dead	32	-	21	17
- No. Live	1	24	35	43
- Average Height	3"	-	-	12.4"
Cornus canadensis	835	3,649	2,440	3,282
Epilobium angustifolium	365	284	209	222
Moss - Percentage	34.8	59	43.5	10.2
Poa sp - Grass #1 - Clump	23	93	-	-
- Percentage	-	-	1.1	0.5
- Grass #2 - Clump	57	-	-	-
- Percentage	-	-	7.5	3.5
Vaccinium vitis-idea - No.	274	-	3,000	8,208
- Percentage	-	5.4	-	-
Salix - No.	1	5	5	6
- Average Height	8"	-	2.4'	3.3'
Betula Keniaca - No.	1	-	6	6
- Average Height	4"	-	1'	17"
Lichen - Percentage	0.5	0.1	1.5	0.6
Mushroom	0	0	5	1
Lupinus nootkatinsus	0	0	10	30
Salix sp. - Ground willow	0	0	0	4

## SUCCESSION PLOT #5

	1950	1955	1961	1965
Mineral Soil - Percentage	69.5	3.5	4.2	1.0
Moose Utilization - Percentage	0	0	1.2	25.6
Populus tremuloides - No. Dead	0	0	0	1
- No. Live	44	51	50	75
- Average Height	2.7"	1.4'	-	2'
Salix - No.	25	17	23	25
- Average Height	5"	1.1'	-	2.7'
Epilobium angustifolium	581	251	158	197
Moss - Percentage	59.5	72	17.3	62
Picea mariana - No. Dead	53	-	5	2
- No. Live	4	19	23	30
- Average Height	1"	-	-	1.8'
Betula Keniaca - No.	4	19	19	33
- Average Height	2"	7"	-	3.3'
Cornus canadensis	114	586	730	901
Lupinus nootkatinsus	1	64	1,960	885
Linnaea borealis - No.	3	-	-	-
- Percentage	-	2	-	-
Vaccinium vitis-idea - No.	-	3	77	849
- Percentage	-	-	-	2.5
Pyrola secunda	-	18	-	24
Poa sp. - Grass #1 - flat - Percentage	-	-	0.2	0.2
Lichen - Percentage	-	-	0.6	3.0
Poa sp. - Grass #2 - wire - Percentage	-	-	-	0.2
Populus tacamahacca	-	-	-	1
Mushroom	-	-	-	1
Ledum grdenlandicum	-	-	-	2

## SUCCESSION PLOT #6

	<u>1950</u>	<u>1955</u>	<u>1961</u>	<u>1965</u>
Mineral Soil - Percentage	0	0	1.2	0.2
Moose Utilization - Percentage	0	0.8	23.6	30
Betula Keniaca - No. Dead	0	0	0	0
- No. Live	175	62	66	69
- Average Height	3"	6.7"	3.1'	4.8'
Salix - No. Dead	1	0	0	0
- No. Live	0	3	16	13
- Average Height	0	2"	3.3'	3.9'
Epilobium angustifolium	2,818	1,538	740	525
Parmassia palustris			125	73
Grass-bent - Percentage			1.6	0.3
Pyrola secunda			5	3
Rubus strigosus			66	0
Moss - Percentage			5	7.7
Galium boreale			125	207
Alnus fruticosa - No.			2	34
- Average Height				1.6'
Sambucus racemosa			1	1
Erigeron acris			13	79
Panicum sp. #2 - Percentage			7.4	19.7
Mushroom			8	9
Rosa acicularis				2
Equisetum arvense			2	110
viola				3
Angelica				23
Gentiana propinqua				28



## SUCCESSION PLOT #7

	1950	1955	1961	1965
Mineral Soil - Percentage	.5	0	6.7	2.5
Moose Utilization - Percentage	0	0	22	6
Ledum grdenlandicum - No.	69	40		
- Percentage			18.0	19.3
Picea mariana - No. Dead	61	-	17	10
- No. Live	5	14	26	37
- Average Height	1"	-	-	1.5'
Equistm sylvaticum	240	964	575	191
Moss - Percentage	5.7	36.1	55	45
Rubus chamaemoria	136	134	311	179
Vine #6	1	-	9	0
Vaccinium vitis-idea	;32	;27	2,470	5,195
Grass - flat - No.	27	65		
- Percentage			7.3	2.1
Epilobium angustifolium	2	107	94	47
Spiraea beaverdiana	4,	23	209	275
Populus tremuloides - No. Dead	0	-	0	1
- No. Live	4	3	8	8
- Average Height	1"	9"	-	1.7'
Betula Keniaca - No Live		5	30	44
- Average Height		10"	-	6"
Populus tacamahacca - No Live		1	1	1
- Average Height		6"		2'
Poa sp. - ticklegrass - No.		6		
- Percentage			1	9.9
Carex sp.		6	-	-
Betula grandulosa		1	10	25
Salix - No. Live		1	3	5
- Average Height		1'	-	1.5'

SUCCESSION PLOT #7 (Cont'd.)

	<u>1950</u>	<u>1955</u>	<u>1961</u>	<u>1965</u>
Mushrooms			3	4
Vaccinium uliginosum			13	101
Lichen - Percentage				0.1
Pedicularis labradorica				1

## SUCCESSION PLOT #8

	1950	1955	1961	1965
Mineral Soil - Percentage	34.5	6.5	1.7	0.8
Moose Utilization - Percentage	0	60.5	4.9	28
Betula Keniaca - No. Dead	1	-	-	8
- No. Live	2,029	1,689	227	325
- Average Height	4"	1.2'	2.2'	3.1'
Cornus canadensis	1,984	3,050	1,025	1,321
Epilobium angustifolium	678	288	84	134
Vaccinium vitis-idaea - No.	167		1,985	3,314
- Percentage		10.5	.	
Linnaea vorealis Sp. #9 - No.	86		1	675
- Percentage		19.2		
Polemonium coeruleum - No. Dead	0	0	0	2
- No. Live	168	121	146	159
- Average Height	1.4"	7.3"	1.5'	1.2'
Rosa woodsii	5	-	1	1
Rubus strigosus	48	9	0	2
Salix - No. Live	3	82	57	77
- Average Height	8"	5"	2.5'	2.8'
Lichen - Percentage	11.5	1	.2	1.9
Moss - Percentage	18	24.6	5.5	4.2
Viburnum paucifloria	3	2	2	9
Populus tremuloides - No Live		13	-	4
- Average Height		8.8"	-	9.2
Rosa acicularis	9	26	86	111
Pyrola secunda		86	-	23
Alnus fruticosa		6	5	52
Populus tacamahacca - No. Live		1	-	1
- Average Height		6"	-	2.5"
Shepherdia canadensis		-	-	1
Grass - Percentage				.2

## SUCCESSION PLOT #9

	1950	1955	1961	1965
Mineral Soil - Percentage	0	0	0	0
Moose Utilization - Percentage	0	0	2.5	10
Alnus fruticosa - No. Dead	20	-	-	3
- No. Live	7	13	53	59
- Average Height	22.7"	-	10.2'	12.0'
Rubus strigosus	658	285	200	139
Epilobium angustifolium	206	206	168	53
Lichen - Percentage	16.5	4	0.2	.5
Ceratodon purpureus - Percentage	14	4	1.6	2.3
Poa - No.	391	820		222
- Percentage			28	15
Urtica lyallii	112	16	4	23
Heracleum lanatum	26	1	0	
Picea glauca - No. Dead				9
- No. Live	43	73	120	93
- Average Height	3"	-	1.4'	1.4'
Ribes lacustre	5	15	98	39
Betula Keniaca - No. Dead				5
- No. Live	13	6	12	4
- Average Height	4"	-	-	1.7'
Rosa acicularis	4	10	137	121
Cornus canadensis		14	43	82
Salix - No. Dead				5
- No. Live		28	2	1
- Average Height		-	-	6'
Populus tremuloides - No. Live		2	-	-
- Average Height		-	-	-
Galium boreale	58	136	175	88
Oplophox horridus		1	1	2
Viola			185	166



## SUCCESSION PLOT #9 (Cont'd.)

	<u>1950</u>	<u>1955</u>	<u>1961</u>	<u>1965</u>
<i>Pyrola secunda</i>			114	71
<i>Sambucus racemosa</i>			6	16
<i>Aquilegia columbiana</i>				1
<i>Stellaria media</i>				1
Mushroom				1
<i>Salix</i> sp.				1
<i>Solidago multiradiata</i>				3
<i>Campanula rotundifolia</i>				42
<i>Plantago</i> sp.				5

FIGURE 10

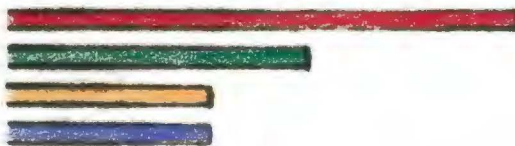
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ABUNDANCE BY YEARS OF SELECTED PLANTS  
ON SUCCESSION PLOTS

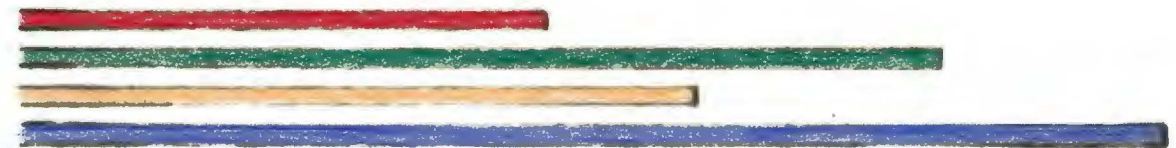
LUPINE



FIREWEED

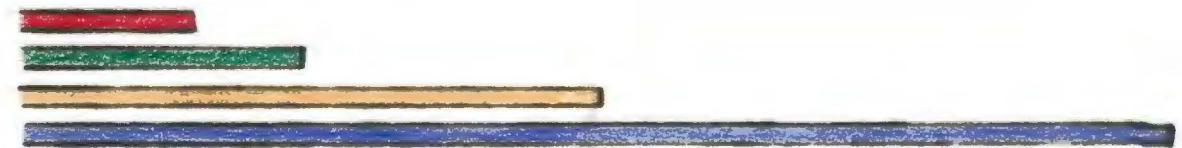


BUNCHBERRY



0 2 4 6 8 10  
(IN THOUSANDS)

CRANBERRY



0 5 10 15 20 25  
(IN THOUSANDS)

<span style="color: red;">■</span>	1950
<span style="color: green;">■</span>	1955
<span style="color: orange;">■</span>	1961
<span style="color: blue;">■</span>	1965

# ABUNDANCE OF WOODY PLANTS ON SUCCESSION PLOTS

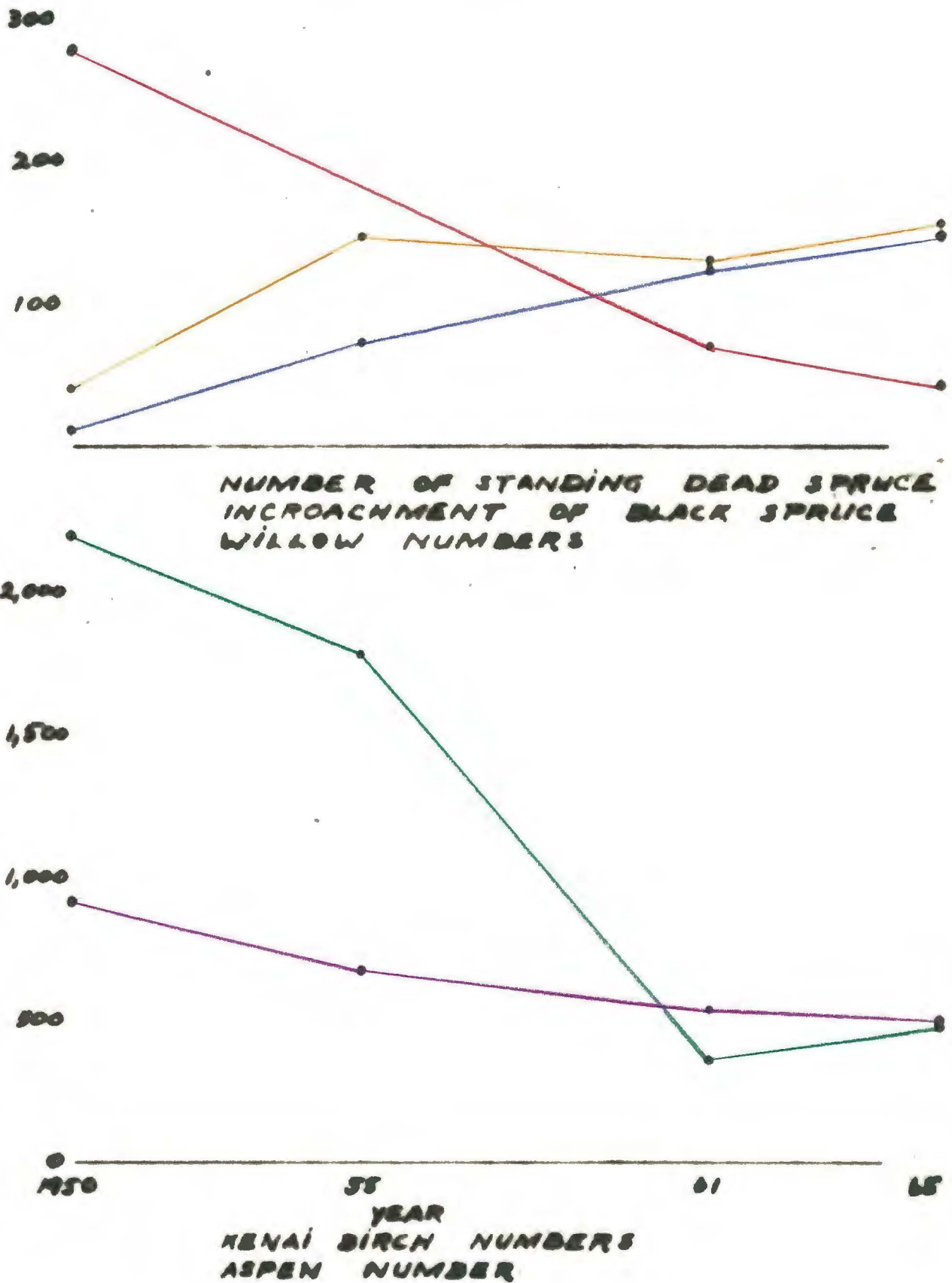


TABLE 18 . Sheep Range Study - Surprise Mountain

## Average Density Percentage of Five Plots

Cover Type	Transects		
	1	2	3
Hardwood browse (Dwarf birch & willow)	14	35	1
Grasses	5	3	19
Dryas spp.	17	2	45
Moss	4	2	2
Lichen	7	12	-1
Crowberry	0	27	0
Cranberry	14	10	4
Rock or Exposed Soil	25	4	17
Other Herbs	1	2	4

\*Density may be over 100%, as sometimes two vegetation layers are involved. i.e. Cranberry underneath dwarf birch.

## Occurrence of Plants at One Foot Intercepts 100 Foot Transect Lines.

Cover Type	Transect Lines		
	1	2	3
Dwarf birch	18	57	11
Willow	2	1	0
Rock or Exposed Soil	38	2	21
Grasses	9	12	20
Moss	0	0	1
Lichen	8	13	2
Dryas spp.	20	13	43
Crowberry	3	20	0
Cranberry	12	24	2
Other Herbs	0	6	9

\*At many intercepts two different plants were present.



4. Browse Evaluation - Closest Plant Method.

"Range Survey Guide," as revised by Glen F. Cole of the National Park Service, is on occasion being used by other federal and state agencies concerned with moose browse evaluation. This spring, using the closest plant sampling technique, the following evaluations were made in four areas on the Kenai. The summary is shown below:

PLOT NUMBER	LOCATION	RANGE CONDITION RATING	MOOSE UTILIZATION PERCENTAGE
1	Kasilof Airstrip	Very poor 84	63
2	Mile 67 Sterling Hwy.	Poor 40	26
3	North of Skilak cabin	Good 18	19
4	Swan Lake Road - Portage Lake	Excellent 4	33

5. Vegetation Study - Engineer Lake Burn

Plant succession and moose browse evaluation transects were established this spring on the Engineer Lake Burn. This re-burn of the 1947 Burn occurred July 6-9, 1962. Fire severely scorched this area, but many hardwood roots suckered during the same growing season attracting moose to this easily accessible burn. On sample plots within the Engineer Lake Burn annual browse production averaged 15 pounds per acre, as compared to 74 pounds on the adjacent 1947 Burn.

6. Spruce Grouse Study

Larry Ellison, biologist for the Alaska Department of Fish and Game started a spruce grouse investigation study near the Finger Lake Road on the Moose Range in 1964. His activities were intensified during 1965 and a report of his investigation accomplished this year follows.

## SPRUCE GROUSE STUDIES CONDUCTED ON THE KENAI NATIONAL MOOSE RANGE\*

1965

Alaska Department of Fish and Game

Laurence Ellison

### OBJECTIVES

To develop trapping and censusing techniques that can be applied in a long-term population dynamics study of spruce grouse.

To obtain life history data on the spruce grouse.

### STUDY AREA

The period April 12 to October 27 was spent in the field. The principal study area was a 4 square-mile plot 8 miles north of Sterling, Alaska within the Kenai National Moose Range. The study area boundaries are roughly as follows: on the west, East and South Finger Lakes; on the north, Finger Lake Road; on the east, Mosquito and Silver Lakes; on the south, a line projected due west from the southern tip of Silver Lake. Vegetation ranges from hilltop, mature, close-canopied white spruce-birch-cottonwood stands with understories characterized by *Menziesia* and Devil's Club to lowland black spruce bogs. Most of the grouse are found in intermediate vegetation zones, these including upland, medium-sized white spruce-birch stands with an understory of blueberry, mountain cranberry, spiraea, and grass; upland, medium-sized black spruce with a blueberry and mountain cranberry understory; and stunted dense black spruce bordering the edges of bogs.

\* Work done under Pittman - Robertson Research Project W-B-R-2, Jobs B-3 and B-4.

## RESULTS

### Trapping and Banding

Sixty-seven grouse were captured including 14 adult males, 30 adult females, and 23 chicks. Thirty-four birds were "noosed" 27 were hand-netted, 5 were mist-netted, and one adult male was taken in an automatic live trap using a female study skin as a decoy. Four fatalities occurred in the capturing operations: one adult female died for an unknown reason in the hand net, and two adult males and a chick were strangled in the noose. Fifty grouse were banded and released on the study area. Five grouse caught along the Funny River Horsetrail outside the study area were released without being banded. Five grouse were shipped to Dr. Robert Stabler in Colorado for parasitological examination. Three birds were sent to the University of Alaska for metabolic studies.

### Spring Census of Territorial Males

A census of territorial males was attempted between May 2 to 29 on a 2-square-mile plot. The census depended on the localization of individual cocks on territories of 10 to 40 acres during the breeding season. Two men and a dog (English Setter) conducted the census.

Nineteen miles of parallel lines spaced at 160-to 240-yard intervals were blazed across the census area. One man systematically hunted the dog over the strips between the lines by walking across a strip at a right angle to a line, then advancing 20 to 50 yards (depending on cover density) and walking back across the strip in the opposite direction. When the end of the strip was reached, the dog was taken back down the middle of the strip as an additional check. Rate of coverage was about one-eighth square mile per day, depending on cover density and number of grouse encountered. A factor aiding the dog in locating males was the extensive network of "trail scents" left by the male in his wanderings over the territory. If the male was off the territory, the behavior of the dog was a cue that a grouse had been using the area. Thus part of the census technique involved rechecking areas in which the dog had seemed interested. When a male was encountered, the site had to be revisited to confirm the localization of the bird. Occasionally, scattered droppings in a forest opening indicated a territory. If a male was performing flutter jump displays when encountered, one could assume he was on the territory. The cock performs the display by flying from a tree to the ground in a normal manner except that he settles to the ground on rapidly beating wings producing a soft drumming. The flutter jumps were performed most in the first 3 to 4 hours after dawn, and in late afternoon and evening. These were the most profitable times to be in the field, since some males were located by their drumming. There was some suggestion that as territoriality waned in late May, males were more likely to be on their territories in early morning than at any other time of day. The first territory was located on May 2 (when the first drumming was heard) and males were apparently localized on territories until about the end of May, allowing a maximum of 4 weeks to complete the census.

A knowledge of the physical characteristics of territories gained during the census aided in locating males. Common attributes of most territories were openings 30 to 40 yards across in spruce stands of moderate to dense density (estimated 50 to 80 percent of the forest floor shaded) with a good ground cover commonly composed of one or more of the following growing on 2 to 6 inches of moss: mountain cranberry, blueberry, clubmoss, Labrador tea and Lichenes. Territories were usually on well-drained slopes or ridges. As a knowledge of cover types on a given area was gained, it became more efficient to hunt for males by cover types rather than by traveling back and forth between lines that cut through types.

Nineteen males were located, which was estimated to be at least 75 per cent of the males on the 2 square mile plot. Probably about ninety percent of the males were found on the first square mile censused, and about sixty percent were found in the second square mile. Reasons for the lower accuracy on the second square mile included: less time devoted to coverage, more movement by males late in the breeding season, less drumming late in the breeding seasons and a greater proportion of dense cover types.

Several other sources of error contributed to the inaccuracy of the census scheme. The dog may not find a territory simply because he does not pass through it or the cock is not nearby. Since males sometimes use different cover types for displaying, roosting, feeding and loafing, movement between census strips often occurs. If a male is in a tree he may be missed by the dog. Males were often found in trees in late morning and early afternoon, sometimes 200 yards from their presumed territory. Snowy and rainy weather tend to make grouse more arboreal and to effect temporary abandonment of territories. Snow, rain, and wind also affect the ability of the dog to scent birds. The tendency for males to congregate in one area creates confusion until some are marked or simultaneous observations are made. On May 15 four males were within a 10-acre area; on May 22, three other males were within another 5 acre area; and on May 11, 16, 17 and 28, two other males were on a 20-acre area. These associations of males persisted throughout most of the period May 5 to about May 29. Probably not all of these males held territories, and the movements of such non-territorial males further complicated censusing. In the spring of 1965, radio tracking may be used to study diurnal movements and diurnal use of cover types by both territorial and non-territorial males.

#### Nest Data

Two nests containing 7 and 9 eggs respectively were found on the study area. Fifteen of the 16 eggs hatched, between June 13 to 15. Mrs. Eugene Smith located three nests near Coho, about twenty five miles southwest of the study area. A nest containing one egg was apparently subsequently abandoned by the hen. The two other nests contained 9 eggs each, 16 of which hatched between June 19 to 22. Observations of broods on the Funny River Benchlands 30 miles south of the study area suggested hatching at this higher elevation occurred in early July.



### Brood Data

A minimum of 35 broods were believed to have hatched on the study area. Between June 15 and July 22, 28 hens with broods were banded and later unbanded hens with broods could still be found on the study area. All 28 hens banded did not of course nest on the area as ingress and egress of broods occurred frequently. Sightings of banded hens demonstrated that chicks 2 to 3 weeks old could travel up to 1.25 air-line miles in a 6-day period. Also, broods 2 to 6 weeks old may have concentrated on a "brood range" in the central 300 to 400 acres of the study area during July. Broods were seen consistently in this black spruce - blueberry type, and sightings of banded hens suggested a movement into this brood range.

Nesting success must have been extremely good, as among 87 hens encountered between June 12 to August 6 81 (93%) had broods. Two sources of bias favoring the finding of hens with broods probably existed. The greater amount of trail scent left by a hen and brood made it relatively easy to locate them. Also, broodless hens may inhabit cover types noticeably different from those occupied by broods, and since the emphasis was on finding broods, the former types would have been visited less frequently.

Mean brood size of 7 accurately counted broods in June was 7.4 chicks; the mean size of 13 other broods for which a rough estimate was obtained was 5.8 chicks. Similarly, means for July were 6.7 chicks among 11 accurately counted broods and 4.6 among 12 other broods. Dense forest vegetation and the tendency for broods to flush before arrival of the dog or observer often precluded complete counts.

### Road Count Data

In 1965 a system for assessing autumn spruce grouse numbers across the State was implemented, by conducting early-morning counts of birds along roads between September 20 and October 25, the period grouse appear on roads most frequently. A minimum of 10 counts was to have been made at each census location. Results of counts are summarized in Table 1.

Apparently, Interior grouse populations were low relative to Southcentral and Southwestern populations. Hunters reported grouse numbers on the Kenai Peninsula and at Dillingham to be fairly high in comparison with populations the two previous falls, but not as high as 3 to 4 years ago. Interior populations have reportedly remained low the past 4 years.

Biologists obtained detailed harvest information from three of the census locations. Robert Wooden recorded a fall kill of 37 birds on the 19-mile route on the Steese Highway. Jerold Deppa, working in Dillingham, tallied a harvest of 254 grouse (estimated actual number over 300) from the 24-mile, Dillingham--to Aleknagik Road for September and October. A harvest of 140 grouse was recorded on 10 miles of the 12-mile Kenai route for the month of October. Little information was gotten in September for this route because of numerous moose hunters patrolling the road. The route included the two-mile long Finger Lake Road, which was closed to vehicular traffic, and a 10 mile section of road from the North Gate to the point the Swan Lake Road enters the 1947 Burn. The total fall kill

Table 1. Numbers of spruce grouse seen on standardized, early-morning road counts.

<u>Location</u>	<u>Miles of Route</u>	<u>Number of Counts Made</u>	<u>Range of Counts</u>	<u>Mean</u>	<u>Miles Driven per grouse seen</u>
Steese Highway	19	11	3-16	9.0	2.1
Taylor Highway	20	9	0-1	0.1	180.0
Fort Richardson	10	3	3-5	3.6	2.7
Kenai Peninsula	12	14	2-29	10.8	1.1
Dillingham	11	15	4-30	15.1	0.7

on the Kernal route was probably over 200 birds, and the total harvest on the Refuge as a whole is conservatively estimated to have been 500 grouse. In all three census localities, Steens, Dillingham and Kernal, the appearance of grouse on roads was terminated by a permanent snow cover, not by hunting pressure.

Sex and age data for birds shot at Dillingham and on the Kernal are presented in Table 2. The high ratio of young to adults probably reflects the vulnerability of chicks to hunting more than it reflects productivity for the summer of 1965. The ratio may also be influenced by a greater amount of movement by chicks in fall. The large proportion of adult males in the Dillingham sample was due to commencing the bag checks in early September. Investigations at Dillingham in 1964 revealed that adult males were more prevalent on roads than they were adult females in August and September. Fifteen of the 18 adult males checked in 1965 at Dillingham were taken in September.

Hunting takes any one morning from the census route had little influence on the standard count the next morning (Table 3), suggesting that on any particular morning the proportion of roadside grouse shot was fairly small, and that during September and October a large number of grouse were passing across the road as a result of extensive fall movements, effecting a nearly continual supply of birds (note particularly October 3 & 15). Data on distances grouse were in fall are obviously required to clearly assess the impact of hunting on roadside grouse populations. Six of the 50 grouse banded between May 2 and August 10 were known to have come out on either the Pinger Lake or Gunnison River Road, these 6 having been banded at distances of 50 to 2100 yards from a road. Hunters shot three of the six grouse; the other three were identified by leg band combinations. I believe that several hundred grouse would have to be banded to obtain meaningful data on the percentage of a fall population shot by hunters and the distances birds have moved when they encounter roads. A more efficient technique for studying movements would probably be radio tracking.

### Specimen Collections

Sixty-seven grouse were collected on the Refuge between April and November. Data were taken on body and organ weights, parasites, and food habits, but most of this has not been tabulated yet. A total of 100 blood films were sent to Dr. Robert Scudler, Colorado College, and he will shortly publish his findings on these and 110 films collected at Dillingham in 1964. It is known at this time that a new species of intestinal parasite was discovered on the Kernal.

In January and April eggless nestles were collected from alpine trees and immediately analyzed by a commercial laboratory (Table 4). The purpose of collecting was to not only establish the nutritive quality of the winter diet of spruce grouse, but also to determine what variables might influence such collections if they were made annually to follow long-term trends in nutrient quality of winter diet. These trends would then be compared with changes in grouse numbers, to see if any relationship existed. No further nestle collecting will be done, pending development of a sound grouse censusing technique.

Table 2. Sex and age of grouse shot along roads at Dillingham in September and October and on the Kenai Peninsula during October.

	Adult ♂	Adult ♀	Juv ♂	Juv ♀	Juv per Adult ♀
Dillingham	18	7	41	35	11.1
Kenai	18	15	69	70	9.2



**Table 3. Standard road counts and daily recorded kill of grouse on the census route, Kamsi, October, 1965.**

October	Standard Count	Kill*
2	9	7
3	29	25
4	20	?
5	No count	4
6	5	
7	6	1
8	No count	2
9	13	8
11	No count	1
13	No count	4
14	No count	6
15	22	21
16	17	12
17	9	18
18	6	4
19	8	1
20	2	9
21	2	2
22	3	4
23	No count	11

\* Kill a minimum number on all days.

Table A. Percentage chemical composition and caloric content of spruce needles collected in early January and early March 1965, Kana Peninsula\*

	Black Spruce				White Spruce			
	Range of 16 observations	Mean	Variance of 4 subsample means		Range of 20 observations	Mean	Variance of 5 subsample means	
Protein	4.4- 6.5	5.70	0.45		5.5- 8.1	6.32	0.39	
Fat	5.5- 7.1	6.20	0.23		2.8- 4.1	3.34	0.08	
Crude Fiber	21.7-23.5	22.247	0.19		21.0-25.9	23.50	1.16	
Ash	1.9- 2.8	2.33	0.11		2.6- 4.4	3.27	0.18	
Nitrogen-Free Extract	61.4-66.7	63.26	0.72		61.4-65.0	63.31	1.01	
		59.94				59.94		
Kilogram calories per 100 grams	303-317	308.9	10.73		486-506	494.8	8.96	

\*Four subsamples, AM and PM in January and AM and PM in March, were taken from each of four black spruce and five white spruce trees.

Statistical analysis of the data indicated that neither photosynthesis nor respiration had any noticeable effect on the diurnal levels of the chemical components. Neither was there any seasonal difference in the samples collected in January and April. Black spruce had a higher fat content ( $P=123.9$ ) and caloric content ( $P=45.4$ ) than white spruce, but a lower ash content ( $P=12.7$ ). All samples contained needles of several ages, so this potentially significant source of sampling error could not be isolated.

## VI. PUBLIC RELATIONS

### A. Recreational Use

A substantial increase in visitation on the Kenai National Moose Range was recorded this season. An increasing number of Alaskans and out-of-state visitors are utilizing this important outdoor recreational area. Surveys indicate total visitor use for 1965 was 143,000 visitors, a 25 percent increase over the preceeding year.

This year, traffic counters at strategic road locations throughout the Moose Range provided continuous and accurate counts of all vehicles entering and departing recreational areas. These counts supplemented by aerial and ground checks gave a reliable means of determining recreational use data for the entire Range and individual areas.

Extreme low temperatures during the first month of the year limited recreational use. Warming trends increased ice fishing effort throughout the area, especially at Hidden Lake. During the winter season more than four hundren skiers enjoyed the ski-tow facilities at Soldotna Hill operated by the Soldotna Ski Club. Winter sports came to a close as spring temperatures accompanied by rain rapidly eliminated snow coverage and ice from lakes the latter part of March.

Summer almost failed to materialize as constant cool and cloudy weather prevailed on the Kenai. Thus, one of the wettest seasons on record reduced outdoor activities of visitors.

Despite the damp conditions, refuge personnel continued with all planned recreational work programs. The Swan Lake Canoe Route was expanded by adding eight lakes and 16 miles of additional water and portage routes. This 60-mile canoe route presently connects twenty-nine lakes by well marked portages with the Moose River and several adjacent streams.

Registration boxes at canoe route entrances provided valuable information concerning length of stay, route taken, name and address, in addition to many constructive remarks. The canoe route received far more enthusiasm from Alaskan and out-of-state canoeists than was anticipated. More than five hundred people visited this recreational area during the short summer season and a few families and groups from the Anchorage and Kenai areas revisited this facility several times.

July and August were the most popular months for canoeing and the average length of stay on the system was three days per party. The major objectives of these visitors in addition to canoeing were fishing, camping, and relaxing in this wilderness area. Fishing was generally good to excellent throughout much of the canoe system. Lakes and streams are inhabited by rainbow, Dolly varden, and steelhead trout; red, silver, chum, and pink salmon. Many canoeists utilized the first few lakes in the system while others continued down the Moose River to the Sterling Highway bridge.

The new Swanson River Canoe Route, north of the Swan Lake road when completed will connect a minimum of thirty lakes and 72 miles of waterways and portages. Travelers may then canoe from the Swan Lake road through a series of lakes and portages to the headwaters of the Swanson River and then float downstream to the river terminus, 50 miles distant.

During July nearly eight thousand persons and an estimated one of every dozen vehicles traveling the Sterling Highway visited the Skilak Lake Recreation area. Major recreational uses in order of visitor importance were camping, fishing, hunting, scenic driving, and canoeing. Other uses include hiking, nature study, boating, picnicking, berry picking, horseback riding, and swimming.

Overcrowded conditions continued to prevail at many of the campgrounds during the peak salmon runs and holiday weekends. Of the thirteen campgrounds on the Moose Range, Russian River, and Hidden Lake camping areas were the most heavily visited by recreationists. In July more than forty-nine hundred people visited the Hidden Lake campground. On the July 4th weekend an estimated three thousand visitors were using the Range. Most facilities were crowded to capacity, some overflowing. Family units at the Hidden Lake campground, then a 37-unit camping area, numbered seventy-five; while 148 family units crowded into the 50-unit facility at Russian River.

During July approximately 14,200 visitors were recorded on the Refuge compared to 8,400 during the same period in 1964. Military families, frequently from the Anchorage area, account for a large segment of visitor use on the Kenai National Moose Range. Commercial vehicles and persons on business traveling the Sterling Highway are not recorded for recreational purposes.

Thirteen guide camps, under Refuge permit, operated in the isolated lowland lake region of the Refuge. These camps provided recreational opportunities not otherwise available to the general visitor. Guides provided charter aircraft service, boats, tents, and gear for the many visitors attracted to this remote



area known for its excellent fishing and hunting resources. These camps remained active during the entire summer.

A major portion of the Funny River Horse Trail was constructed from Funny River road, near Soldotna, to the Upper Funny River, a distance of 12 miles. During August and September numerous horseback riders and hikers utilized the trail to reach favored hunting areas. Completion of this trail will provide access to the vast tundra and glacial regions high in the Kenai Mountains.

Recreational wildberry picking was almost non-existent this season. The poor berry crop contrasted sharply with the 1964 season's excellent crop which excelled those of the past four or five years.

Sheep, goat, black bear, grouse, and ptarmigan seasons opened August 10, and the moose season began ten days later, drawing hunters from all of Alaska, the continental United States, and Europe. Numerous boats were sighted on rivers and lakes. Roads and the pipeline were heavily traveled and aircraft were in the skies from dawn to dusk patrolling the lake shores for moose. The antlerless season during the last four days of November drew masses of hunters, many from the Anchorage area. Hunting pressure was at its greatest and kill was heavy along road systems as the deepening snow forced additional moose into the lowlands.

Winter arrived nearly two weeks early this fall. Early freeze-up provided fine ice skating for local enthusiasts until five weeks later when heavy snows curtailed this sport for another season.

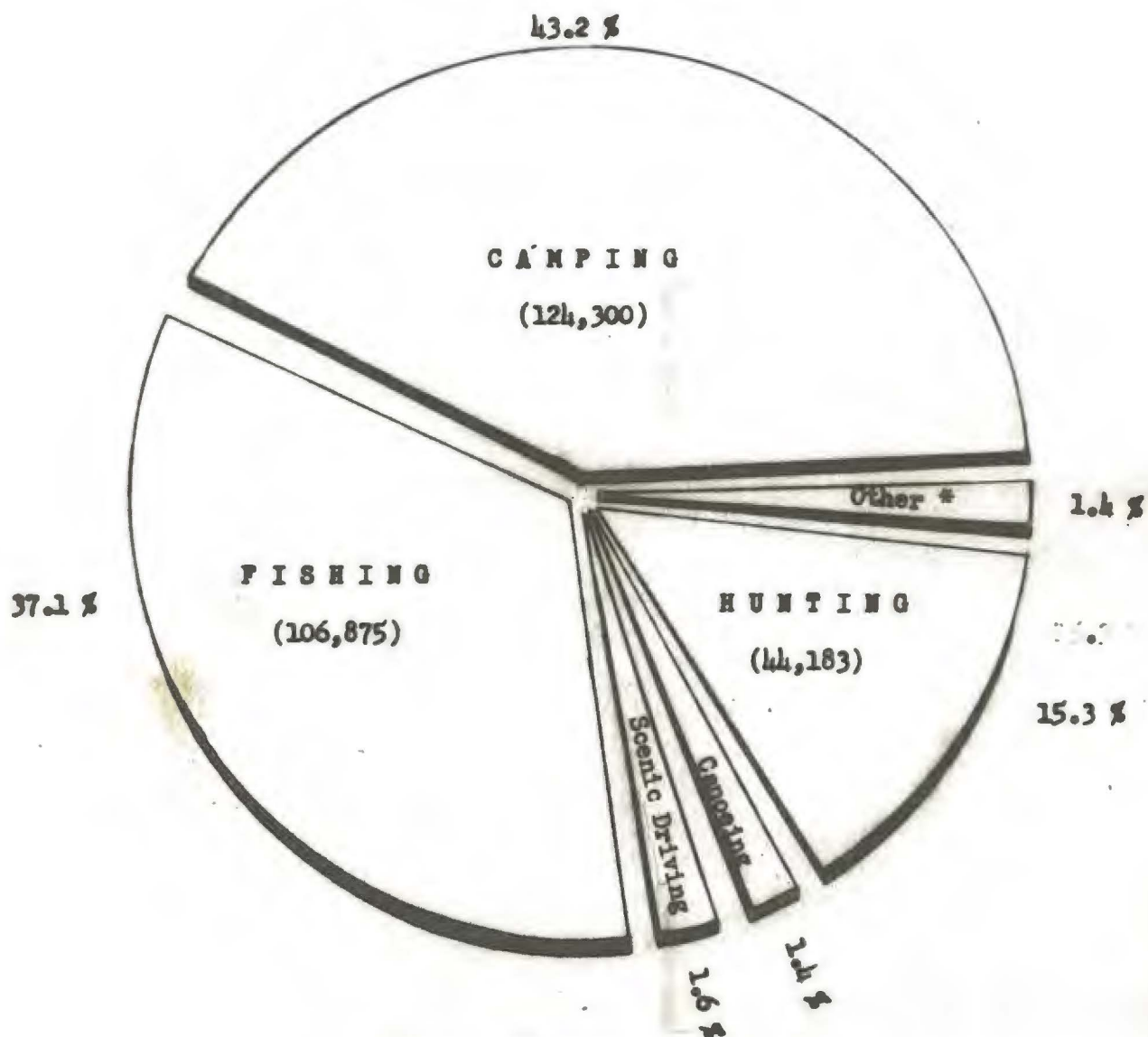
The use of snow travelers for recreational and hunting purposes has increased rapidly in Alaska. Local sales have soared without apparent limits. Favorite weekend outings by individuals, groups or organized clubs include racing, touring the taiga, extended trips to open alpine areas high in the Kenai Mountains that test the machine's performance under various snow and terrain conditions, or perhaps an outing to a secluded lake for good ice fishing. In many instances the snow traveler is used as a second family car.

During the fall hunting season several boundary violations occurred. Operation of these machines is only permitted within the Moose Range boundary from December 1 through March 31, and not for the purpose of taking big game. Game animals are extremely vulnerable to these vehicles and undoubtedly changes in present hunting regulations in other Alaska areas will be required.

New public use recreational forms were employed for the first time this calendar year. (Table 19) The new form provides a uniform method for measuring and reporting recreation use on the public lands and waters of the United States. The first report utilizing this new form will cover the calendar year 1965.

FIG. 12 RECREATIONAL USE 1965

Kenai National Moose Range



(Total: 267,888 Visitor Days)

\*

Skiing  
Hiking  
Nature study  
Boating  
Picnicking

Berry picking  
Snow travelers  
Ice skating  
Swimming  
Water skiing

TABLE 19.

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1965 PUBLIC USE - CONVERSION FACTORS

	Number of Visits	Estimated Average Hours for Each Visit	Total Hours
<b>A. <u>Hunting</u></b>			
Waterfowl	800	6	4,800
Upland Game	3,000	4	12,000
Big Game	50,000	17	510,000
Other <sup>1</sup>	340	10	3,400
Total <sup>2</sup>	34,140		530,200
<b>B. <u>Fishing</u></b>			
Total <sup>2</sup>	42,750	30	1,282,500
<b>C. <u>Miscellaneous</u></b>			
Nature Study <sup>3</sup>	200	40	8,000
Driving & Sightseeing	28,500	2	57,000
Picnicking	1,000	3	3,000
Swimming	100	6	600
Boating	1,000	7	7,000
Ice Skating	200	4	800
Water Skiing	50	6	300
Camping, Tent	9,200	50	460,000
Camping, Trailer or Camper	20,200	50	1,010,000
Camping, Group	150	144	21,600
Other Accommodations	-	-	-
Berry & Mushroom Picking	400	5	2,000
Visitor Centers & Museums	-	-	-
Other Uses (Identify)	-	-	-
Canoeing	710	66	46,860
Hiking	200	48	9,600
Skiing	3,500	4	14,000
Snow Traveler	200	6	1,200
Total <sup>2</sup>	65,610		1,641,960
<b>D. <u>Grand Total of A,B,C</u> <sup>2</sup></b>			
	142,500		3,454,660

Total hours divided by 12 equals number of Visitor-days

287,888

<sup>1</sup> Include "varmit" hunting.

<sup>2</sup> Totals will agree with line 1 on Form NR-6

<sup>3</sup> Includes birdwatching, wildlife observations, photography, use of nature trails.

<sup>4</sup> Other than for hunting and fishing.

## B. Refuge visitors

Visitors during the year included:

DATE	NAME	ORGANIZATION & ADDRESS	PURPOSE
3/11	Nelson Elliot	BSF&W, Portland	Visit
4/11	David Klein	Alaska Coop. Wildl. Unit, College	Visit
5/13	Robert Paul	BSF&W, Washington, D.C.	Visit
5/18	Clinton H. Lostetter	BSF&W, Portland	Visit
6/6	Vernon Ekedahl	BSF&W, Portland	Visit
6/6	Delbert H. Rasmussen	BSF&W, Portland	Visit
6/10	Russ Miller	BSF&W, Portland	Inspection
7/4	Tom Evans	BSF&W, Washington, D.C.	Visit
7/9	John Gatlin	BSF&W, Albuquerque	Visit
7/9	William T. Krummes	BSF&W, Albuquerque	Visit
7/10	John R. Langenbach	BSF&W, Portland	Visit
7/10	Paul T. Quick	BSF&W, Portland	Inspection
7/10	John Findlay	BSF&W, Portland	Inspection
7/10	Michio Takatake	HDP&G, Honolulu	Visit
7/10	Wes Woolgerd	MT&GD, Montana	Visit
8/2	H.J. Matthai	Munich, Germany	Photography
8/10	William M. Striplin, Jr.	BSF&W, Portland	Business
8/12	A. Starker Leopold	Univ. of Calif., Berkeley	Visit
8/16	Bruce Stollberg	BSF&W, Washington, D.C.	Inspection
9/13	John J. Craighead	Montana Coop. Wildl. Unit, Missoula	Visit
9/13	Karl W. Kenyon	BSF&W, Seattle	Visit
12/6	M. Tchikawa	Juju Paper Co., Japan	Business
12/6	T. Akimota	Juju Paper Co., Japan	Business

## C. Refuge Participation

Refuge Manager Troyer gave a slide talk on bear research to the Wildwood Rod and Gun Club on January 11.

During the January Alaska Department of Fish & Game meeting, Troyer also gave a presentation of activities on the Moose Range.

Assistant Refuge Manager Thayer attended a state-wide game enforcement meeting at Willow, Alaska, the first week of February. A Red Cross sponsored first aid training class was a part of this meeting.

Assistant Refuge Manager Wade discussed Refuge timber availability and sale procedures with a delegation of Japanese businessmen on the 16th in Anchorage. They are interested in establishing a large pulp chipping plant on the Peninsula.

A moose browse study group, representing all Alaska federal and state agencies concerned with moose, met in the area on February 16-18. A proposed moose research coordinating council was inie

tiated at this meeting.

Two displays were prepared for Wildlife Week and exhibited in Kenai and Soldotna.

The "Alaska Caribou" and "Whooping Crane" films were shown to 450 Kenai school children on March 8. Refuge Manager Troyer attended the Peninsula Sportsmen Meeting on March 10 and showed the "Alaska Caribou" film to 35 members.

On March 24, Troyer gave a talk to the Kenai Chamber of Commerce on the National Wilderness System.

Assistant Refuge Manager Wade attended a joint range meeting in Palmer between the Alaska Department of Fish and Game, Bureau of Land Management, and U.S. F.S. on March 16-17.

Assistant Refuge Manager Wade attended a State-wide forestry meeting in Palmer on April 6-7.

In April Assistant Refuge Managers Wade and Thayer were made Cub Scout Leaders. Mr. Wade was elected President of the Kenai PTA for the coming school year.

Biologist Richey attended the BLM Fire School April 5-11 in Fairbanks.

Dr. David Klein, Leader, Alaska Cooperative Wildlife Research Unit, and eight graduate students were given a tour of the Range April 11-13.

Refuge Manager Troyer gave a talk on bear research to the Methodist Men's Club on May 12.

The movie "Arctic Wildlife Range" was shown to the Kenai Chamber of Commerce in May.

Assistant Refuge Manager Thayer assisted and advised the City of Kenai in outlining a city park and trail program in May.

Biologist Richey gave an illustrated talk June 30 to the Kenai Chamber of Commerce on outdoor recreation on the Moose Range.

Refuge Manager Troyer attended the Western Association of Fish and Game Commissioners Conference in Anchorage on July 6-9 and met with many of the Western people to discuss mutual problems.



The Boy Scouts of the Kenai Peninsula held their annual jamboree at Hidden Lake the week of August 6. A total of seventy-one Scouts participated. While present, they spent considerable time assisting in cleaning the area.

Assistant Refuge Manager Wade showed "Sea Otters of Anchitka", "Cheechako", and "Arctic Range" to men at Anchitka for project LONG SHOT on August 23.

On September 16 Troyer and Richey met with U.S. Forest Service personnel from the Chugach National Forest to discuss mutual recreational problems.

Assistant Refuge Manager Wade gave an illustrated slide talk to the NCO Wives Club at Wildwood Station on September 28, explaining Moose Range activities.

Wade, Troyer, and Spencer attended the State Interagency Moose Meeting on October 11 in Anchorage.

Bob Wade attended the Annual Alaska Forest Inventory meeting in Anchorage on October 25 and gave a slide talk to the Kenai Garden Club on November 3.

The ALASKA SPORTSMAN'S November edition carried a cover depicting Dall rams on the Moose Range. The picture was taken by Will Troyer.

Troyer met with the Kenai Chamber of Commerce Board of Directors to discuss the Neighborhood Youth Corps problem on December 13.

Wade attended a Civil Defense Training session at WILDWOOD on December 14-16.

The film "The Alaska Caribou" was shown to the Rod and Gun Club at Wildwood on December 6.

#### D. Hunting

Species	BIG GAME	
	Season	Limit
Moose: Bulls	Aug. 20-Sept. 30	
	Nov. 1-Nov. 30	1
Moose: Cows & Calves	Nov. 27-Nov. 30	1
Mountain Goat	Aug. 10-Dec. 31	2
Mountain Sheep	August 10-Sept. 20	1 3/4 curl r
Brown & Grizzly bear	Sept. 1-Sept. 30	1
Black Bear	Aug. 10-June 30	3
Wolverine	Nov. 10-March 31	No limit

UPLAND GAME

-86-

<u>Species</u>	<u>Season</u>	<u>Limit</u>
Grouse	August 10-March 15	15/d-30/poss
Ptarmigan	August 10-April 30	20/d-40/poss
Hare	No closed season	No limit

FUR ANIMALS

Mink, Marten, Fox, Weasel	Nov. 10-Jan. 31	No limit
Lynx, Land Otter	Nov. 10-March 31	No limit
Muskrat	Nov. 10-June 10	No limit
Beaver	Feb. 1-April 30	40
Coyote	No closed season	No limit

MARINE MAMMALS

Seals	Oct. 15-July 31	No limit
Beluga Whale	No closed season	No limit

WATERFOWL

Waterfowl	Sept. 1-Dec. 14	Same as federal regulations
-----------	-----------------	-----------------------------

E. ViolationsCASES CLOSED

<u>Name</u>	<u>Charge</u>	<u>Fine</u>	
J. Von Phillips	Taking illegal size Dall sheep	\$100	\$50 sus.
Robert E. Carlson	Taking female Dall sheep	100	25 sus.
Robert R. Kraus	Taking female Dall sheep	100	25 sus.

CASES PENDING

Plumis Walter Moore Ernest Midford Knight Mrs. Plumis W. Moore	Taking moose during closed season		
Plumis Walter Moore Ernest Midford Knight	Hunting brown bear during closed season		
Dale Griggs James Yoon	Taking sheep less than 3/4 curl.		

## F. Safety

Several employees were injured this past summer. The number of accident free days extended to 655 when the first accident of the year occurred. Following is a list of reported injuries:

- April 6. Rex Williams - Heavy pry bar slipped while working on "cat" resulting in hole punched in left hand.
- June 16. Ray Williams - Pulled muscle in left forearm while raking lawn.
- July 12. Rex Williams - Heavy hammer dropped on right foot causing a bruise.
- July 26. Gregory Olson - Tendon torn from left hip joint while walking in mountain area.
- August 9. Michael Johnson - Cut left hand with an axe.

We have accumulated 144 accident free days since the last mishap.

Good housekeeping procedures were stressed in the shop and office this past year. Preventive maintenance on vehicles and other mechanical equipment was carried out. Safety with axes and chain saws was demonstrated to temporary employees. The excellent movie "Pulse of Life" was shown in July.

## VII. OTHER ITEMS

### A. Items of Interest

Jeanne K. Peavley, clerk (typist) resigned on February 5 and was replaced by Linda Groleske on February 1.

Lesley A. Holt, maintenanceman, resigned on September 10 to return to his former home in Missouri.

Robert Richey received his appointment as a Refuge Biologist on February 10 and was promoted to Assistant Refuge Manager on July 18. Mr. Richey is primarily responsible for the recreational program.

Considerable film footage was taken for the movie depicting Moose Range activities during the course of the year. Earl Fleming was employed in May and June to assist in this project.

Site planning of the proposed Youth Corps Center at Bottinontnin Lake and a list of conservation projects to be completed during

the first year of operation required considerable time and thought. The number of proposed projects on the Moose Range would have surely kept the Corpsmen occupied if the Center had become a reality.

The manuscript "Nesting and Productivity of Bald Eagles on the Kodiak National Wildlife Refuge, Alaska" by Willard A. Troyer and Richard J. Hensel was published in the November issue of The Auk. A manuscript "Aerial Census of Moose Using Quadrat Sampling Units" by Charles D. Evans, Willard A. Troyer, and Calvin J. Lensink has been submitted to the Journal of Wildlife Management.

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

Name	Job	Employed
Greg Olson	IAS 5	June 8- August 30
Von Phillips	IAS 5	May 25-August 25
Ray Williams	Laborer	June 7-August 16
Leonard Efta	Laborer	May 24-June 11
Michael Coray	Laborer	June 2-August 13
Michael Johnson	Laborer	June 26-September 10
Jimmy Thompson	Laborer	June 2-June 25
Charles Riner	Laborer	June 2-July 30
David J. Lamm	Bull-dozer Oper.	Sept. 13-Nov. 11
Harold Pope	Carpenter	Sept. 13-Nov. 26

We participated in the local Neighborhood Youth Corps program in November and December. During this period from one to six youths worked under our supervision assisting in office work, cutting trails, and shop maintenance.

Intense aircraft activity during the hunting season resulted in the usual aircraft accidents on the Moose Range. One aircraft upset while landing on the upper Funny River Airstrip during turbulent wind conditions; one aircraft collided with the ground while buzzing large bull moose on a mountain slope; and another aircraft broke a ski while landing on a snow-drift covered lake to shoot a moose. The latter accident resulted from the pilot's attempt to get the plane landed and stopped while the moose was still within rifle range.

A twin engine commercial aircraft on a scheduled flight from Homer to Soldotna struck Tustumena Lake approximately 1 mile from shore with flying beneath a very low overcast. The five

persons aboard were not injured by the inadvertant water landing, but four of them quickly succumbed to exposure in the cold water. The single survivor, a trained and experienced swimmer of Olympic ability, swam ashore and was rescued. The plane was later salvaged and rebuilt.

#### The Recreational Management Plan

The Recreational Management Plan for the Kenai National Moose Range was submitted and approved by the Regional Office. This plan will serve as a guideline to the year 2000 for the future development and management programs on the Moose Range.

#### B. Photographs

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

Submitted by: Willard A. Troyer  
Willard A. Troyer  
Refuge Manager

January 31, 1966

Approved: David L. Spencer  
David L. Spencer, Supervisor  
Alaska Wildlife Refuges

(\* Please note: All three Assistant Refuge Managers wrote portions of this report.)

WAT:ces





#1 Tustumena Glacier on the Kenai National Moose Range is only one of the many scenic attractions.





#2. Dall sheep inhabit the mountains. More than nine hundred were counted during the 1965 survey.

#3. Vegetative transects were established in sheep wintering ranges.







#4. An estimated 8,500 moose inhabit the Moose Range.

#5. Calves comprise 19 per cent of the 1965 moose population.







#6. Marmot colonies are found in the mountains.

#7. Willow ptarmigan summer in the mountains but migrate to lowland areas in the winter.

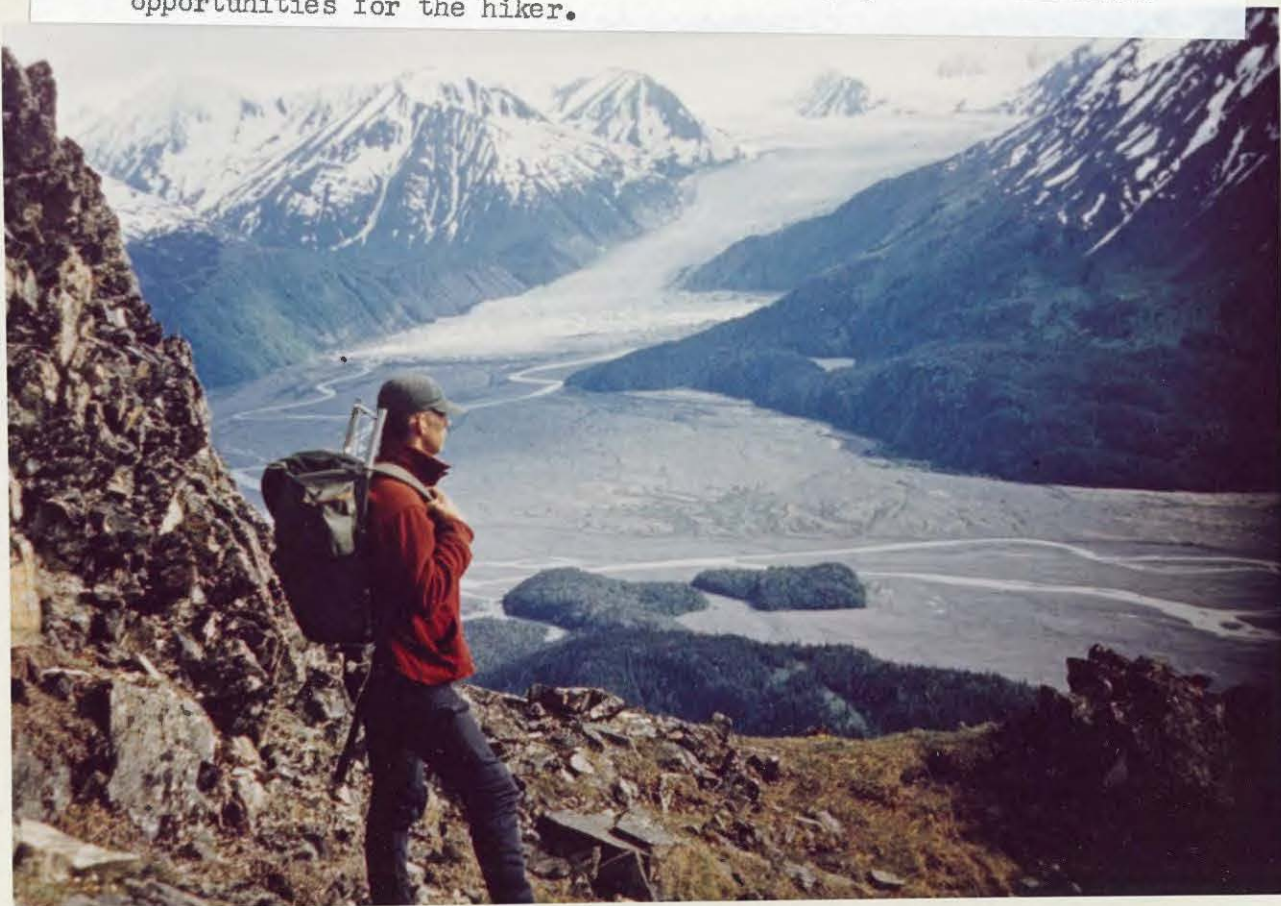






#8. Camping is one of the major recreational pursuits on the Moose Range.

#9. The alpine wilderness area on the Moose Range provides unlimited opportunities for the hiker.







#10. The Swan Lake Canoe Route is a popular recreational area.

#11. The cry of the loon can be heard from many lakes.





• JAN • 66

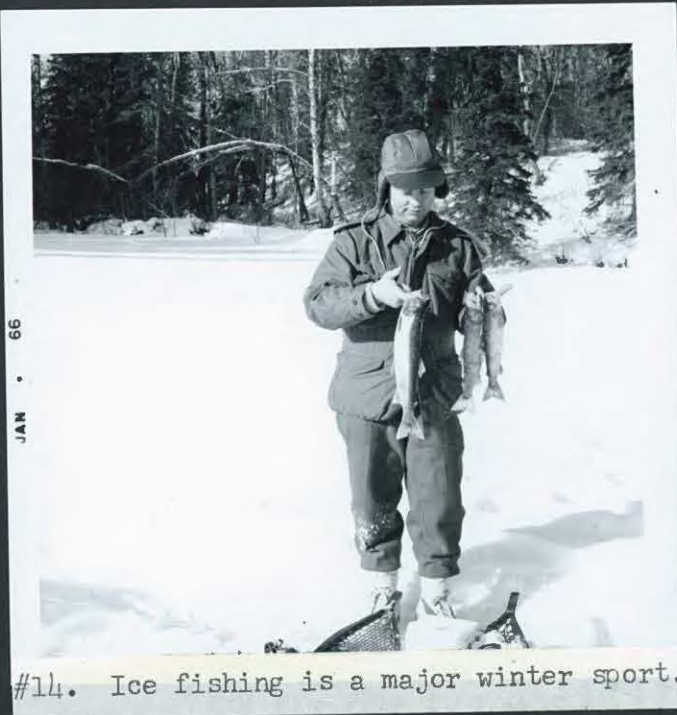


#12. The earthquake lowered the Chickaloon Flats and covered them with a silty mud, but vegetation and waterfowl are again returning.



#13. A record 39 pairs of trumpeter swans nested on the Kenai and produced 163 cygnets.







JAN

66



#16. More than 500 canoeists traveled the Swan Lake Canoe Route.

JAN

66



#17. Surveys indicate 142,000 visitors traveled to the Moose Range for outdoor recreational purposes.



JAN 66



#18. Spawned out salmon indicate the importance of the Moose Range streams to the multimillion dollar Cook Inlet salmon industry and to sport fishermen.



JAN 66

#19. Japanese interests will soon require large timber sales.



#20. Considerable work in beautifying the Kenai headquarters was accomplished.



#21. Planting trees at Kenai headquarters during Beautification Week.





#22. Soil and moisture funds were used to correct this erosion problem.



#23. The completed project.



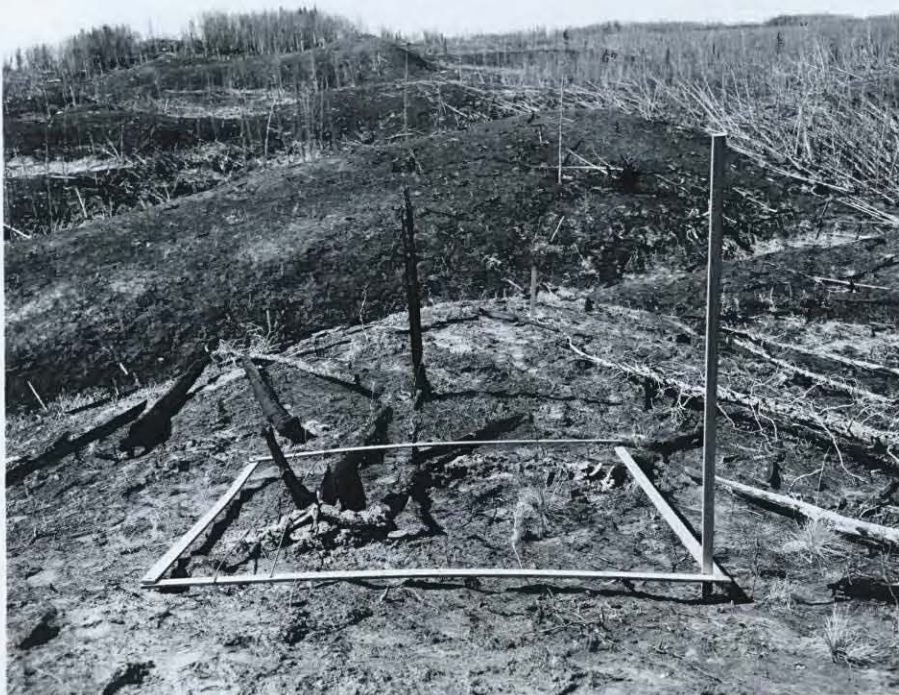


#24. Oil and gas operations demand constant attention in minimizing damage to habitat.



#25. Moose Range personnel requested Standard Oil to grade and seed the roadsides to the oil field.





#26. Vegetation plots were established at the Engineer Lake fire area.



#27. Some campers fail to appreciate the outdoors.



*See large Map in Map  
Cabinet marked Kenai Refuge*

R E C R E A T I O N A L   M A N A G E M E N T   P L A N   A R E A   M A P

KENAI NATIONAL MOOSE RANGE, ALASKA


L E G E N D

ROADS ..... 

TRAILS ..... 

CANOE SYSTEM

Portage ..... 

Waterway ..... 

CAMPGROUND ..... 





CAMPING AND PICNIC SITE ..... 

WAYSIDE PICNIC SITE ..... 

SHELTER ..... 

LOOKOUT ..... 

HISTORICAL SITE ..... 

Black  Existing facilities  
Red  Facilities proposed prior to 1975  
Blue-Violet  Facilities proposed prior to 2000  
Yellow  Special Areas

S C A L E



1 Inch = 1 Mile

3-1750  
Form No. 1  
(Rev. March 1953)

## W A T E R F O W L

REFUGE Kenai National Moose Range

MONTHS OF January TO April, 19 65

[illegible]

3 -J 50a  
 Cont R-1  
 (Rev. March 1953)

WATERFOWL  
 (Continuation Sheet)

REFUGE Kenai National Moose Range

MONTHS OF January TO April, 1965

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production Broods: Estimated seen : total	
	3/14 11	3/21 12	3/28 13	4/4 14	4/11 15	4/18 16	4/25 17	5/2 18			
Swans:											
Whistling	0						100		700		
Trumpeter	14	25	40	50	150	175	175		5,495		
Geese:											
Canada	6					600	1,200		12,600		
Cackling						75	300		2,625		
Brant							200		1,400		
White-fronted											
Snow							500		3,500		
Blue											
Other											
Ducks:											
Mallard	150	150	150	180	200	400	800		22,610		
Black											
Gadwall											
Baldpate							100		700		
Pintail						1,000	3,000		28,000		
Green-winged teal						190	500		4,830		
Blue-winged teal											
Cinnamon teal											
Shoveler							25		175		
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup	100	100	100	200	200	300	500		14,000		
Goldeneye	500	500	500	500	700	900	1,000		60,200		
Bufflehead											
Ruddy											
Other Merganser	100	100	100	100	100	100	500		14,700		
Coot:											

(over)



	(5)	(6)	(7)
	Total Days Use	Peak Number	Total Production
Swans	6,195	275	-
Geese	20,125	2,200	-
Ducks	145,215	6,425	-
Coots	-	-	-

SUMMARY	
Principal feeding areas	Chickaloon Bay, Kenai River, Lakes, Moose River.
Principal nesting areas	Chickaloon Bay, lakes and river.
Reported by <u>Averill S. Thayer</u>	

INSTRUCTIONS (See Secs. 7531 through 7534, Wildlife Refuges Field Manual)

- (1) Species: In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.
- (2) Weeks of Reporting Period: Estimated average refuge populations.
- (3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.
- (4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.
- (5) Total Days Use: A summary of data recorded under (3).
- (6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.
- (7) Total Production: A summary of data recorded under (4).

MONTHS OF May TO August, 1965

[illegible]

3 - 150a  
 Cont. R-1  
 (Rev. March 1953)

WATERFOWL  
 (Continuation Sheet)

REFUGE Senai National Moose Range

MONTHS OF May TO August, 1965

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production : Broods: Estimate : seen : total	
	7/11 11	7/18 12	7/25 13	8/1 14	8/8 15	8/15 16	8/22 17	8/29 18			
Swans:											
Whistling	0	0	0	0	0	0	0	0	13,400		
Trumpeter	272	272	272	272	272	272	270	265	25,600	39	163
Geese:											
Canada, lesser	50	50	50	50	50	50	50	50	108,600		
Cackling									6,200		
Brant											
White-fronted									12,600		
Snow											
Blue											
Other											
Ducks:											
Mallard	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	210,700		
Black											
Gadwall	150	100	100	100	100	100	100	100	22,000		
Baldpate	400	400	400	400	300	300	300	300	90,300		
Pintail	2,500	2,000	2,000	2,000	2,000	2,000	2,000	2,000	388,500		
Green-winged teal	500	500	500	500	500	500	1,000	1,000	163,100		
Blue-winged teal											
Cinnamon teal											
Shoveler	200	200	200	200	200	200	900	1,200	51,100		
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup	400	400	400	400	400	400	500	600	51,100		
Goldeneye	500	500	500	500	500	500	500	500	59,500		
Bufflehead	50	50	50	50	50	50	50	50	8,000		
Ruddy											
Other Merganser	500	500	500	500	500	500	500	500	54,600		
Coot:											
				(over)							

	(5)	(6)	(7)	SUMMARY
	Total Days Use	Peak Number	Total Production	
Swans	42,000	900	163	Principal feeding areas <u>Chickaloon Bay and lowland lakes.</u>
Geese	127,400	5,400	40	
Ducks	1,098,900	19,000	5,000	Principal nesting areas <u>Chickaloon Bay and lowland lakes.</u>
Coots				
				Reported by <u>Averill S. Thayer</u>

INSTRUCTIONS (See Secs. 7531 through 7534, Wildlife Refuges Field Manual)

- (1) Species: In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.
- (2) Weeks of Reporting Period: Estimated average refuge populations.
- (3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.
- (4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.
- (5) Total Days Use: A summary of data recorded under (3).
- (6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.
- (7) Total Production: A summary of data recorded under (4).



## W A T E R F O W L

REFUGE      Kenai National Moose Range

MONTHS OF September TO December , 1965

[illegible]

3 -1750a

Cont. R-1

(Rev. March 1953)

# WATERFOWL (Continuation Sheet)

REFUGE Kenai National Moose RangeMONTHS OF September TO December, 19 65

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production :Broods:Estimate : seen : total	
	11/14 11	11/21 12	11/28 13	12/5 14	12/12 15	12/19 16	12/26 17	18			
Swans:											
Whistling	5	5	5						7,700		
Trumpeter	25	20	12	10	10	10	10		15,000		
Geese:											
Canada, lesser									75,900		
Cackling											
Brant											
White-fronted											
Snow									15,400		
Blue											
Other											
Ducks:											
Mallard	200	200	200	200	200	200	200		126,700		
Black											
Gadwall									46,200		
Baldpate									77,000		
Pintail									140,000		
Green-winged teal									32,200		
Blue-winged teal											
Cinnamon teal											
Shoveler									23,100		
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup	900	800	700	600	500	500	500		129,500		
Goldeneye	900	800	800	800	800	800	800		120,400		
Bufflehead	100	50	50	50	50	50	50		15,700		
Ruddy									14,000		
Other Merganser	800	700	500	500	300	300	300		102,200		
Coot:											

(over)

	(5)	(6)	(7)	SUMMARY
	Total Days Use	Peak Number	Total Production	
Swans	22,700	275		Principal feeding areas <u>Chickaloon Bay, Kenai River and</u>
Geese	91,300	12,000		<u>lowland lakes.</u>
Ducks	827,000	15,350		Principal nesting areas <u>Chickaloon Bay and lowland lakes.</u>
Coots				
				Reported by <u>Averill S. Thayer</u>

INSTRUCTIONS (See Secs. 7531 through 7534, Wildlife Refuges Field Manual)

- (1) Species: In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.
- (2) Weeks of Reporting Period: Estimated average refuge populations.
- (3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.
- (4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.
- (5) Total Days Use: A summary of data recorded under (3).
- (6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.
- (7) Total Production: A summary of data recorded under (4).

3-1751

Form NR-1A

(Nov. 1945)

## MIGRATORY BIRDS

(other than waterfowl)

Refuge Kendall National Moose RangeMonths of Januaryto April 301965

(1) Species	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Number
I. <u>Water and Marsh Birds:</u>										
Sandhill Crane	3	4/20	200	4/30	Still present					400

(over)



(1)	(2)		(3)		(4)		(5)		(6)
III. <u>Doves and Pigeons:</u> Mourning dove White-winged dove									
IV. <u>Predaceous Birds:</u> Golden eagle Duck hawk Horned owl Magpie Raven Crow Bald Eagle Goshawk Hawk Owl Harlan's Hawk Marsh Hawk Great Grey Owl	Resident		150	1/15	Still present				200
	"		300	1/15	"	"			500
	"		1,500	4/30	"	"			2,000
	"		2,000	4/30	"	"			4,000
	"		150	4/30	"	"			300
	"		300	1/15	"	"			350
	"		50	1/15	"	"			60
	1	4/20	10	4/30	"	"			20
	1	4/20	20	4/30	"	"			40
	Resident		10	1/15	"	"			15
Reported by.....						R.V.W.			

#### INSTRUCTIONS

- (1) Species: Use the correct names as found in the A.O.U. Checklist, 1931 Edition, and list group in A.O.U. order. Avoid general terms as "seagull", "tern", etc. In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance. Groups: I. Water and Marsh Birds (Gaviiformes to Ciconiiformes and Gruiformes)  
II. Shorebirds, Gulls and Terns (Charadriiformes)  
III. Doves and Pigeons (Columbiformes)  
IV. Predaceous Birds (Falconiformes, Strigiformes and predaceous Passeriformes)
- (2) First Seen: The first refuge record for the species for the season concerned.
- (3) Peak Numbers: The greatest number of the species present in a limited interval of time.
- (4) Last Seen: The last refuge record for the species during the season concerned.
- (5) Production: Estimated number of young produced based on observations and actual counts.
- (6) Total: Estimated total number of the species using the refuge during the period concerned.

3-1751

Form NR-1A

(Nov. 1945)

## MIGRATORY BIRDS

(other than waterfowl)

Refuge Kenai National Moose RangeMonths of Mayto August1965

(1) Species		(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total
Common Name		Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Number
<b>I. Water and Marsh Birds:</b>											
Sandhill Crane	Were	present	600	6/15	Still	present		20	25		800
Common Loon	1	5/3	1,500	7/20	"	"					1,800
Arctic Loon	2	5/3	200	7/20	"	"					300
Red-throated Loon	2	5/5	50	7/20	"	"					100
Horned Grebe	2	5/10	1,200	7/20	"	"					1,500
Red-necked Grebe	1	5/10	100	7/20	"	"					400
Double-crested Cormorant	2	5/3	10	5/10	1	6/1					30
<b>II. Shorebirds, Gulls and Terns:</b>											
Common Snipe	Were	present	500	8/30	Still	present					800
Glaucous-winged Gull	"	"	5,000	8/5	"	"					6,000
Herring Gull	"	"	6,000	8/5	"	"					8,000
Mew Gull	"	"	5,000	7/15	"	"					6,000
Bonaparte's Gull	"	"	700	8/5	"	"					1,000
Semipalmated Plover	1	5/11	200	6/15	1	8/25					300
American Golden Plover	5	5/10	300	6/15	2	8/30					400
Black Bellied Plover	1	5/10	200	6/15	1	6/20					300
Whimbrel	4	5/15	50	5/25	1	8/20					80
Spotted Sandpiper	5	6/1	1,000	7/10	1	8/20					1,500
Solitary Sandpiper	1	6/10	200	7/10	1	8/20					300
Arctic Tern	1	5/1	1,500	7/10	Still	Present					1500

(over)

(1)	(2)	(3)	(4)	(5)	(6)
III. <u>Doves and Pigeons:</u>					
Mourning dove					
White-winged dove					
IV. <u>Predaceous Birds:</u>					
Golden eagle	Resident	15	8/30	Still present	30
Duck hawk	"			"	
Horned owl	"	200	6/1	"	300
Magpie	"	1,000	8/30	"	1,500
Raven	"	1,500	8/30	"	2,000
<del>Crow</del> Bald Eagle	"	100	6/10	"	120
Goshawk	"	200	6/10	"	300
Hawk Owl	"	20	8/30	"	30
Great Grey Owl	"	10	8/30	"	20
Short-eared Owl	"	50	8/30	"	70
Boreal Owl	"	300	8/30	"	400
Osprey	2	5/25	10	7/5	20
Reported by <u>Robert V. Wade</u>					

#### INSTRUCTIONS

- (1) Species: Use the correct names as found in the A.O.U. Checklist, 1931 Edition, and list group in A.O.U. order. Avoid general terms as "seagull", "tern", etc. In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance. Groups: I. Water and Marsh Birds (Gaviiformes to Ciconiiformes and Gruiformes)  
 II. Shorebirds, Gulls and Terns (Charadriiformes)  
 III. Doves and Pigeons (Columbiformes)  
 IV. Predaceous Birds (Falconiformes, Strigiformes and predaceous Passeriformes)
- (2) First Seen: The first refuge record for the species for the season concerned.
- (3) Peak Numbers: The greatest number of the species present in a limited interval of time.
- (4) Last Seen: The last refuge record for the species during the season concerned.
- (5) Production: Estimated number of young produced based on observations and actual counts.
- (6) Total: Estimated total number of the species using the refuge during the period concerned.

3-1751

Form NR-1A

(Nov. 1945)

## MIGRATORY BIRDS

(other than waterfowl)

Refuge Kenai National Moose RangeMonths of Septemberto December1965

(1) Species	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Number
I. <u>Water and Marsh Birds:</u>										
Common Loon	Were	present	900	9/1	3	9/30				1,000
Arctic Loon	"	"	15	9/1	1	9/10				100
Red-throated Loon	"	"	50	9/1	2	9/30				100
Horned Grebe	"	"	900	9/1	3	10/30				1,500
Red-necked Grebe	"	"	100	9/1	2	10/30				200
Sandhill Crane	"	"	150	9/1	4	10/10				1,500
II. <u>Shorebirds, Gulls and Terns:</u>										
Common Snipe	Were	present	1,500	9/1	15	10/11				6,000
Glaucous-winged Gull	"	"	3,000	9/15	2	12/5				10,000
Herring Gull	"	"	2,000	9/1	5	11/1				5,000
Mew Gull	"	"	1,500	9/1	3	10/11				2,000
Bonaparte's Gull	"	"	200	9/1	1	10/11				500

(over)



(1)	(2)	(3)	(4)	(5)	(6)
III. <u>Doves and Pigeons:</u>					
Mourning dove					
White-winged dove					
IV. <u>Predaceous Birds:</u>					
Golden eagle	Resident	20	12/15	Still present	50
Duck hawk	"	250	9/20	" "	250
Horned owl	"	1,000	9/1	" "	1,000
Magpie	"	1,500	9/1	" "	2,000
Raven	"	150	9/20	" "	250
<del>White</del> Bald Eagle	"	250	9/1	" "	300
Crow	"	100	9/20	" "	150
Goshawk	"	100	9/1	" "	100
Hawk Owl	"	300	9/1	" "	300
Short-eared Owl					
Boreal Owl					
Reported by.....					

#### INSTRUCTIONS

- (1) Species: Use the correct names as found in the A.O.U. Checklist, 1931 Edition, and list group in A.O.U. order. Avoid general terms as "seagull", "tern", etc. In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance. Groups: I. Water and Marsh Birds (Gaviiformes to Ciconiiformes and Gruiformes)  
 II. Shorebirds, Gulls and Terns (Charadriiformes)  
 III. Doves and Pigeons (Columbiformes)  
 IV. Predaceous Birds (Falconiformes, Strigiformes and predaceous Passeriformes)
- (2) First Seen: The first refuge record for the species for the season concerned.
- (3) Peak Numbers: The greatest number of the species present in a limited interval of time.
- (4) Last Seen: The last refuge record for the species during the season concerned.
- (5) Production: Estimated number of young produced based on observations and actual counts.
- (6) Total: Estimated total number of the species using the refuge during the period concerned.

3-1750b  
Form NR-1B  
(Rev. Nov. 1957)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE

WATERFOWL UTILIZATION OF REFUGE HABITAT

Refuge Kenai For 12-month period ending August 31, 1965

Reported by R.V. Wade Title Ass't Refuge Manager

(1)	(2)		(3)	(4)	(5)
Area or Unit	Habitat		Use-days	Breeding	Production
Designation	Type Acreage			Population	
	Crops	Ducks	1,538,745	1,200	5,000
	Upland	Geese	173,125	20	40
	Marsh	Swans	61,502	70	163
	Water	Coots			
	Total	Total	1,773,672	1,290	5,103
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	Crops	Ducks			
	Upland	Geese			
	Marsh	Swans			
	Water	Coots			
	Total	Total			
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	Crops	Ducks			
	Upland	Geese			
	Marsh	Swans			
	Water	Coots			
	Total	Total			
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	Crops	Ducks			
	Upland	Geese			
	Marsh	Swans			
	Water	Coots			
	Total	Total			
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	Crops	Ducks			
	Upland	Geese			
	Marsh	Swans			
	Water	Coots			
	Total	Total			
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	Crops	Ducks			
	Upland	Geese			
	Marsh	Swans			
	Water	Coots			
	Total	Total			
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	Crops	Ducks			
	Upland	Geese			
	Marsh	Swans			
	Water	Coots			
	Total	Total			
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -

(over)

## INSTRUCTIONS

All tabulated information should be based on the best available techniques for obtaining these data. Estimates having no foundation in fact must be omitted. Refuge grand totals for all categories should be provided in the spaces below the last unit tabulation. Additional forms should be used if the number of units reported upon exceeds the capacity of one page. This report embraces the preceding 12-month period, NOT the fiscal or calendar year, and is submitted annually with the May-August Narrative Report.

- (1) **Area or Unit:** A geographical unit which, because of size, terrain characteristics, habitat type and current or anticipated management practices, may be considered an entity apart from other areas in the refuge census pattern. The combined estimated acreages of all units should equal the total refuge area. A detailed map and accompanying verbal description of the habitat types of each unit should be forwarded with the initial report for each refuge, and thereafter need only be submitted to report changes in unit boundaries or their descriptions.
- (2) **Habitat:** Crops include all cultivated croplands such as cereals and green forage, planted food patches and agricultural row crops; upland is all uncultivated terrain lying above the plant communities requiring seasonal submergence or a completely saturated soil condition a part of each year, and includes lands whose temporary flooding facilitates use of non-aquatic type foods; marsh extends from the upland community to, but not including, the water type and consists of the relatively stable marginal or shallow-growing emergent vegetation type, including wet meadow and deep marsh; and in the water category are all other water areas inundated most or all of the growing season and extending from the deeper edge of the marsh zone to strictly open-water, embracing such habitat as shallow playa lakes, deep lakes and reservoirs, true shrub and tree swamps, open flowing water and maritime bays, sounds and estuaries. Acreage estimates for all four types should be computed and kept as accurate as possible through reference to available maps supplemented by periodic field observations. The sum of these estimates should equal the area of the entire unit.
- (3) **Use-days:** Use-days is computed by multiplying weekly waterfowl population figures by seven, and should agree with information reported on Form NR-1.
- (4) **Breeding Population:** An estimate of the total breeding population of each category of birds for each area or unit.
- (5) **Production:** Estimated total number of young raised to flight age.

3-1752  
Form N 2  
(April 1946)

UPLAND GAME BIRDS

Refuge Kenai National Moose Range Months of January to April 30, 1965

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Spruce Grouse	Spruce forests 900,000 acres	300			1:1	200			3,000	Rough estimate
Ptarmigan	Alpine tundra and brush lowlands 1,700,000 acres	377			1:1	300			4,500	" "



## INSTRUCTIONS

Form NR-2 - UPLAND GAME BIRDS.\*

- (1) SPECIES:            Use correct common name.
- (2) DENSITY:           Applies particularly to those species considered in removal programs (public hunts, etc.). Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED:   Estimated number of young produced, based upon observations and actual counts in representative breeding habitat.
- (4) SEX RATIO:         This column applies primarily to wild turkey, pheasants, etc. Include data on other species if available.
- (5) REMOVALS:          Indicate total number in each category removed during the report period.
- (6) TOTAL:             Estimated total number using the refuge during the report period. This may include resident birds plus those migrating into the refuge during certain seasons.
- (7) REMARKS:           Indicate method used to determine population and area covered in survey. Also include other pertinent information not specifically requested.

\* Only columns applicable to the period covered should be used.

3-1752  
Form 2  
(April 1946)

UPLAND GAME BIRDS

Refuge Kenai National Moose Range

Months of May

to August 31, 1965

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Spruce Grouse	Spruce forest 900,000 Acres	90			1:1	300			10,000	Rough estimate
Ptarmigan	Alpine meadows 300,000 acres	375			1:1	200			8,000	" "

## INSTRUCTIONS

Form NR-2 - UPLAND GAME BIRDS.\*

- (1) SPECIES: Use correct common name.
- (2) DENSITY: Applies particularly to those species considered in removal programs (public hunts, etc.). Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED: Estimated number of young produced, based upon observations and actual counts in representative breeding habitat.
- (4) SEX RATIO: This column applies primarily to wild turkey, pheasants, etc. Include data on other species if available.
- (5) REMOVALS: Indicate total number in each category removed during the report period.
- (6) TOTAL: Estimated total number using the refuge during the report period. This may include resident birds plus those migrating into the refuge during certain seasons.
- (7) REMARKS: Indicate method used to determine population and area covered in survey. Also include other pertinent information not specifically requested.

\* Only columns applicable to the period covered should be used.

3-1752  
Form 2  
(April 1946)

UPLAND GAME BIRDS

Refuge Kenai National Moose Range

Months of September

to December 31, 19<sup>65</sup>

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Spruce Grouse	Spruce forest 900,000 acres	95			1:1	600			9,500	Rough estimate
Ptarmigan	Alpine meadows and lowland brush	265			1:1	300			6,400	" "



## INSTRUCTIONS

### Form NR-2 - UPLAND GAME BIRDS.\*

- (1) SPECIES:            Use correct common name.
- (2) DENSITY:           Applies particularly to those species considered in removal programs (public hunts, etc.). Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED:   Estimated number of young produced, based upon observations and actual counts in representative breeding habitat.
- (4) SEX RATIO:         This column applies primarily to wild turkey, pheasants, etc. Include data on other species if available.
- (5) REMOVALS:          Indicate total number in each category removed during the report period.
- (6) TOTAL:             Estimated total number using the refuge during the report period. This may include resident birds plus those migrating into the refuge during certain seasons.
- (7) REMARKS:           Indicate method used to determine population and area covered in survey. Also include other pertinent information not specifically requested.

\* Only columns applicable to the period covered should be used.

3-17  
Form NR-3  
(June 1945)

BI NAME

Refuge Kenai National Moose Range

Calendar Year 1965

(1) Species	(2) Density	(3) Young Produced	(4) Removals				(5) Losses			(6) Introductions		(7) Estimated Total Refuge Population		(8) Sex Ratio
Common Name	Cover types, total Acreage of Habitat	Number	Hunting	For Re- stocking	Sold	For Research	Predation	Disease	Winter Loss	Number	Source	At period of Greatest use	As of Dec. 31	
B	Lowland, timber, alpine brush 1,400,000 acres	2,000	1,175				31		100			8,600	7,500	1:4
k Bear	Same as above	100	30						5			600	565	1:1
n Bear	Same as above	20	6									35	29	1:1
Sheep	Alpine tundra 200,000 acres	150	38	18			10		12			932	866	1:2
tain Goat	Alpine 200,000 acres	25	6						5			119	113	1:1

Remarks:

\* Automobile collisions

A. Thayer

Reported by \_\_\_\_\_

## INSTRUCTIONS

### Form NR-3 - BIG GAME

- (1) SPECIES: Use correct common name; i.e., Mule deer, black-tailed deer, white-tailed deer. It is unnecessary to indicate sub-species such as northern or Louisiana white-tailed deer.
- (2) DENSITY: Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge: once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED: Estimated total number of young produced on refuge.
- (4) REMOVALS: Indicate total number in each category removed during the year.
- (5) LOSSES: On the basis of known records or reliable estimates indicate total losses in each category during the year.
- (6) INTRODUCTIONS: Indicate the number and refuge or agency from which stock was secured.
- (7) TOTAL REFUGE POPULATION: Give the estimated population of each species on the refuge at period of its greatest abundance and also as of Dec. 31.
- (8) SEX RATIO: Indicate the percentage of males and females of each species as determined from field observations or through removals.

3-1754  
Form NR-4  
(June 1945)

SMALL MAMMALS

Refuge Kenai National Moose Range

Year ending April 30 ~~March 31~~ December 31, 1965

(1) Species	(2) Density		(3) Removals					(4) Disposition of Furs					(5) Total Popula tion	
Common Name	Cover Types & Total Acreage of Habitat	Acres Per Animal	Hunting	Fur Harvest	Predator Control *	For Re- stocking	For Re- search	Share Trapping			Total Refuge Furs Shipped	Furs Donated	Furs Destroyed	
								Permit Number	Trappers Share	Refuge share				
Beaver	Marsh-brush 750,000	500		15	17									1,500
Mink	" " "	625		15	13									1,200
Land Otter	" " "	1,250		3	4									600
Muskrat	" " "	1,875		-	-									400
Coyote	All 1,700,000	3,000		22	25									400
Martin	Timber	Trace												Trace
Weasel	Timber	1,500		10	10									800
Wolverine	All Refuge	11,300		6	4									150
Wolf	All Refuge	Trace		-	-									Trace
Lynx	All Refuge	2,400		8	17									500
Snowshoe hare	All Refuge <del>3000</del>	560	150											3,000
Fox	All Refuge	120,000												10

\* List removals by Predator Animal Hunter

\* List removals by Predator Animal Hunter

REMARKS:

A. Thayer

Reported by \_\_\_\_\_



## INSTRUCTIONS

Form NR-4 - SMALL MAMMALS (Include data on all species of importance in the management program; i. e., muskrats, beaver, coon, mink, coyote. Data on small rodents may be omitted except for estimated total population of each species considered in control operations.)

- (1) SPECIES: Use correct common name. Example: Striped skunk, spotted skunk, short-tailed weasel, gray squirrel, fox squirrel, white-tailed jackrabbit, etc. (Accepted common names in current use are found in the "Field Book of North American Mammals" by H. E. Anthony and the "Manual of the Vertebrate Animals of the Northeastern United States" by David Starr Jordan.)
- (2) DENSITY: Applies particularly to those species considered in removal programs. Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottom land hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) REMOVALS: Indicate the total number under each category removed since April 30 of the previous year, including any taken on the refuge by Service Predatory Animal Hunter. Also show any removals not falling under headings listed.
- (4) DISPOSITION OF FUR: On share-trapped furs list the permit number, trapper's share, and refuge share. Indicate the number of pelts shipped to market, including furs taken by Service personnel. Total number of pelts of each species destroyed because of unprime-ness or damaged condition, and furs donated to institutions or other agencies should be shown in the column provided.
- (5) TOTAL POPULATION: Estimated total population of each species reported on as of April 30.
- REMARKS: Indicate inventory method(s) used, size of sample area(s), introductions, and any other pertinent information not specifically requested.

Refuge Kenai National Moose RangeYear 1965

## Botulism

## Lead Poisoning or other Disease

Period of outbreak \_\_\_\_\_

Period of heaviest losses \_\_\_\_\_

## Losses:

	Actual Count	Estimated
(a) Waterfowl	_____	_____
(b) Shorebirds	_____	_____
(c) Other	_____	_____

Number Hospitalized	No. Recovered	% Recovered
(a) Waterfowl	_____	_____
(b) Shorebirds	_____	_____
(c) Other	_____	_____

Areas affected (location and approximate acreage) \_\_\_\_\_

Water conditions (average depth of water in sickness areas, reflooding of exposed flats, etc.) \_\_\_\_\_

Condition of vegetation and invertebrate life \_\_\_\_\_

Remarks None known

Kind of disease \_\_\_\_\_

Species affected \_\_\_\_\_

Number Affected Species	Actual Count	Estimated
_____	_____	_____
_____	_____	_____
_____	_____	_____

Number Recovered \_\_\_\_\_

Number lost \_\_\_\_\_

Source of infection \_\_\_\_\_

Water conditions \_\_\_\_\_

Food conditions \_\_\_\_\_

Remarks None known

## PUBLIC RELATIONS

(See Instructions on Reverse Side)

Refuge Kenai National Moose RangeCalendar Year 1965

## 1. Visits

a. Hunting 33,000 b. Fishing 42,750 c. Miscellaneous 66,750 d. TOTAL VISITS 142,500

## 1a. Hunting (on refuge lands)

TYPE	HUNTERS	ACRES	MANAGED BY
Waterfowl	<u>800</u>	<u>75,000</u>	<u>BSFW</u>
Upland Game	<u>3,000</u>	<u>1,200,000</u>	<u>BSFW</u>
Big Game	<u>30,000</u>	<u>1,760,000</u>	<u>BSFW</u>
Other			

Number of permanent blinds NoneMan-days of bow hunting included above 100Estimated man-days of hunting on lands adjacent to  
refuge 10,000

## 1b. Fishing (area open to fishing on refuge lands)

TYPE OF AREA	ACRES	MILES
Ponds or Lakes	<u>150,000</u>	
Streams and Shores		<u>300</u>

## 1c. Miscellaneous Visits

Recreation 66,750 Official 700Economic Use 1,200 Industrial 70,000

## 2. Refuge Participation (groups)

TYPE OF ORGANIZATION	ON REFUGE		OFF REFUGE	
	NO. OF GROUPS	NUMBER IN GROUPS	NO. OF GROUPS	NUMBER IN GROUPS
Sportsmen Clubs			<u>3</u>	<u>60</u>
Bird and Garden Clubs			<u>1</u>	<u>20</u>
Schools			<u>1</u>	<u>450</u>
Service Clubs			<u>5</u>	<u>150</u>
Youth Groups	<u>2</u>	<u>20</u>	<u>1</u>	<u>71</u>
Professional-Scientific	<u>4</u>	<u>35</u>		
Religious Groups			<u>1</u>	<u>30</u>
State or Federal Govt.	<u>4</u>	<u>18</u>		
Other				

## 3. Other Activities

TYPE	NUMBER	TYPE	NUMBER
Press Releases	<u>6</u>	Radio Presentations	<u>0</u>
Newspapers (P.R.'s sent to)	<u>5</u>	Exhibits	<u>3</u>
TV Presentations	<u>0</u>	Est. Exhibit Viewers	<u>10,000</u>

## INSTRUCTIONS

Item 1: Total of a, b, and c, equal d.

"Visit" - definition. Any person who is on refuge lands or waters during a day or part thereof for the purpose of: hunting, fishing, bird-watching, recreation, business or economic use, official visit, or similar interest. INCLUDE - those who stop within the refuge while traveling on a public highway because of an interest in the area. EXCLUDE - persons engaged in oil or other industry not directly related to the refuge, persons using refuge as most direct route or principal avenue of traffic, and those boating on navigable rivers or the Intercoastal Canal, unless they stop to observe wildlife on the refuge.

Computing visits. Where actual counts are impractical, "sampling" is used with midweek and week-end samples varied by season or weather. A conversion factor of 3.5 (of passengers per car) is used when accurate figures are not available. Each refuge will develop a conversion factor for boats based on range of usage. Count a camper once for each 24-hour period or fraction thereof.

Item 1a: Acres - of refuge open for each type of hunting.

Managed hunts require check in and out of hunters, issuance of permits, or assignment of blinds.

Other - INCLUDE crow, fox, and similar hunting.

Lands adjacent to refuge. Normally considered within 1 mile or less of boundary, unless established sampling procedures cover a wider area. For big game hunting, the distance may be greater.

Item 1b: Acres of streams open to fishing, if practical; otherwise just miles open. Information on "shores" is primarily for coastal fishing.

Item 1c: Recreation. INCLUDE photography, observing wildlife, picnicking, swimming, boating, camping, visitor center use, tours, etc. TOTAL Recreation, Official, and Economic Use visits under Item 1.

Industrial. INCLUDE persons engaged in industry, i.e., oil industry or factories. EXCLUDE these from Item 1.

Item 2: INCLUDE the "On Refuge" groups in Items 1c and 1. In "Off Refuge" column include only those group meetings in which refuge employees actually participate. EXCLUDE these from Items 1c and 1.

Item 3: Exhibits - INCLUDE displays, fairs, parades, and exhibits OFF the refuge; EXCLUDE those ON.



NONAGRICULTURAL COLLECTIONS, RECEIPTS, AND PLANTINGS

(1)

Refuge Kenai National Moose Range Year 19 65

Species	Collections and Receipts (Seeds, rootstocks, trees, shrubs)						Plantings (Marsh - Aquatic - Upland)						
	Amount (lbs., bus., etc.)	(2) C or R	Date	Method or Source	Cost	(3) Total Amount on Hand	Location of Area Planted	Rate of Seeding or Planting	Amount Planted (Acres or Yards of Shoreline)	Amount and Nature of Propagules	Date	Survival	Cause of Los
Meadow Foxtail	124	R	4/65	Purchase	92.10	0							
Meadow Fescue	24	R	"	"	16.32	0							
Alsike Clover	82	R	"	"	37.22	0							
Oats	4	R	"	"	9.20	0							
Kentucky Bluegrass	50	R	"	"	35.00	0							
Brome Grass	24	R	"	"	11.28								
Total-----					\$201.12								

- (1) Report agronomic farm crops on Form NR-8
- (2) C = Collections and R = Receipts
- (3) Use "S" to denote surplus

Total acreage planted:

Marsh and aquatic \_\_\_\_\_  
Hedgerows, cover patches \_\_\_\_\_  
Food strips, food patches \_\_\_\_\_  
Forest plantings \_\_\_\_\_  
Erosion Control \_\_\_\_\_

Remarks: Seeds used on S&M Project - cut bank erosion control

- also used: 5,200# 8-32-16 fertilizer - \$239.80  
400# 33-0-0 fertilizer - 26.80

3-1758  
Form NR-8  
(Rev. Jan. 1956)

Fish and Wildlife Service Branch of Wildlife Refuges

CULTIVATED CROPS - HAYING - GRAZING

Refuge Kenai National Moose Range County \_\_\_\_\_ State Alaska

Cultivated Crops Grown	Permittee's Share Harvested		Government's Share or Return				Total Acreage Planted	Green Manure, Cover and Water- fowl Browsing Crops Type and Kind	Total Acreage
	Acres	Bu./Tons	Harvested		Unharvested				
			Acres	Bu./Tons	Acres	Bu./Tons			
Negative Report.									
								Fallow Ag. Land	

No. of Permittees: Agricultural Operations \_\_\_\_\_ Haying Operations \_\_\_\_\_ Grazing Operations \_\_\_\_\_

Hay - Improved (Specify Kind)	Tons Harvested	Acres	Cash Revenue	GRAZING	Number Animals	AUM'S	Cash Revenue	ACREAGE
				1. Cattle				
				2. Other				
				1. Total Refuge Acreage Under Cultivation				
Hay - Wild				2. Acreage Cultivated as Service Operation				

DIRECTIONS FOR PREPARING FORM NR-8  
CULTIVATED CROPS - HAYING - GRAZING

Report Form NR-8 should be prepared on a calendar-year basis for all crops which were planted during the calendar year and for haying and grazing operations carried on during the same period.

Separate reports shall be furnished for Refuge lands in each county when a refuge is located in more than one county or State.

Cultivated Crops Grown - List all crops planted, grown and harvested on the refuge during the reporting period regardless of purpose. Crops in kind which have been planted by more than one permittee or this Service shall be combined for reporting purposes.

Permittee's Share - Only the number of acres utilized by the permittee for his own benefit should be shown under the Acres column, and only the number of bushels of farm crops harvested by the permittee for himself should be shown under the Bushels Harvested column. Report all crops harvested in bushels or fractions thereof except such crops as silage, watermelons, cotton, tobacco, and hay, which should be reported in tons or fractions thereof.

Government's Share or Return - Harvested - Show the acreage and number of bushels harvested for the Government of crops produced by permittees or refuge personnel. Unharvested - Show the exact acreage and the estimated number of bushels of grain available for wildlife. If grazing is made available to waterfowl through the planting of grain, cover, green manure, grazing or hay crops, estimate the tonnage of green food produced or utilized and report under Bushels Unharvested column.

Total Acreage Planted - Report all acreage planted, including crop failures.

Green Manure, Cover and Waterfowl Grazing Crops - Specify the acreage, kind and purpose of the crop. These crops and the acreage may be duplicated under cultivated crops if planted during the year, or a duplication may occur under hay if the crop results from a perennial planting.

Hay - Improved - List separately the kinds of improved hay grown. Annual plantings should also be reported under Cultivated Crops, and perennial hay should be listed in the same manner at time of planting.

Total Refuge Acreage Under Cultivation - Report total land area devoted to agricultural purposes during the year.

## REFUGE GRAIN REPORT

Refuge Kenai National Moose Range

Calendar year 1965  
Months of \_\_\_\_\_ through \_\_\_\_\_, 195

(1) VARIETY*	(2) ON HAND BEGINNING OF PERIOD	(3) RECEIVED DURING PERIOD	(4) TOTAL	(5) GRAIN DISPOSED OF				(6) ON HAND END OF PERIOD	(7) PROPOSED OR SUITABLE USE*		
				Transferred	Seeded	Fed	Total		Seed	Feed	Surplus
Negative	Report										

(8) Indicate shipping or collection points \_\_\_\_\_

(9) Grain is stored at \_\_\_\_\_

(10) Remarks \_\_\_\_\_

\*See instructions on back.



## REFUGE GRAIN REPORT

This report should cover all grain on hand, received, or disposed of, during the period covered by this narrative report.

**Report all grain in bushels.** For the purpose of this report the following approximate weights of grain shall be considered equivalent to a bushel: Corn (shelled)—55 lb., corn (ear)—70 lb., wheat—60 lb., barley—50 lb., rye—55 lb., oats—30 lb., soy beans—60 lb., millet—50 lb., cowpeas—60 lb., and mixed—50 lb. In computing volume of granaries, multiply the cubic contents (cu. ft.) by 0.8 bushels.

- (1) List each type of grain separately and specifically, as flint corn, yellow dent corn, square deal hybrid corn, garnet wheat, red May wheat, durum wheat, spring wheat, proso millet, combine milo, new era cowpeas, mikado soy beans, etc. Mere listing as corn, wheat, and soybeans will not suffice, as specific details are necessary in considering transfer of seed supplies to other refuges. Include only domestic grains; aquatic and other seeds will be listed on NR-9.
- (3) Report all grain received during period from all sources, such as transfer, share cropping, or harvest from food patches.
- (4) A total of columns 2 and 3.
- (6) Column 4 less column 5.
- (7) This is a proposed break-down by varieties of grain listed in column 6. Indicate if grain is suitable for seeding new crops.
- (8) Nearest railroad station for shipping and receiving.
- (9) Where stored on refuge: "Headquarters granary," etc.
- (10) Indicate here the source of grain shipped in, destination of grain transferred, data on condition of grain, unusual uses proposed.



TIMBER REMOVAL

Refuge Kenai National Moose Range Year 1965

Permittee	Permit No.	Unit or Location	Acreage	No. of Units Expressed in B. F., ties, etc.	Rate of Charge	Total Income	Reservations and/or Diameter Limits	Species Cut
I. J. Charlton	65-04	Swanson River Road	200	50,000 B.F.	2.50/M	125.00	Refuge Refutations	Spruce
Wm. S. Thomas	KEN 4-66	Skilak Road	5	500 Xmas trees	.05 ea.	25.00	"	"
Robert Highnote	KEN 5-66	Funny River Road	5	100 " "	.05 ea.	5.00	"	"
Marshal McManus	KEN 6-66	Skilak Road	5	200 " "	.05 ea.	10.00	"	"
Jack LaCross	KEN 7-66	Block #2	1,000	20,000 B.F.	2.50/M	50.00	"	"
Nineteen Free Use Permits for:		130 cords of dead or down fuelwood 147,500 bd. ft. house logs.						

Total acreage cut over 1,215 Total income \$215.00

No. of units removed B. F. 217,500 Method of slash disposal lop and scatter  
Cords 130  
Ties 800 Christmas trees

ANNUAL REPORT OF PESTICIDE APPLICATION

**Kenai National Moose Range**

Proposal Number

Reporting Year

1965

INSTRUCTIONS: Wildlife Refuges Manual, secs. 3252d, 3394b and 3395.

Date(s) of Application	List of Target Pest(s)	Location of Area Treated	Total Acres Treated	Chemical(s) Used	Total Amount of Chemical Applied	Application Rate	Carrier and Rate	Method of Application
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Negative Report. Experimental herbicide spraying reported in NR, Section - <u>Control of Vegetation</u> .								

10. Summary of results (continue on reverse side, if necessary)