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Kenai National Wildlife Refuge  
Soldotna, Alaska

Annual Narrative Report  
Calendar Year 1966

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1966

KENAI NATIONAL MOOSE RANGE

STAFF:

Willard A. Troyer, Refuge Manager

Averill S. Thayer, Assistant Refuge Manager

Robert A. Richey, Assistant Refuge Manager

Rex E. Williams, Foreman I Maintenanecman

John Kodysz, Maintenanecman

Cherie E. Stroud, Clerk (Typist)

U. S. DEPARTMENT of the INTERIOR  
Bureau of Sport Fisheries and Wildlife  
U. S. Fish and Wildlife Service  
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Reprint - AERIAL CENSUS OF MOOSE BY QUADRAT SAMPLING UNITS  
By Charles D. Evans, Willard A. Troyer, and  
Calvin J. Lensink

# KENAI NATIONAL MOOSE RANGE

## NARRATIVE REPORT

January - December 1966

### I. GENERAL

#### A. Weather Conditions.

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

	TEMPERATURES				PRECIPITATION (in inches)		
	<u>Extremes</u>		Average Mean	10-Yr. Average Mean	This Month	10-Yr. Average Mean	Snowfall
	Max.	Min.					
January	36	-32	10.2	19.8	.42	1.23	7.8
February	39	-29	13.6	24.3	.60	1.08	7.6
March	45	-27	14.0	22.8	.28	.97	2.7
April	54	9	32.7	31.0	.82	.68	4.9
May	56	25	40.1	42.9	2.77	.66	5.0
June	66	35	49.8	49.5	.36	1.47	0.0
July	75	39	53.0	53.3	2.17	2.45	0.0
August	70	38	52.1	53.2	5.39	2.63	0.0
September	64	28	47.4	46.5	2.49	3.60	0.0
October	59	-17	31.1	35.0	1.46	2.80	16.0
November	42	-12	17.6	22.4	1.38	1.45	12.5
December	35	-30	10.0	9.5	.80	1.01	15.9
					18.94		72.4

#### B. Habitat Conditions.

1. Water. Lakes became ice-free around the middle of May. Sports Lake, located near Soldotna, has become ice-free the last three years on the following dates: May 30, 1964; April 30, 1965; and May 12, 1966. Water levels were considered normal throughout the year.
2. Food and Cover. The growing season was considered normal although rainfall was sparse in late June and early July; small amounts fell intermittently. Vegetation from the newly seeded roadsides at Jean Lake grew successfully without any irrigation during this dry period. Lowbush cranberries were plentiful but blueberry production was poor.

## II. WILDLIFE

### A. Migratory Birds

1. Waterfowl. The 1966 spring waterfowl migration indicated an increase of birds utilizing the area over last year. This was principally attributed to the recovery of the Chickaloon Flats from the 1964 earthquake effects. A few birds arrived the second week in April. On April 26, 2,000 snowgeese, 500 whitefronts, 400 Canadas and several hundred pintails and mallards were observed in the Kaslof Flats. On May 9, snowgeese were absent from this area but 500 Canada geese, 200 pintails and 100 mallards were still present. The Chickaloon Flats was utilized by 1,000 pintails, 200 widgeon, 100 mallards and a few shovelers on the same date. Waterfowl did not appear to linger long this spring and proceeded north soon after arrival.

Excellent number of ducks were present during September and an estimated 800 ducks and 200 geese were utilizing the Chickaloon Flats on September 9. By September 21, 5,000 ducks were present but no geese. In early October nearly all the ducks had migrated south. Normally large concentrations of ducks and geese appear during the first two weeks of October but this year this concentration never materialized in Cook Inlet. The lakes further north remained ice-free later than usual. Waterfowl left later and upon departure passed directly south without stopping in the Cook Inlet area.

The vegetation of the Chickaloon Flats continues to recover and is thus attracting more birds.

Hunting pressure was considered light.

2. Trumpeter Swans

Spring Breeding Population. The arrival of trumpeter swans appeared a little later than last year. By early May most breeding pairs were on their territories. Again, as in past years, several established territories on old nesting sites, but failed to nest. Some occupied the sites for most of the summer while others only remained on the areas for a few weeks. A few failed to complete nest construction while others never appeared to actually select a nest site. Those proceeding the furthest with nest construction or egg laying remained on the territories the longest.

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 106 swans, 72 (68 percent)

were nesters and 34 non-nesters. The total adult count compares to 91 adults in 1964 and 132 in 1965.

Nesting. A total of 36 swan nests were located during this year's survey (Table 1). The total nesters was a little lower than the 39 present last year, but much greater than average for the past 10 years as indicated in Table 2. Egg laying was not completed in Nest #9, 11 and 13.

Pairs which occupied territories near old nest sites but failed to nest were at Silver Salmon Lake, Camp Island Lake, Sunken Island Lake, one just north of Gagara Lake and one pair on the swampy lake southeast of Warbler Lake. A number of the nest sites occupied last year were not used, but some of the previous nesting sites not occupied in 1965 were in 1966; such as Elephant Lake and Stormy Lake. Nest # 9 and 28 were at new nest sites.

We have no proof but believe many of the same pairs occupy the same sites year after year. Plans for banding some adults should verify this in the future.

The location of a nest site within a territory may be the identical site each year or it may be several hundred yards distant and at other times the same pair appears to be nesting in an adjacent lake, but within the same nesting territory. Nest #7 located on the point of an island in 1965 was on the same island this year but about 50 yards distant. The Mink Creek nest was moved from a point on the west side of the lake to the north, a distance of approximately  $\frac{1}{2}$  mile. Nest # 24 was moved across the narrow lake. Nest # 1, 3, 5, 20, 23 and 32 were on the exact locations as last year.

Nesting Period and Incubation. The first swan nesting observation was recorded May 9; ten days later than the April 29th observation made last year. The difference in hatching dates shown in Table 3 also indicate that nesting commenced about a week later than last year for most pairs.



TABLE 1

NEST LOCATION, PRODUCTION, AND SURVIVAL  
OF 36 TRUMPETER SWAN NESTS ON THE KENAI PENINSULA 1966

Nest	Location	Clutch Size	Hatching Success Date Checked	Cygnets	Cygnets Survival to Sept. Date	Cygnets
1	Mackey Lake	6	6/20	6	9/9 & 16	6
2	Elephant Lake	4	6/28	4	9/9	4
3	Mosquito Lake 1 Mile West	5	6/24	4	Mortality	
4	Mink Creek Lake	6	6/14	3	9/3	2
5	Fish Lake	5	6/28	3	9/9	2
6	Swan Creek	7	6/15	7	9/3 & 9	6
7	Krein Lake	4	6/22	4	9/9	2
8	Nest Lake 1 1/2 Mile West	5	6/28	5	9/3 & 9	5
9	Marten Lake	2	Abandoned--may not have completed clutch			
10	Grey Cliff L.	5	6/28	5	9/9	2
11	Lower Moose River		Abandoned			
12	Upper Moose River	5	6/28	3	9/3	2
13	Bear Lake		Abandoned			
14	Brood Lake	5	6/20	5	Can't find	
15	Moose Lake 1 Mile NW	3	6/28	1	Mortality	
16	Moose Pasture	6		4	9/3	3
17	Dipper Lake	4		4	9/3	3
18	Diamond Lake 1 Mi. SE	6		4	9/13	1
19	Diamond Lake	6	6/21	6	9/9	6
20	Vogel Lake	4	Abandoned			
22	Moose Point	6	7/5	6	9/9	3
23	Hook Lake 1 Mi. E.	5	6/21	5	9/9	3
24	Quill Lake	5	6/24	5	9/9	5
25	Scaup Lake 2 Mi. E.	4	6/24	4	9/10	3
26	Snipe Lake 2 Mi. N.	5	6/29	5	9/10	2
27	Stormy Lake	7	6/28	5	Can't find	
28	Nikiski	3	7/12	3	9/9	2
29	Beck Lake	6	6/29	5	9/13	3
30	Tonys Lake 1/2 Mi. E.	6	6/29	5	9/9	2
31	Pollards Lake	6	6/19	6	9/4	6
32	Clam Gulch	Unknown	6/29	6	Can't find	
33	Bay Lake 1 Mi. SE	4	6/29	3	9/4	2
34	L. Killey River	5	Abandoned			
35	U. Killey River	Unknown	6/29	2	9/4	2
36	Fox River	6	6/30	4	9/4	4

170\*

137

86

\*Eight eggs included in two nests from which egg counts were not obtained.

TABLE 2

TRUMPETER SWAN PAIRS NESTING  
ON THE KENAI PENINSULA 1957-1966

<u>YEAR</u>	<u>NUMBER OF NESTS</u>
1957	20
1958	21
1959	20
1960	27
1961	30
1962	25
1963	22
1964	25
1965	39
1966	36

---

It is difficult to determine the beginning of the incubation period; however, several pairs were observed regularly and the date when they first appeared to be incubating was recorded. Hatching dates were also recorded for these pairs as shown in Table 4.

The data in Table 4 may be somewhat inaccurate as possibly during the first observations swans were still laying rather than incubating; however, the incubation period does coincide with that reported by Banks (1960).

The first cygnets observed were on June 12 and 15 as compared to June 4 of last year. Most broods hatched during the period of June 22 to 28. By June 29 all nests had hatched except Nest # 28. Unfortunately this nest was not again checked until July 12 at which time all eggs had hatched.

Nesting Behavior. The behavior of individuals while nesting varies considerably. Some pairs are very aggressive and when planes fly overhead they spread their wings and flap wildly in a most defiant manner. Other swans remain on nests and ignore the plane, while some detect the noise of the plane from some distance and leave the nest to hide in vegetation nearby. The latter trait can cause error in nesting surveys as they may not be detected when passing overhead. I have on occasion had swans make aggressive moves toward a plane when approaching the nest while taxiing on the water. However, in no instance have they shown aggressive behavior toward an investigator when approaching the nest on foot.

It is not known how long a nesting swan may leave her nest while incubating for the purpose of feeding, etc. However, this does occur as indicated from the following observations:

Nest Site # 1 - On June 10 at 1130 about one week prior to hatching, both swans were absent from the nest site. The eggs were covered and a pair believed to have been there were on a small pothole lake north of the nest site. This was a distance of one mile. Another check at 1400 revealed both swans at the nest site with one incubating.

Nest Site # 3 - On June 3 at about 1000, both swans were absent from the nest site. The eggs were covered and the swans were on an adjoining lake 1/2 mile distant. In the

TABLE 3

HATCHING DATES OF VARIOUS  
TRUMPETER SWAN NESTS IN 1965 and 1966

Nest	1966 Hatching Date	1965 Hatching Date
Mink Creek Lake	June 12	Prior to June 6
Swan Creek	June 15	June 4
Mackey Lake	June 17	June 12
Brood Lake	June 17	
Pollards Lake	June 19	June 11
Hook Lake	June 21	
Quill Lake	June 22	
Krein Lake	June 22	June 25
Scaup Lake	June 23	
Mosquito Lake	June 23	June 19
Stormy Lake	June 24	
Moose Pasture	June 25	June 8
Elephant Lake	June 26	
Fish Lake	June 26	June 17
Nest Lake	June 26	June 18
Upper Moose River	June 26	
Grey Cliff Lake	June 27	
Dipper Lake	June 28	
Snipe Lake	June 28	

TABLE 4

INCUBATION PERIODS OF SIX SWAN  
NEST CLUTCHES IN 1966

Nest Number	Beginning of Incubation	Hatching Date	Incubation Period
1	May 12	June 17	37 days
2	May 23	June 26	35 days
3	May 20	June 24	36 days
4	May 9	June 12	35 days
5	May 23	June 26	35 days
7	May 18	June 22	36 days

late evening they were incubating. On June 4 at 0930, the pair was again off the nest but nearby with the eggs covered.

**Nest Site # 5** - This nest site can be seen from the Swan Lake Road and the pair received considerable disturbance. On June 15, after they had incubated for sometime, a check revealed only three eggs were left of the original five. Shells were noted on the ground nearby and possibly some predator caused the loss. Whether this occurred in the swan's absence is not known. On June 21 carpenter used the lake for the purpose of fishing and then camped on an island adjacent to the nest. The swans remained off the nest most of the day and the eggs were uncovered. It was assumed that the nest would be abandoned as they had been previously disturbed for a good portion of a day. However, checks the next day revealed they were again incubating and all 3 eggs successfully hatched on June 26.

**Nest Site # 8** - On June 6, the pair was seen near the nest site and the eggs were covered. This same situation was noted on June 10 and 24. On June 28 all five eggs hatched successfully.

These observations indicate that swans do leave nest unattended during the incubating period, but the length of time vacated is not known. It is apparent that in certain cases, lack of incubation for quite a few hours may not have any detrimental effects.

**Clutch Size.** The clutch size of 32 nests in which egg laying was completed, were checked prior to hatching. They ranged from 2-7 eggs with a mean of 5.1 eggs per nest. (Table 5) This mean is less than the 5.7 recorded in 1965 but greater than 4.3 mean of 1964. Large clutches were not as common as last year. It is possible that egg laying in Nest # 9 was not completed prior to abandonment.

**Hatching Success.** Three and possibly five nests were abandoned prior to completion of incubation. These were Nests #9, 11, 13, 34, and 20 (Table 1). The latter may have successfully hatched but we were unable to find any cygnets. The nest site was examined on June 28th and a few shells were in the nest. It appeared they were remains of successfully hatched eggs, but they may have been destroyed by a predator prior to hatching. It is interesting to note that this same situation happened on the identical location in 1965 when the pair had 3 eggs, but cygnets could not be located. We were not able to locate cygnets at Nest Site # 34. In addition #32 and 35 were not checked prior to hatching.

TABLE 5

CLUTCH SIZE OF 32 TRUMPETER  
SWAN NESTS ON THE KENAI PENINSULA

<u>Clutch Size</u>	<u>Frequency</u>
7	2
6	11
5	10
4	6
3	2
2	1
1	0

---

Range 2-7

Mean 5.1 eggs per nest



Of the 162 eggs recorded in the 32 nests, 129 hatched for a hatching success of 79 percent. This does not include Nests #35 and 32 from which 8 cygnets hatched but no pre-hatching data was available; nor the three nests in which no cygnets were found. Sixteen of the clutches had a 100 percent hatching success. The total number of known cygnets was 137.

The greatest cause of hatching failure is not known. Some eggs may be infertile. Possibly failure of eggs to hatch simultaneously within a clutch may result in the abandonment of some eggs. Egg mortality prior to hatching does occur. Such an incidence was recorded in Nest # 5. This nest was ground checked on June 6 and contained 5 eggs. On June 15 another check revealed only 3 eggs with shells scattered nearby. The remaining 3 eggs hatched successfully on June 26.

We found cyg-  
2 developed p-  
days or Red dis-  
which had dis-  
the shell - B  
to be the res-  
not simultaneous  
hatching - ?  
flaming

Survival and Mortality. Twenty-six broods, consisting of 86 cygnets were accounted for in the early September aerial surveys. Brood sizes ranged from 1-6 with an average of 3.3. Brood number 3, 14, 15, 27 and 32, which were recorded in July could not be located in September. Total cygnet mortality occurred in Brood # 3 and probably # 15. In the case of Brood # 14, 27, and 32 no adult pairs or cygnets could be found in the immediate area. These three broods all had five or six cygnets and it is unlikely that the entire broods and adults succumbed to mortality after July. They possibly were missed in the surveys or moved completely out of the areas.

Nest # 14 is located in a group of isolated lakes. A pair has nested successfully in this area the past four years. Each year a brood of cygnets were successfully hatched and observed in July. Yet each year the entire brood has disappeared by early September. If the entire brood succumbed to mortality, it is unlikely that the nest site would have always been occupied the following year by a new pair of adults. It seems probable that some of these broods move so extensively by September 1 or earlier that they are not in their territory during the fall counts. Therefore I believe the total fall counts reflect a minimum population.

Table 6 shows the known mortality which occurred in 26 individual broods. Several were checked often enough to determine what age period mortality occurred. Nine

TABLE 6

KNOWN CYGNET MORTALITY OF 28 BROODS

AND PROGRESSIVE MORTALITY OF 8 BROODS

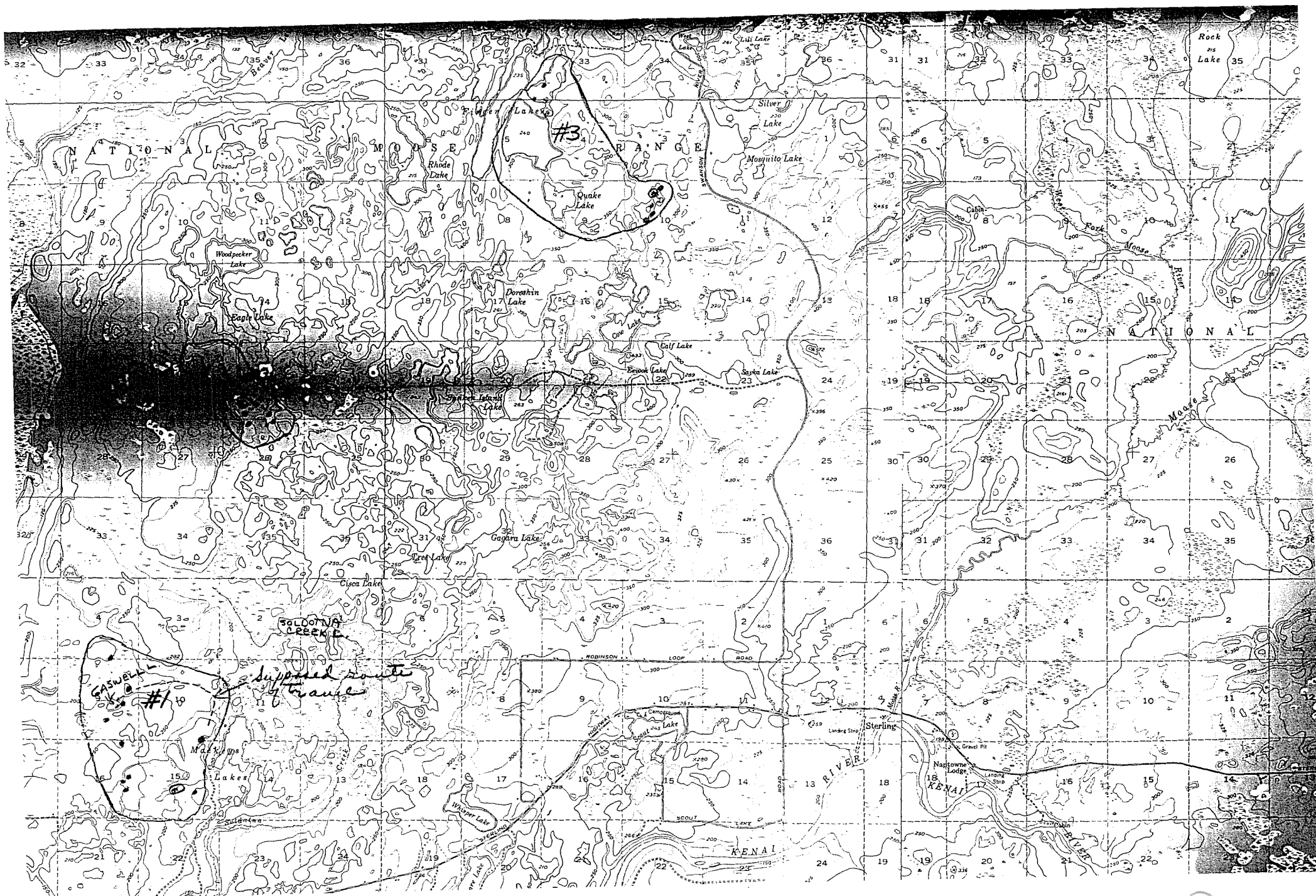
Brood #	Brood Size When Hatched	KNOWN MORTALITY WITHIN 10* DAY AGE PERIODS						Total Mortality
		1-10	11-20	21-30	31-40	41-50	Over 50	
1	6	0	0	0	0	0	0	0
2	4	0	0	0	0	0	0	0
3	4	0	1	0	2	0	1	4
4	3	0	0	0	1	0	0	1
5	3	0	0	0	1	0	0	1
6	7	0	0	0	0	0	0	1
7	4	0	2	0	0	0	0	2
8	5	0	0	0	0	0	0	0
10	5							3
12	3							2
15	1							1
16	4							1
17	4							1
18	4							3
19	6							0
21	5							0
22	6							3
23	5							2
24	5							0
25	4							1
26	5							3
28	3							1
29	5							2
30	5							3
31	6							0
33	3							1
35	2							0
36	4							0
	121	0	3	0	4	0	1	36

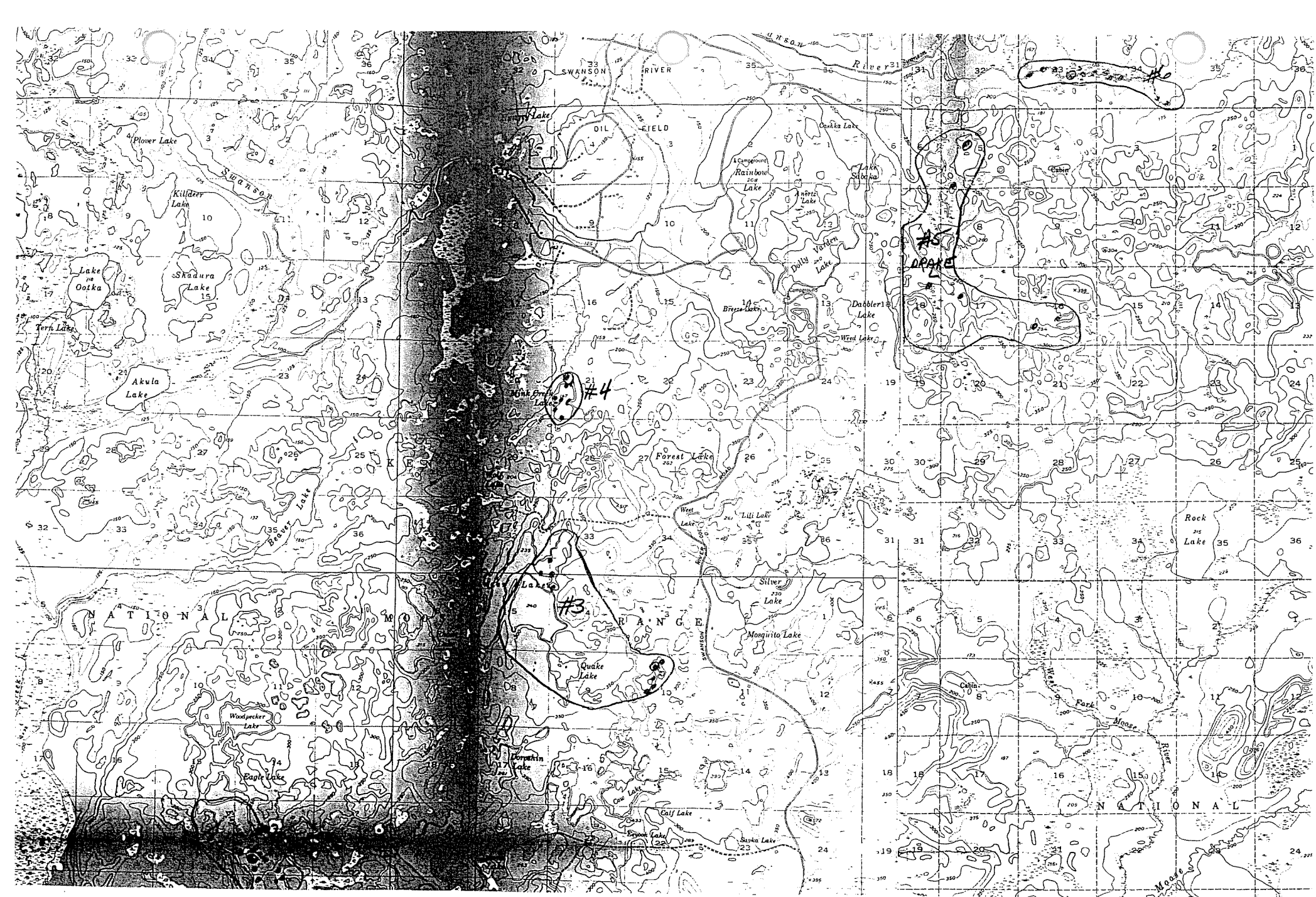
of the 28 broods, or about one-third, had no mortality. It is interesting to note that most of these were relatively large broods. There seems to be no definite pattern of the age at which most mortality occurs. However these data and past observation indicate the cygnets often disappear after they are at least one month old. Perhaps this may be attributed to more extensive brood movement progressing with age. It seems likely they would be more vulnerable to predator when traveling on land. Possibly when cygnets are learning to fly they may get left behind or wander in the wrong direction and thus become separated from the parents.

We believe that the loss of Brood # 3 was due to human activity. On July 9 the 2 adults and 4 cygnets were observed near the nest site. On July 12 they could not be found, but on July 13 we located one adult and three cygnets at Finger Lake approximately 2 miles distant. Jerry Deppa of the Alaska Department of Fish and Game then found a dead cygnet on the shore near the nest site. It appeared to have a bullet wound. The adult was never located. On August 1 only a lone cygnet could be located on Finger Lake and it remained in this area for several weeks, then disappeared. Two other adults were found on Trapper Joe Lake which appeared to have been shot by hunters.

In February 1966 the Alaska Department of Fish and Game received a report that an adult swan was frozen in the ice on the shores of the Koniak River near Soldotna. The swan was found and while attempting to free the ice from the birds feet, it gave a sudden lunge, plunged into the river and was swept under the ice. It never reappeared and presumably was drowned.

Brood Movements. Periodic aerial observations of six broods were again recorded in an attempt to delineate pre-flight movements and the approximate area utilized. These broods were nest numbers 1 through 6. Figure 1 records sightings made on each brood in their respective home ranges. It does not however indicate the extent of the movements for in some cases passage between lakes was accomplished several times. Broods # 1, 3, 4, 5, and 6 were also recorded in the same manner last year. It is interesting to note that except for # 5, the movements greatly coincided with those of last year.





Brood # 1. This brood consisting of six cygnets hatched on June 17. On June 20 when only three days old, the family crossed the marshy areas separating Mackey Lake from Power Plant Lake and were located in the center of the latter lake. They were also observed here on June 21, but were again found on the northern end of Mackey Lake on June 24. Sometime during the next four days they traveled overland in a suspected semi-circular route through a few swamps to Gaswell Lake. This route is shown in Figure 1. They remained in this lake for about one week. On July 5 they were observed moving through a relatively heavy black spruce forest southwest of Gaswell Lake. During the remainder of July they remained in this general vicinity crossing about between the small series of lakes. In early August they returned to Mackey Lake. On August 19 they were located on Soldotna Creek Lake out of the territory they utilized all summer, however at this time they were capable of flight.

Brood # 2. The brood consisting of four cygnets hatched on June 26. They remained in Elephant Lake nearly all summer and only strayed to the small lakes to the southeast, which could be reached through a marsh. It is interesting to note that the brood remained mostly on the south end of the lake near the nest site.

Brood # 3. This brood hatched on June 23 and consisted of four cygnets. They remained in the nest site until July 9. We were unable to locate them between July 9 and 13. They were seen between South Finger and East Finger Lake on the latter date; a distance of  $1\frac{1}{2}$  miles from the nest site. However only one adult and three cygnets could be found. Further checking revealed a dead cygnet near the old nest site with a bullet wound. The other adult was never found. It was suspected that it too was shot. The adult with three cygnets remained in the Finger Lake area for about three weeks, then disappeared. However a lone cygnet was seen on several occasions until the middle of August; then it too disappeared. It's probable human disturbance may have caused the sudden movement from the nest site, but the brood made the same general movement last year.



Brood # 4. The brood is always one of the earliest hatchers and this year three cygnets were seen on July 12. The family moved around the lake and lake edges all summer, but was never seen away from the lake.

Brood # 5. This family moved extensively and was difficult to locate. The brood of three cygnets hatched June 26 and immediately moved through a heavy spruce forest to the small lake to the southwest. This movement across land as in Brood # 1 occurred when cygnets were less than three days old. This same movement occurred in 1965. The brood is subject to human interference as the nest site can be seen from the road. The adults seem extremely wary. On July 5 when only 10 days old they were seen on the long narrow lake, over three miles from the nest site. Two weeks later they had returned to Drake Lake.

Brood # 6. This brood consisting of 7 cygnets was hatched on June 15. As last year they remained in a two mile stretch of Swan Creek, even though they could have followed the creek either direction for several miles.

Molting. Molting apparently covers quite an extensive period of time and pairs do not appear to molt simultaneously. The nest at Swan Creek contained extensive numbers of feathers at the time of hatching, indicating molting was underway on June 15. On June 29 the pair at Nest # 30 was checked. The female was molting, but the male was capable of flight. A check of two pairs on June 28th revealed only one adult of each pair was capable of flight. Feathers erupted profusely from one adult which attempted to fly. On August 1, an attempt was made to band nine adults with young, but only one was found incapable of flight. On the same date a bird believed to be one year old was found in a flock of seven which also was not capable of flight.

*Believe - Bunkle have molting  
brooding birds (cygnets) to take  
care of several months  
E.H.S.*

The major flightless period may be July but probably starts in June and extends into August.

Banding and Marking. Permission was requested from the Migratory Bird Station to color mark several pairs of adults. Color marked even observations should determine whether pairs are utilizing the same nesting territory each year, assist in recording movements of broods, obtain information on migratory habits, etc. However permission to color-mark

birds was not received until late July and only two birds were marked. These were banded with Monel #9 leg bands and a red plastic (vinylite) colored neck band similar to those used on Canada Geese.

On August 1, ten adults were checked and only two were incapable of flight. Birds were captured by taxiing along side of the flightless birds with a Supercub aircraft while another investigator stood on the outside of the float with a long-handled net and captured the bird by placing the net over the bird. One of the birds completely submerged and swam underwater for some distance when capture was attempted. The other bird showed no such behavior. *Commonly observed at Red Rock during capturing-banding operation 11/2*

The adult at Grey Cliff Lake was leg banded with 519-201-04 and 519-201-03. The red neck band was etched with the figure A-1. Physical measurements were:

Total Weight	23 lbs.
Total length	56 inches.
Tail	10 inches.
Foot (knee to toe)	11 $\frac{1}{2}$ inches.
Bill	4 $\frac{1}{2}$ inches.
Wing (not feathers)	12 $\frac{1}{2}$ inches.

A group of seven adult birds were seen in Dunlin Lake. Several of these appeared incapable of flight, but since the primary objective was to mark birds with broods, only one of the seven was banded. This bird was banded with the following leg bands: 519-201-06; 519-201-07. The red neck marker was A-2. Physical measurements were:

Total Weight	23 lbs.
Total length	55 inches.
Bill (from eye)	5 $\frac{3}{4}$ inches
Bill	4 $\frac{1}{4}$ inches.
Head	8 $\frac{1}{2}$ inches.
Foot	12 inches.
Tail	7 $\frac{3}{4}$ inches.

This bird appeared to be one year of age. The tail feathers were greyish and the legs were much lighter than the adult. Calling definitely distinguished it as a trumpeter.

Bird # A-1 was observed several times with the brood after marking. The neck mark could be seen from an aircraft at 200-300 foot elevation.

Several more broods will be marked next year during the molting period to complete this phase of the project.

Wintering Population. Last winter 10 swans stayed in the Kenai River just below Skilak Lake.

A family of two adults and one cygnet were noted this winter on December 1 and December 8. More adults were seen and presently five swans are wintering in this area.

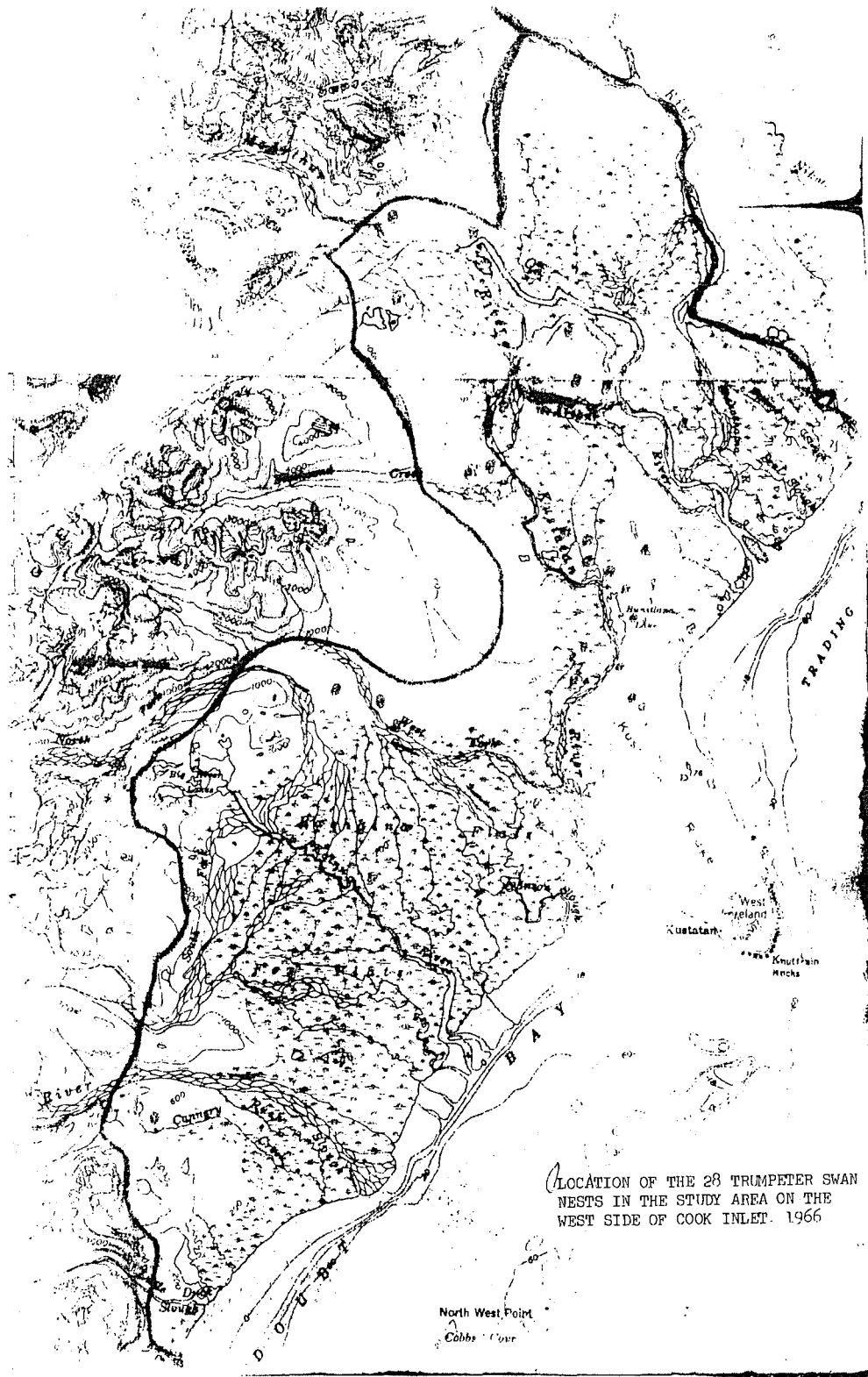
West Side Cook Inlet Surveys. A significant number of trumpeter swans nest on the western side of Cook Inlet and along the Susitna River. The cost and time covering this entire area by plane is prohibitive with funds available. However there is a possibility that the swans on the Kenai National Moose Range are part of this entire population. Because of their population relationship and the fact that much of the area is subject to intensive oil exploration which may change the present environment, a portion of the area was sampled for swan nests.

The area covered, as shown in Figure 2, includes most of the marsh and water areas directly west of Redoubt and Trading Bays. The tract can be covered in one days flying time. In the future it will be flown each June during the same period as on the Kenai. Cygnet counts were not attempted because the tall vegetation obstructs vision and the results could not be considered accurate.

The 1966 surveys were flown June 13. A total of 83 adults and 28 nests were found. Eight of these nests were covered and eggs could not be counted. The 20 nests averaged 5.1 eggs per clutch which is identical to the mean number of eggs found on the Kenai. (Table 7). The range varied from 3 to 8 eggs.

## B. Upland Game Birds

1. Spruce Grouse. Spruce grouse populations fluctuate from year to year but appeared to be similar in density to 1965. Larry Ellison of the Alaska Department of Fish and Game continued his studies near Finger Lake. His investigation also indicated the populations were similar to 1965.



LOCATION OF THE 28 TRUMPETER SWAN  
NESTS IN THE STUDY AREA ON THE  
WEST SIDE OF COOK INLET. 1966

TABLE 7

CLUTCH SIZE OF 20 TRUMPETER SWAN  
NESTS ON THE WESTERN SIDE OF COOK INLET, 1966

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

---

Range 3-8

Mean 5.1 eggs per clutch

Nearly all grouse harvested by hunters are those found along graveled roads where they concentrate to obtain grit. His studies revealed that these birds are from populations found within two miles of the road.

2. Ptarmigan. Ptarmigan were again available to hunters along the Sterling Highway in January, February, March, and December; however, little hunting pressure was exerted. During the winters of heavy snow they migrate from mountain foothills into the 1947 Burn where they thrive on hardwood buds.

Breeding pairs and covies did not appear as numerous in the mountains during the summer or last year. The decline was more apparent with willow ptarmigan than rock ptarmigan.

In April, May and June all three species of ptarmigan were observed on Surprise Mountain. Habitat types are such that they are found quite close together.

## C. Big Game Animals

### MOOSE

#### 1. Productivity.

Productivity information of moose has been obtained the past few years by three different means; calving inventories flown in June; composition counts obtained in the fall; and from female reproductive tracts collected during the hunting season.

#### June Calving Inventories

Five moose calving inventories were flown in the Moose River and Chickaloon River flats area between June 20-24, 1966. Surveys were conducted by Will Troyer and Abe Thayer and were flown in the early morning hours between 4:00 and 8:00 a.m. During the five flights a total of 795 moose were sampled (Table 8). Each year these surveys are conducted between June 15-30 and cover the same area in the same manner. Most calving has been completed by the middle of June. Obviously some mortality has already occurred and will continue; however by conducting the surveys on



the same dates, productivity trends should be obtained if continued over a number of succeeding years.

The calf-cow ratio was 29:100 and the percentage of calves in the total population sampled was only 14.0. Both of these figures are about the lowest recorded in the past seven years (Table 9). Another factor which indicated either low productivity or low survival is that only four out of 108 cows observed with calves had twins.

#### Productivity Indicated From Winter Composition Counts

The only composition counts available are those obtained during the Square-Mile Plot Inventory flown in late November. The area sampled included 108 plots northeast of Tustumena Lake and Kasilof River. A total of 660 moose were tabulated and 134 or 20.0 percent of these consisted of calves.

The calf-cow ratio was 31:100. This of course not only indicates a slightly higher calf-cow ratio than obtained during the spring but a five percent calf increase in the total population. Obviously the opposite should have occurred as some continued calf mortality is expected throughout the summer.

#### Productivity Obtained From Reproductive Tracts

Female reproductive tracts were collected during the late November cow moose season in 1964 and 1965, by State and Refuge personnel. Collections covered the Moose Range area south to Homer. A total of 144 tracts were collected in 1964 and 79 in 1965. The 223 tracts were subdivided into 65 collected north of the Kenai River and the remainder south to Homer. The pregnancy rate for the two years was relatively the same with 91 percent of all cows over 1½ years old pregnant. The area north of the Kenai River showed 89 percent pregnant and 93 percent south of the Kenai River. Nearly one out of every five cows had twin calves. These data indicated a fairly high reproductive rate.

#### Discussion

The indices obtained for showing the reproductive rate of the moose population indicate wide differences and discrepancies. Obviously considerable mortality occurs sometime between pregnancy and the period when calf surveys are flown. However the indicated increase of calves in the fall population to that in the spring cannot reflect the true picture.

TABLE 8

## COMPOSITION OF THE MOOSE POPULATION IN THE MOOSE

RIVER AND CHICKALOON AREAS IN LATE JUNE, 1966

Date	Single		O+	Total	Percent	Total	Total	Total	Percent	Total	RATIO		
	Cows	1C		Calves		Cows	Bulls	Yearlings		Moose	Calves	Cows	Bulls
6/20	81	18	1	20	10.0	100	46	33	16.0	199	20:	100:	46
6/21	18	14	0	14	18.0	32	17	12	16.0	75	44:	100:	43
6/22	87	27	2	31	14.0	116	47	29	13.0	223	27:	100:	40
6/23	35	25	1	27	19.0	61	29	24	17.0	141	44:	100:	47
6/24	64	20	0	20	13.0	84	31	22	14.0	157	24:	100:	37
Totals	285	104	4	112	14.0	393	170	120	15.0	795	29:	100:	43

TABLE 9

MOOSE CALF PRODUCTIVITY AS DETERMINED  
FROM AERIAL SURVEYS DURING THE LAST  
TWO WEEKS IN JUNE 1960-1966

Year	Calf/100 Cows	Percent Calves
1960	58:100	18
1961	41:100	14
1962	28:100	16
1963	45:100	17
1964	44:100	18
1965	38:100	19
1966	29:100	14

Reasons which might reflect such a reverse calf population change are: (1) Either the spring or fall composition counts are not accurate. This could be caused by failure to see calves in the spring; misclassification of adults which could inflate or deflate calf-cow ratios; or the sample may not be representative of the total population. (2) The composition change caused by a heavy bull harvest and cow harvest prior to fall counts could reflect a higher percentage of calves in the total population or a higher calf:cow ratio. However any mortality occurring between June and December would serve to counteract such a change. In addition yearlings included in the adult category in the fall but not in the spring decrease the percentage of calves in the total population from spring to fall.

The composition as obtained from the square-mile plot survey method may not give accurate calf ratios for the total population as different areas are sampled with different intensities; however comparison of this method with the total count method in 1964 indicated very little variation.

The first two methods indicate a fairly low productivity for the moose herd while reproductive tracts indicate good pregnancy rates. Apparently considerable mortality occurs sometime between pregnancy and the June calving surveys. Most of the moose sampled in these surveys winter in the 1947 Burn where range conditions appear excellent. Possibly low nutritional qualities of browse plants or predation may be factors causing a calf reduction during this period.

If our population inventories of around 7100 are correct and the 20 percent calves in the total population remain fairly accurate; approximately 1420 calves are present in November in that portion of the Moose Range northeast of Tustumena Lake.

## 2. Population Inventory

The square-mile quadrat method was again employed this year to census moose northeast of the Kasilof River and Tustumena Lake. This survey was conducted from November 15 to November 28 in a similar manner to last year.

Pilots for the two Supercubs used were Will Troyer and Bob Richey with Abe Thayer assisting on a few plots. This year

we had difficulty in obtaining observers and the following people assisted: Gene Tentfest, Bob Himman and Larry Eagles of the Alaska Department of Fish and Game, John Kodysz and Ray Williams of the Bureau of Sport Fisheries and Wildlife and Ted Grainge and Mrs. Will Troyer. The variety of observers is not recommended but could not be helped.

A reconnaissance flight on November 14 delineated the major population concentration. 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 1947 grids were then consecutively numbered and classified as 353 low, 1354 medium and 240 high (Table 10). Plots actually flown consisted of 6 low, 68 medium and 34 high for a total of 108.

Census of each plot was conducted in a similar manner to the past two years. The plot grids 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 recorded.

A detailed description of this census method is given in the reprint in the appendix.

Two moose were tallied in the six low plots, 186 in the mediums and 472 in the high plots as shown in Table 8. Variations within the strata were 0-2 in the low, 0-11 in the medium and 0-67 in the highs. Extrapolating these sampling units to the total area at the 90 percent confidence interval resulted in an estimated population of 7152 animals,  $\pm$  1262.

The total flying time expended was 61 hours and the total count time was 27 hours. The flying time was very similar to that utilized last year.

#### Discussion

Table 10 show the comparison of the surveys flown the past three years and the results obtained. The total count for the three years, 6979, 7432 and 7152 shows little fluctuation

in the populations and also indicates the feasibility of this survey method.

The confidence limits were slightly better this year than in former years and this may be attributed to better stratification. Variations were just as great in the highs but much smaller in the mediums. The number of low plots was increased. This was accomplished by attempting to expand plots in which we expected none to include some plots in which one or two moose might be expected. This reduced the number of zero's in the medium plots.

The plots away from the road system and in the mountain areas were flown first. Since the hunting season ended November 20, the population estimation obtained is a post-season one.

The survey method certainly gives a much more realistic figure of the total population than that obtained in former years by a total count method. It also reduces the cost since the flying time expended is about two-thirds that required by the former method. The disadvantages are that it does not show as good a distribution of the population and possibly may not reflect a true composition of the total population.

### 3. Population Composition

Spring. The spring population was obtained during the calf surveys in June and was based on the classification of 795 moose. This composition is shown in Table 6 and consisted of 112 calves, 170 bulls, 120 yearlings and 393 cows. The accuracy of these counts depends on the observers ability to distinguish yearlings from adults and observe the new velvet antlers on bulls. The latter are fairly apparent by the middle of June, but some yearlings are difficult to distinguish from adults. During the past two years, yearlings composed about 15 percent of the total population and 13 percent of the population excluding calves. This would indicate fairly good survival through the winter.

Calves within the population has already been discussed under Productivity.

Bulls constituted 21 percent of the total population and the bull:cow ratio was 43:100. This is slightly higher than

the 17 percent and ratio of 35:100 recorded in 1965.

Fall. The fall composition counts were obtained from the square-mile quadrat plots and was based on the classification of 660 moose. This composition is shown in Table 11. Counts indicated 98 bulls, 134 calves and 428 cows. We believe classification of these animals is very accurate. Of course it includes the yearlings in the adult classes. The bull then constituted 15 percent of the total population and a ratio of 23 bulls per 100 cows. Several factors attribute to the variation between the spring and fall compositions. Since yearlings should show a sex ratio of 50:50 in the spring, this segment added to the population should increase the bull ratio; however heavy hunting pressure is believed to be selective to yearling bulls; therefore the change may not be as great as anticipated. The hunter take of bulls was virtually completed by the time the fall composition counts were flown and since the harvest is selective to bulls by about a two to one ratio the percentage of bulls in the population would have been reduced. Another discrepancy possibly is the habitat distribution of bulls in the Moose River area may be out of proportion to the total population. It's obvious that until we learn more of the various population segment movements we will not be able to correctly interpret composition counts.

The composition of the population, especially bulls varies considerably from area to area. Heavy hunting pressure along the roads and lakes and the tendency of a greater percentage of bulls to move into the mountain foothills results in a lower proportion of bulls in the lowland population.

The composition of the moose in the plots in the lowlands revealed a ratio of 14 bulls per 100 cows and only 9.5 percent of the total population. This compares with 31 bulls per 100 cows and 19 percent of the total population in the mountains and remote areas. The calf:cow ratio also varied some with 29:100 in the mountains and 35:100 in the lowlands, indicating better productivity in the lowlands.

The low bull ratio may be reaching a dangerous point and possible reduction of the early bull season may be justified if the ratio spread between cows and bulls becomes greater.

To actually evaluate the number of bulls available during the rutting season composition counts should be flown during the rutting period. Plans are to conduct such count immediately after the close of the 1967 September season.

TABLE 10

RESULTS AND COMPARISON OF SQUARE-MILE QUADRAT METHODS FOR  
CENSUSING MOOSE ON THE KENAI NATIONAL MOOSE RANGE 1964 - 1966

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



TABLE 11

COMPOSITION OF THE MOOSE POPULATION OBTAINED  
FROM THE SQUARE-MILE QUADRAT SURVEY METHOD 1964-1966

Year	Percent Bulls	Percent Cows	Percent Calves	RATIO Calf: Cow: Bull	Total Moose Sample
1964	14.0	64.0	22.0	36: 100: 21	524
1965	15.0	66.0	19.0	30: 100: 22	598
1966	15.0	65.0	20.0	31: 100: 23	660

4. Movements. Migration from fall ranges in the mountain foothills to the lowland areas started earlier but appeared more gradual than the past two years.

On November 14, good concentrations were noted along the Mystery Creek Road, in the Puny River Homestead area, and Swan Lake Road. At the end of the year a number still remained in the benchland between Puny River and Tustumena Lake.

Migration routes have never been established but from observations it appears the large population in the Puny River Benchland filters down along the Puny River through the 1947 Burn. They spend sometime in the Puny River Homestead area before moving across the Sterling Highway in the 1947 Burn within the area excepted from the Range. Portion of these also move through the Silkox while others cross the Kenai River at the outlet of Skilak Lake and move into the 1947 Burn along the Skilak Road.

The mountain population in the Mystery Creek and Fuller Lake drainages drift across the Mystery Creek Road into the 1947 Burn along the pipeline. Some may move into the Swan Lake Road. Frankly we do not know where the extensive summer herds in the Carbon Hills winter, but believe some migrates to Kasloof while others move south to the head of Kachemak Bay.

The intensity of hunting effort varies considerably on the Kenai National Moose Range. The lowland areas receive heavy hunting pressure while the mountains receive little effort.

It appears that there may be a number of sub-populations within the entire moose population on the Kenai. A number of moose remain in the lowlands during the summer months and these are augmented by substantial moose numbers during the winter. Some mountain populations appear to use confined summering and wintering areas.

I believe it is absolutely imperative to delineate these various populations, their migration routes and their wintering and summer ranges before we can intelligently manage moose. Until we do obtain this information, the possibility of mismanagement occurs. For instance is our early moose harvest taking moose from a separate lowland population or are these animals of an overall population which failed to migrate to the foothills for a given year? If the former

is true then regulations should be established to only take the annual increment for the lowland animals capable of sustaining the kill rather than consider the kill as being taken from total moose numbers. If we continue to attempt to manage segments of the population for trophy purposes, which we should, we must know their winter and summer ranges as well as their migratory routes.

#### 5. Hunting Kill

Hunting regulations permitted taking one bull moose during the periods of August 20 to September 30 and November 1-30. In addition, either sex could be taken from September 25-30.

Hunting regulations in Alaska require each moose hunter to obtain a harvest ticket prior to hunting moose. At the end of the season it becomes mandatory to return the ticket and give the following information: successful or unsuccessful, date of kill, location, and sex. Alaska Department of Fish and Game personnel tabulated kills in each hunting unit and coded it as to various geographic areas. The data presented here was obtained from their records. A total of 31,549 moose tickets were issued in Alaska and only 3,339 were not returned. The number unreturned is almost identical to those not returned in 1965.

Fifty-six percent of the hunters who killed moose were residents of the Kenai Peninsula, forty percent were residents of Alaska other than the Kenai and four percent were non-residents of Alaska.

The total reported moose kill was 826 animals of which 580 were bulls and 246 cows. By far the greater majority of these were taken in the lowland area north of the Kenai River (Table 11a). Since approximately 10 percent of the harvest tickets were not returned a 10 percent factor is added to the kill for an estimated total take on the Moose Range of 908 animals. This compares with 1,175 taken in 1965 and 1,326 killed in 1964.

TABLE 11a

DISTRIBUTION OF THE MOOSE KILL DURING THE  
1966 SEASON

	BULL KILL		COW KILL	TOTAL
	Aug-September	November		
Unit A. North of the Kenai River	221	161	185	567
Unit B. Between Kenai River and Kasilof River	63	56	30	149
Unit C. That portion from Kasilof River to Clam Gulch and Caribou Hills	46	33	31	110
TOTAL	330	250	246	826

## BALL SHEEP

### 1. Population Surveys

Aerial. The annual aerial Ball sheep population survey was conducted from July 20-29. Two Super Cubs were used with Refuge Manager Troyer and Assistant Refuge Manager Mickey serving as pilots. Observers were S. Glenn Erickson and Bob Wade. A total of 1045 sheep were tallied in 34 hours and 50 minutes of flying time. This is the highest count ever recorded, exceeding the high 1964 count by 16 animals. The population increase has been relatively constant since 1949 but appears to be leveling off. (Figure 3).

The composition of the population consisted of 617 ewes and yearlings, 196 lambs, 95 rams below  $\frac{3}{4}$  curl and 138 rams  $\frac{3}{4}$  curl or more. (Table 12). Lambs constituted 19 percent of the total population and large rams 13 percent of the population. The classification of rams cannot be considered absolutely correct as it is difficult to distinguish size of the curl from the air; however if the same personnel make the counts in the same manner, it should give a trend over a period of years. It does indicate a fair number of trophy size animals are still in the population.

Ground Counts. Ground counts were conducted from Emma Lake to the headwaters of the North Fork of Indian Creek on June 16-17; from Green Lake to the South Fork of Indian Creek on June 26-27 and several times during the summer on Surprise Mountain. Information on the latter will be reported under Investigations.

Ground counts were made with the aid of a spotting scope. Sheep were individually checked and classified to the best of the investigators abilities. In these counts lambs constituted 20 percent of all sheep and legal rams 14 percent. (Table 13). Both of these figures follows those obtained from aerial surveys very closely. The total of 90 rams constituted 27 percent of all sheep. This compares to 22 percent in the aerial surveys; however rams of  $\frac{1}{4}$  curl may not always be distinguishable in a large group of ewes.

### 2. Summer Distribution.

Distribution of the Ball sheep during the July aerial counts is shown in Figure 4 and Table 12. This distribution shows little change over last year except in the area between Tustumena Glacier to Sheep Creek. The population increased from 128 in 1965 to 204 in 1966. No doubt some movement into the area occurred as the lamb recruitment does not account for the increase. This has been an area of relatively low sheep populations and it will be interesting to observe the population status in future years.

FIGURE 3

AERIAL SHEEP SURVEYS ON THE KENAI NATIONAL MOOSE RANGE 1949-1966

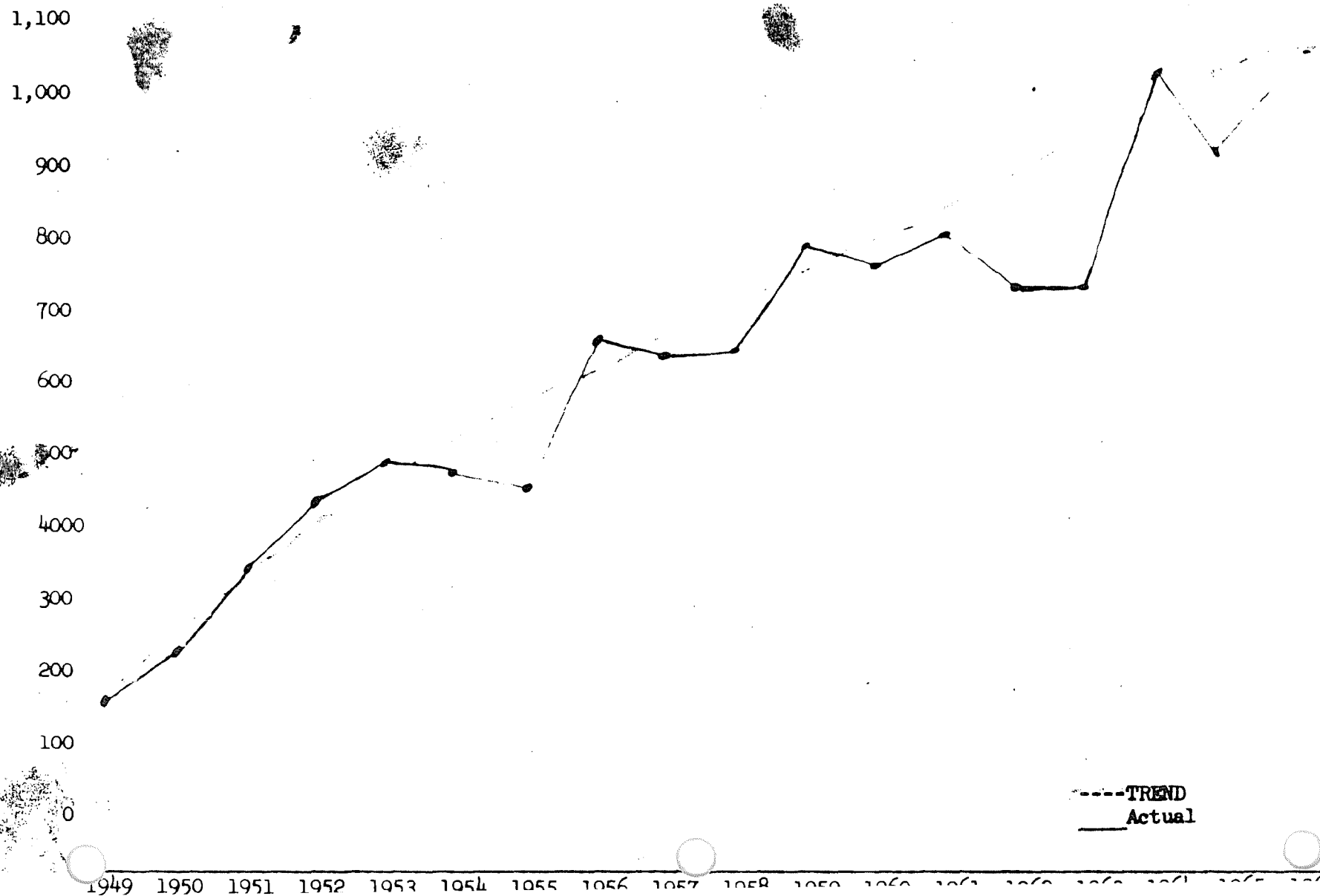


TABLE 12

COMPOSITION AND DISTRIBUTION OF THE DALL  
SHEEP ON THE KENAI NATIONAL MOOSE RANGE AS DETERMINED  
FROM AERIAL SURVEYS IN 1966

Area	Ewes & Yrl.	Lambs	RAMS		Total
			3/4+	3/4-	
Surprise Mt.	162	53	10	12	237
Skilak Glacier to Twin Lakes	13	9	19	7	48
Twin Lakes to Killey River	9	2	14	2	27
Killey River to N. Fork Indian Creek	149	42	20	8	219
Between Indian Creek Forks	52	11	34	19	116
S. Fork - Tust- umena Glacier	120	47	12	12	191
Tustumena Glacier Fox Creek	55	17	18	14	104
Fox Creek - Sheep Creek	57	15	11	21	104
	617	196	138	95	1046

TABLE 13

COMPOSITION OF DALL SHEEP ON THE KENAI NATIONAL MOOSE RANGE  
 AS DETERMINED FROM GROUND COUNTS 1966

Area	Ewes	Lambs	Yearling	R A M S			Total		Total
				$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	Full	Rams	
Green Lake - South Fork	122	60	21	9	6	12	9	36	239
North Side of North Fork	24	8	7	14	15	19	6	54	93
	146	68	28	23	21	31	15	90	332



### 3. Lambing

Plans to fly periodic surveys in May and June to determine lambing periods and areas were not completed due to other job priorities. One flight was conducted on May 20 and the following sheep classified:

Surprise Mountain	98 adults	no lambs
Funny River Hills	9 adults	1 lamb
North Fork	8 adults	20 lambs
Emm Lake Mountain	38 adults	4 lambs
South Fork	88 adults	4 lambs
Green Lake	42 adults	19 lambs

Most ewes with new-born lambs were located in fairly rough, rocky habitat where escape cover was available. This type terrain may be a necessary requirement of the sheep ranges. A number of lone ewes were noted in rocky terrain indicating they were seeking such habitat and solitude before lambing.

The percentage of lambs in the total sheep population during this flight is probably inaccurate. Newborn lambs are difficult to see in rocky crevices and ewes often obscure the lamb by standing over it.

### 4. 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 record 47 rams were taken on the Moose Range. Another ram was taken in Unit 15 south of Bradley Lake. In addition one illegal ewe and one yearling were taken near Green Lake and another illegal ewe was killed on Surprise Mountain. The take is the highest ever recorded. 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	16
1961	31
1962	31
1963	35
1964	24
1965	35
1966	47

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

Distribution of the sheep kill occurred in the following areas:

Tustumena Glacier to Sheep Creek	3
Green Lake to North Fork	13
North Fork to Killey River	5
Killey River to Shilak Glacier	12
Surprise Mountain	7
Unknown	7

Hunting was more scattered than usual. Although a number of people hunted Green Lake, the concentration was not as large during the opening week. However steady hunting pressure continued all season. Twin Lakes and Iceberg Lake received quite heavy pressure as did Surprise Mountain.

Trophy Value. Horn measurements were obtained from 23 of the kills. These measurements taken over a period of years should show a trend in trophies available in the population. On the average, horn length was smaller than last year and only a few were full curl rams. (Table 14).

#### MOUNTAIN GOAT

The annual aerial mountain goat survey is conducted concurrently with the sheep survey. (Figure 4). Goats observed during the 1966 count consisted of 43 cawns, 32 kids, and 37 billies for a total of 117.

Goat populations seem to shift more than sheep and apparently erratic movements are quite common. One goat was observed on Surprise Mountain this spring but apparently moved as it was not again seen during the summer.

Last year a group were seen on the island centered in Tustumena Glacier, yet none were found in the locality this year. No information is available on the harvest, as harvest tickets are not required to take this animal. The long hunting season lasts from August 10 to December 31 but few hunters seek this animal.

#### BEARS

##### 1. Brown Bear

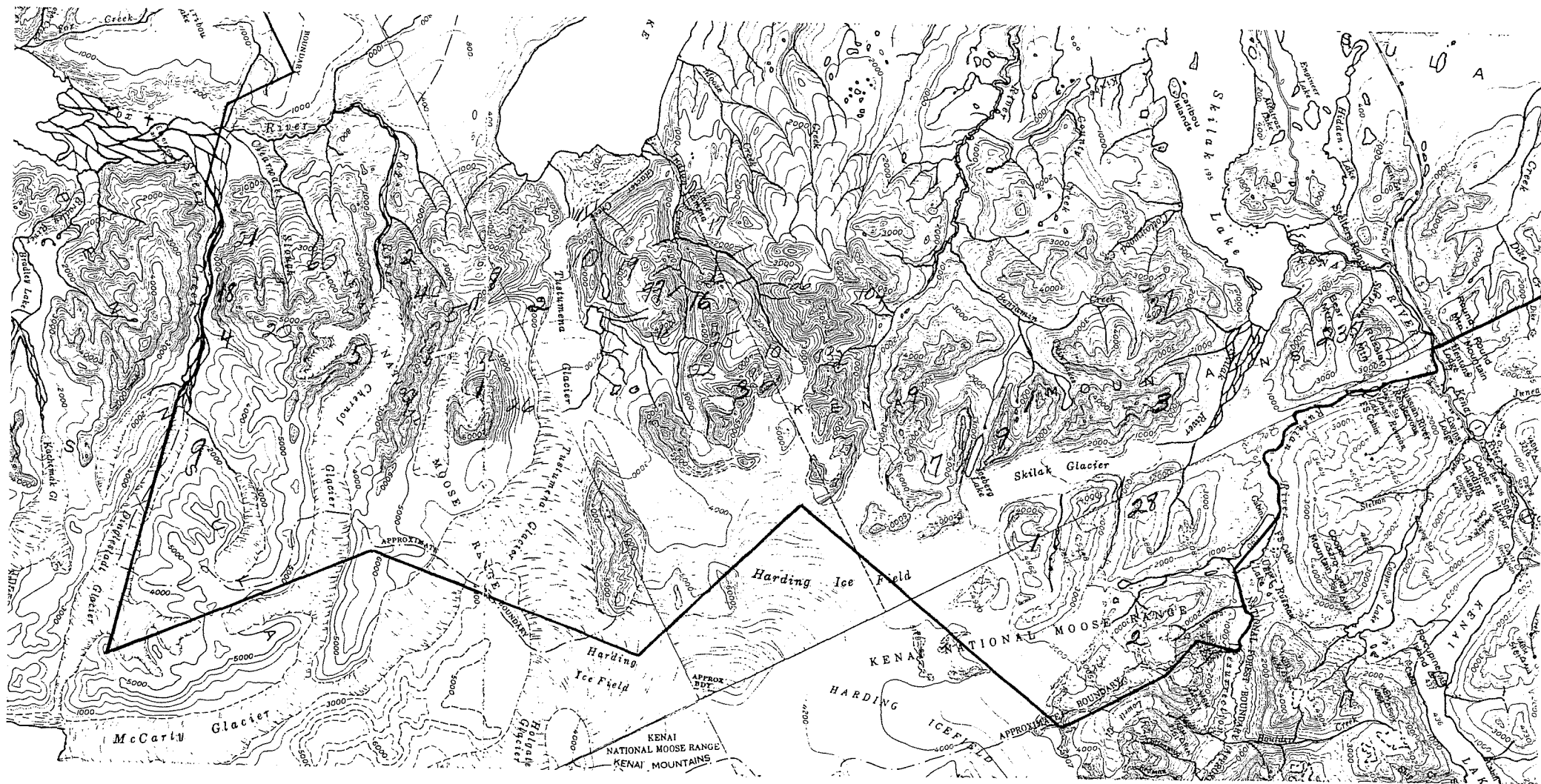
The brown bear population of the Moose Range continues to be low with scattered numbers through the mountain foothills, the lowlands and a fair population near Upper Russian Lake.

TABLE 14

HORN MEASUREMENT AND ESTIMATED AGES  
OF SHEEP TAKEN DURING THE 1966 SEASON  
ON THE KENAI NATIONAL MOOSE RANGE

RIGHT HORN		LEFT HORN			Estimated Age
Length	Base Cir.	Length	Base Cir.	Curl	
27 1/2	12 1/2	27 1/2	12	3/4	5
27 1/2	12 1/2	27 1/2	12 1/2	3/4	5
27 1/2	13	27	13	3/4	5
27 3/4	12 3/4	29 1/2	13	7/8	7
28 1/2	13 1/2	28 1/2	13 3/4	3/4	6
28 1/2	13 1/2	28 1/2	13 1/2		6
28 1/2	14	29	14	7/8	5
29	12	29	12	7/8	
29	13	29	13 1/8	3/4	
29 3/8	13 1/2	29	13 1/2	7/8	6
30	13	30	13		6
30	13 1/2	30	13 1/2	7/8	6
30 1/2	13 1/2	30 1/2	13	7/8	6
30 1/2	13 1/2	30 1/2	13 1/2	7/8	7
31 1/2	12 1/2	31 1/2	12 5/8	7/8	7
31 1/2	13	31 1/2	13 1/2	7/8	6
32 1/8	13 1/2	32	13 1/2	7/8	7
32 1/2	13 1/2	32 1/2	12 7/8	7/8	7
32 1/2	12 1/2	34	12 1/2		7
33	13 1/8	32 1/2	13	7/8	7
33 1/2	13 1/2	34 1/2	13 1/2	Full	8
33 1/2	13 1/2	34 1/2	12 5/8	Full	7
33 1/2	13 1/2	34 1/2	12 3/4	Full	9

FIGURE 4 -35a-



## 2. Black Bear

Black bear are numerous, particularly in the areas near and above timberline. A few are taken each fall for food by local residents.

## CARIBOU

Last summer 15 caribou were re-introduced after an absence of caribou on the Kona Peninsula since 1912. A few were sighted throughout the year, but seemed to have scattered widely.

On April 24th and 26th two additional groups consisting of 29 animals were flown to Soldotna, trucked to Watson Lake Campground and released. These consisted of 13 adult females, 10 which were pregnant; 3 bulls consisting of one adult, 1 yearling and 1 two-year old; 5 female yearlings; and 5 female two-year olds.

During the summer a group of four were seen several times near the Kona Airport. On November 14 Refuge Manager Troyer observed nine animals near Bare Lake in the Moose River Flats consisting of one adult bull and 8 cows and yearling. This group is still in the area, however since the observation an additional calf has joined the band.

## B. Fur Animals, Predators, Rodents and Other Mammals

1. Coyote. Coyotes are common on the Moose Range; extensive winter hunting is conducted for them. Hunters travel on foot and by aircraft and snow-traveler. Shooting coyotes from aircraft is prohibited but evidence shows some of this is being done. The State of Alaska pays a \$30 bounty on coyotes. They reported 37 bounties in Unit 15 last year, but the portion taken off the range is not available. *Can the ones taken off the refuge be legally bountied? HHHB*
2. Beaver. The last beaver survey was conducted in 1964. Another survey was planned last fall but weather conditions prevented its completion. The beaver population trend is not known but appears quite stable. Trapping pressure has been light and is reported under Recreation.
3. Wisk, Otter, Weasel, Lynx. Little is known about population changes of these animals. Variance in the annual take primarily reflects differences in trapping effort.
4. Snowshoe Hare. Although the snowshoe hare population remains low winter hunting for them continues to be popular. There appears to be a slight increase in the Kasilof area.
5. Wolves. While visiting a plane on the Upper Fucy River airstrip on September 12, Assistant Kodiak Refuge Manager Vernon Barnes noted two wolves running a caribou. Mr. Barnes was positive of his

identification, and this is the third authentic observation of wolves on the Kenai in the past three years. *Good HBB*

6. Wolverine. Wolverines are present on the Moose Range but are seldom seen except from the air.
7. Marmots. Colonies of marmots are found throughout the mountains. They come out of hibernation in early May, often tunneling through twelve feet of snow to reach the surface. The location of all large colonies are not known but the following are known: One extremely large colony is in the headwaters of Surprise Creek on Surprise Mountain; another is Marmot Pass between the Upper Funny River Airstrip and the North Fork of Indian Creek; another just north of Twin Lakes; and a smaller colony near Crater Lake just above the junction of the North and South Fork of Indian Creek.

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

The nesting bald eagle population appears stabilized on the Refuge. Wintering birds along the Kenai River fluctuates from year to year but are fairly numerous.

This year's known active nests included one nest four miles upstream on the Killey River; another located near the Kenai River directly across from Dr. Fair's residence. Active nests were also observed along the shoreline of Torpedo Lake and Two Island Lake.

On February 17, thirty-seven bald eagles (all adults except two), were counted along the open waters of the Kenai River below Skilak Lake. On December 7, an immature bald eagle was observed to dive upon and force an immature swan to the water as it attempted escape along the Kaslof River.

The powerful wing beats of the eagle enabled the bird to overtake the swan but the aircraft distracted the eagle momentarily and the swan returned to its river resting area upstream.

A large concentration of bald eagles was observed October 17, along the Kenai River inlet to Skilak Lake. Approximately thirty birds, half of which were immature, were resting in spruce and cottonwood trees in the immediate vicinity. Later that afternoon, a shoreline flight along Skilak Lake revealed twenty additional eagles in the area. Occasionally hawks, owls and magpies are observed during the year. A Harlequin's hawk nest was located near the Silver Salmon Lake Trail on Swanson River Road. *I wondered where they nested HBB*

The raven is numerous on the Refuge and several nest sites were located during early summer. One was found in a cottonwood tree on the canoe portage between Big Mink Lake and Camp Island Lake. Another nest was observed along the Skilak Lake Road in a cottonwood, and still another near the Lower Funay River Airstrip.

During early May, nesting activities began at the osprey nest site near Holly Varden Lake. Both returning adults were seen busy at the task of nest reconstruction following winter storms. This is the only known osprey nest on the Moose Range and has been active for several years. Two young were successfully raised. In late summer, adult ospreys were observed along the Swanson River near Flower Lake suggesting another active nest may be present but remains undiscovered.

#### F. Other Birds.

This year observations were recorded on punch cards and filed by species.

On March 12, the "winnowing sound" of a nearby Wilson's Snipe became audible from a considerable distance thus announcing Spring at an extremely early date.

Not until the first week in May did the usual occurrence of Passerines appear. Robins and the rusty blackbird were sighted May 7, while tree swallows and several sparrow species arrived during the second week.

Numerous sightings of lesser sandhill crane were sighted during May 2-9. During their annual migration north, fifty birds were observed on the Chickadee Flats, twenty-five on Kasilof Marsh and additional small groupings throughout the Refuge.

On June 25, four parasitic jaeger (Stercorarius parasiticus) were observed flying north from Kenai Packers Cannery area on the Kenai River.

Several wheatear visited the Refuge Headquarters on August 19, and were observed by Refuge personnel.

#### G. Fish.

Sport fishing is one of the major recreational attractions to the visitor on the Kenai National Moose Range. The months of February, March and early April received considerable ice-fishing pressure. During the summer, lakes are fished for trout and

streams for salmon. The heaviest fishing pressure occurs at Russian River, Hidden Lake and Polly Varden Lake.

Alaska Department of Fish and Game, Fishery Biologist Larry Engels, reported the fishing pressure at Russian River jumped from 8,318 man days of fishing effort in 1965 to 17,887 in 1966. This covered the period from June 15 to August 15. Nearly all fishing effort was concentrated on red salmon, and the increase was partially due to an excellent salmon run. This area is considered one of the most important fisheries in Alaska. Nearly all fishing is concentrated on the lower two miles of the river.

Blizzard Lake near Shilak was sampled and showed fair showings of rainbows and silver salmon. Stormy Lake was also sampled and showed good populations of rainbow and char. This lake has considerable fishing pressure and is accessible by car. Only the lower portion lies within the Moose Range.

Rock Lake, Sunken Island Lake and Upper Jean Lake which had been unsuccessfully planted with rainbows, were restocked with red salmon.

Twin Lakes received an additional plant of 98 adult grayling on August 3.

#### H. Disease.

No report.

### III. REFUGE DEVELOPMENT

#### A. Physical Development

Last year's beautification of the Kenai Headquarters site continued to receive favorable comment from local citizens. The many spruce trees transplanted in this area during the beautification all survived but one.

Erosion control of highway cutbanks was once again a major project this year. Before and during breakup some slope cutbanks completed during 1965 in the Jean Lake area eroded slightly necessitating repairs. Erosion control work in this area resumed during early June. The Alaska Department of Highways provided an end-loader and dump trucks to remove excess soil from cutbanks as the Refuge E-8 Cat continued sloping and leveling erosional areas in preparation for planting. Grading, seeding and planting of these soil and moisture areas commenced immediately upon completion of

How 'bout a photo of site?



sloping operations. Additional soil and moisture funds were used to accomplish similar erosion control work along the Skilak Lake Road near the Sterling Highway junction. Seeding of the area previously graded and sloped was completed in July. In the late fall several additional eroded hills along the Sterling Highway were sloped and graded in anticipation of seeding next summer. The largest and last hillside was about 25 percent completed when freezing temperatures caused us to cease operations. Timber cut from these projects was distributed as firewood to nearby campgrounds.

The Kenai Headquarters "washhouse" addition for summer temporary and transient employees was completed. Sleeping quarters for eight people are now available. A bathroom, a kitchen with sink, cabinets, refrigerator, electric stove and built-in dining table were also completed. The installation of a new office cecapool was required during mid winter.

Construction of a one-square mile moose pen enclosure was a project undertaken jointly by the Alaska Department of Fish and Game and the Moose Range. The Alaska Department of Fish and Game provided most of the finances but the pen required considerable attention and assistance from the Moose Range staff. The four mile boundary lines were cleared with the Refuge D-8 Cat. During May, the State hired a crew of summer employees to begin construction of the moose pen fence. Although this phase of the project was halted during the spring breakup, the cutting and transportation of fence posts continued. By late July nearly 1400 posts had been cut, peeled and hauled to the pen site with the Refuge low-boy trailer. Cut and fills required during fence construction was accomplished with the D-8 Cat. The moose pen was completed in early November by State personnel.

Considerable effort was expended in constructing the new Swanson River Canoe Route. More than 70 percent of the portage trails were completed before breakup. Wooden portage and trail marker signs were routed and painted during the winter months. Large entrance signs for this route were also constructed and placed at strategic locations on the newly graveled access road to Paddle Lake. An ample parking area, with a commanding view of the lake system, was also graveled and appropriate log work added. This canoe route was officially opened in early July.

Trail maintenance continued throughout the Moose Range during the summer. More than six miles of boundary posting was completed in the Sterling and Soldotna areas.

A number of vehicle parking areas were constructed near trail entrances providing access to lakes along the Swanson River and

Swan Lake Roads. These areas were graveled and appropriate log work and signs installed.

An additional loop access road in the Lower Skilak Lake Campground with six camping units was partially completed and additional units were constructed in the old campground. Some log work, a new double seat pit toilet and road culverts were also placed in this camping area.

Other campground development included a new double seat pit toilet installed at Hidden Lake Campground; a new picnic site and pit toilet at Jean Lake, and surveying and marking a new loop road at Dolly Varden Campground. Hand clearing along this road right-of-way was partially completed.

Construction of a proposed access road and campground near Tustasena Lake commenced in the late fall. Nearly two miles of forty foot right-of-way had been cleared to the Kasilof River before extreme cold weather curtailed further operation. This project should be completed next year. Twenty-eight campground fire grates were built in the Refuge shop during November and December.

Standard Oil Company of California completed the removal of an old and damaged culvert with the installation of a new six foot culvert at Weed Lake on the Swanson River Road.

A new tractor truck and lowboy trailer, capable of hauling a D-8 Cat, was procured as excess property from GSA. A new Dodge pickup truck arrived early in March and a new Plymouth Station Wagon arrived soon thereafter.

### B. Plantings

No seeding or planting was accomplished this year except that reported under Physical Development associated with the Soil and Moisture work.

### C. Collections and Receipts

No plants or seeds were collected.

Two unhatched trumpeter swan eggs were collected and retained for further study.

### D. Control of Vegetation

#### Mechanical

One D-8 Tractor pulling Flaco-roller choppers was used during December in the 1926 Barn to eradicate spruce and release hardwoods. Only 100 acres were completed and an additional 1,000

acres of rehabilitation work will be necessary to complete the project. Areas completed in previous years are now heavily used by moose during early winter months.

#### Chemical

A 10-acre plot directly south of Grus Lake, north of the Swanson River was aerially sprayed by chemicals on June 15, 1966 in an attempt to eradicate spruce. A 50-50 ratio of 2,4-D and 2,4,5-T was applied at the rate of four pounds per acre in a mixture of 30 gallons of water. A previous experiment using the same combination of chemicals and water indicated a 64 percent kill when treated from the ground. The plot has not been checked since application but will be in 1967 to determine the results. The cost of spraying was \$100 or \$10 per acre. In a large scale operation the cost would be reduced.

*Better to not  
spray at all, Jim*

#### E. Planned Burning

On June 24 an attempt to burn a 10-acre plot along Mystery Creek Road failed. Fire lanes were previously established around the plot, humidity was low and the vegetation was extremely dry. Conditions appeared perfect but a 10 to 15 mile per hour wind which had been forecast failed to develop and the fire did not spread. Work priorities and weather conditions prevented any further experiments.

The area picked was within the 1947 Burn and had a low amount of fuel available. The U.S. Forest Service personnel as well as the Refuge staff stood by with fire equipment to assist in controlling the burn. In the future it may be desirable to have fire lanes, fire fighting equipment ready, but have only two men attempt to start the burn. Once the fire is underway, other personnel alerted may be called to the scene immediately. Requiring all personnel to standby while attempting to start a fire can become costly.

#### F. Fires

The Bureau of Land Management again assumed the Skilek Fire Guard Station during the summer fire season. No fires occurred on the Range.

### IV. RESOURCE MANAGEMENT

#### A. Fur Harvest

Trapping pressure was low. Thirteen active trappers reported

the following fur animals taken:

Beaver	17
Mink	13
Weasel	2
Wolverine	4<
Coyote	15
Otter	4
Lynx	17<

#### B. Timber Removal

The availability of timber on the Moose Range is a good service to local users. Timber is generally not available from private land at a stumpage rate permitting profitable operation. Timber permits are listed on NR-11.

Approximately 1500 spruce posts varying in diameter from 14 inches to 8 inches and measuring 12 feet in length were obtained by the Alaska Department of Fish and Game personnel along the Swanson River Road near Rainbow Lake. These posts were used for construction of the first moose pen.

The Japanese pulp chip mill which had been proposed for construction in Homer during 1966 has been indefinitely postponed. Therefore a large scale timber operation is not anticipated for a few years.

#### C. Commercial Fishing

Two fishermen have been issued a permit to conduct a joint commercial fishing venture in Gullik Lake. They have not yet started fishing. These freshwater fishing ventures have not proven profitable.

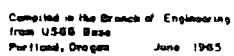
#### D. Other Uses

Standard Oil Company of California, under S.U.P. #32, 905 paid for and removed the following amount of gravel at \$.05 per cubic yard.

Date	Cubic Yds.	Am.
1-21-66 (used during Nov. '65)	225	12.75
2-66	40	2.00
6-66	1050	52.50
7-66	1195	59.75
9-10-thru 11-66	4550	227.50
	7060	\$ 354.50

FIGURE 5 -43e

U. S. FISH AND WILDLIFE SERVICES  
BUREAU OF SPORT FISHING AND WILDLIFE



CONTOUR INTERVAL 1000 FEET

IRo ALA 362 424.

The following commercial tent camp site permits were issued:

Permit #	Date	Permittee	No. Sites	Fee
KH 13-66	6-24-66	Lloyd L. Hall	6	\$60.00
KH 14-66	5-25-66	William Cunningham	5	50.00
KH 19-66	6-27-66	Marshall Farmer	2	20.00
KH 15-66	6-10-66	Jim's Flying Service	4	40.00
KH 3-67	9-07-66	Harry White	1	10.00
			18	\$ 180.00

Special Use Permit issued January 13, 1966 to Kenneth Olsen to use lands and operate a ferry on the Kenai River for a fee of \$100.

#### E. Oil Operations

##### Production

During 1966, the Swanson River Oil Field produced 10,768,000 barrels of oil and 5,125,000,000 cubic feet of gas from 47 oil wells and two gas wells. 27,225,000,000 cubic feet of gas was injected in the field. Gas is used in forcing oil to the surface.

Cumulative production of the field to January 1967 is: 61,900,000 barrels oil and 18,000,000,000 cubic feet of gas. The field contains 59 wells.

Oil field activities during the year included re-drilling 6 wells, shutting in 10 oil wells and 6 gas wells, completion of a 16 inch gas pipeline to the field, installation of a gas compressor plant and initiating construction of additional vapor recovery apparatus. The vapor recovery equipment will eliminate the flaring of gas. Large culverts were installed at several stream crossings to insure unobstructed fish passage.

During the re-drilling of a well a brief gas blowout caused the overflow of an open storage tank containing a mixture of drilling mud, oil, lignite and other solutions. This mixture flowed into the freshwater well overflow and was carried off the drilling pad a short distance into the muskeg.

Assistant Refuge Manager Thayer observed this flow shortly after it began and had it stopped. The contaminants were removed from the swamp and the break in the ring dike through which it escaped was repaired. This spill resulted from negligence by the oil company: the ring dike is required to be impervious.

So? Did they get it? Hey  
John  
new what  
didn't get  
5

## Exploration

### Seismographic

Interest in seismographic exploration on the Moose Range continues. Currently the Texaco Oil Company is conducting an 80-mile seismograph program and the Mobil Oil Company is conducting a 20-mile program. See Figure # 6.

Programs are becoming more intensive with the refinement of recording systems and increased interest in information from deeper strata. See Photographs.

Refuge regulations governing seismographic operations have been revised several times providing additional restrictions dealing principally with the protection of specially designated areas and waters.

Figure # 7 illustrates a segment of one type of seismograph trail in use this winter. Each shot point consists of 50 pounds of ammonium nitrate buried 100 feet.

Figure # 8 illustrates a more intensive program.

Each shot point contains 37 pounds of nitro-carbo-nitrate situated at the bottom of a 75 foot drilled hole. Shot points are detonated simultaneously in groups of three; one on the end of each offset and one on the center trail. Eight hundred and sixty geophones detect reverberations from the detonation and generate electric currents that are recorded on a paper tape. A study of these paper tapes is the basis for possible exploratory drilling or additional seismographic work, generally the latter.

An intensive seismic program is more destructive and expensive than an exploratory well.

In early summer the previous winter's seismograph trails are inspected and the companies involved are supplied with cleanup and restoration instructions.

These instructions deal with covering and fertilizing exposed topsoil and transplanting native saplings on the trails at stream and road crossings.

Although the oil companies protect their public relations and image with regard to conservation and conservation agencies violations of terms and special conditions in their seismographic permits are not uncommon.

The Texaco Oil Company was authorized to cross Snake River at a



FIGURE 6

# KENAI NATIONAL MOOSE RANGE ALASKA

UNITED STATES  
DEPARTMENT OF THE INTERIOR

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

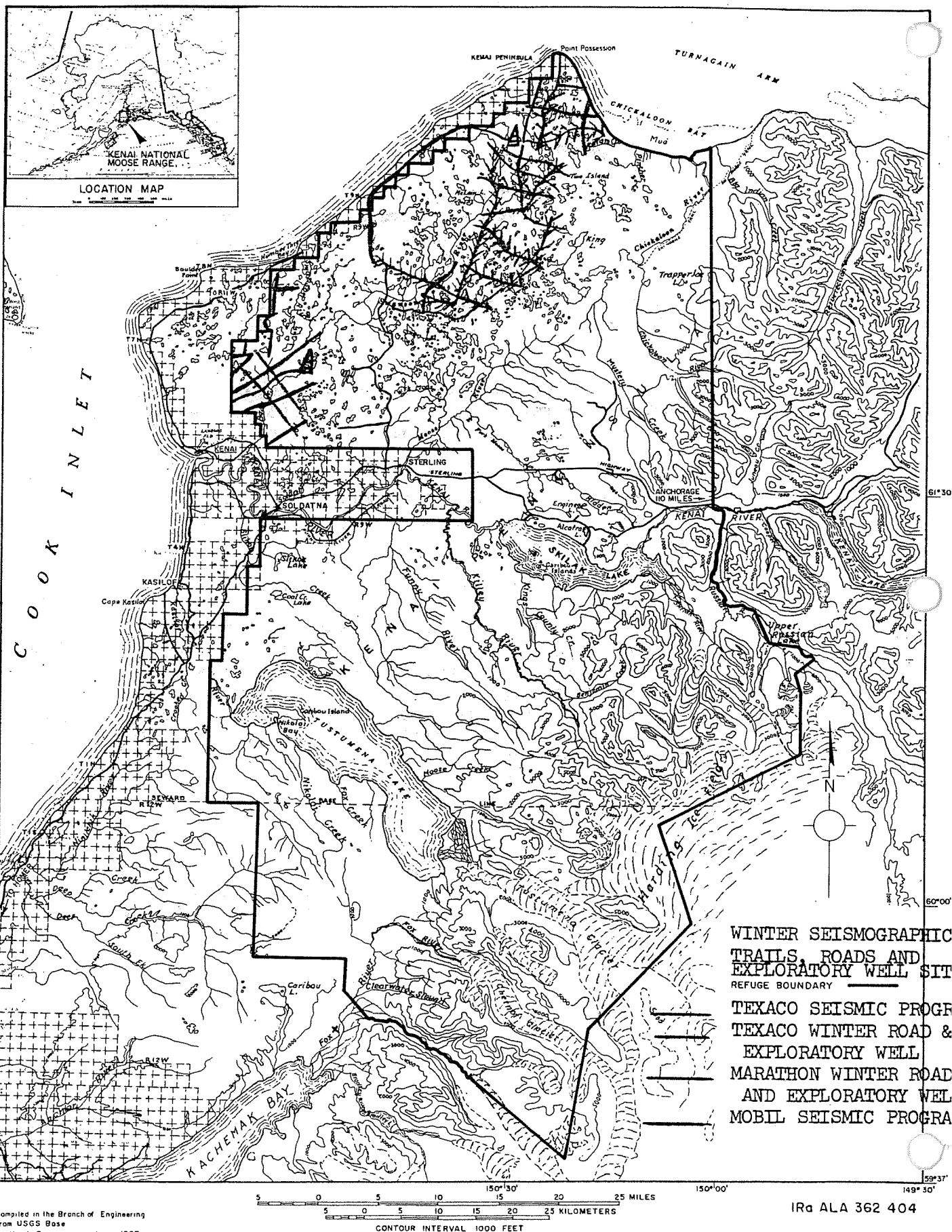




FIGURE 7

← 950 feet →

● Shot point  
X Geophone

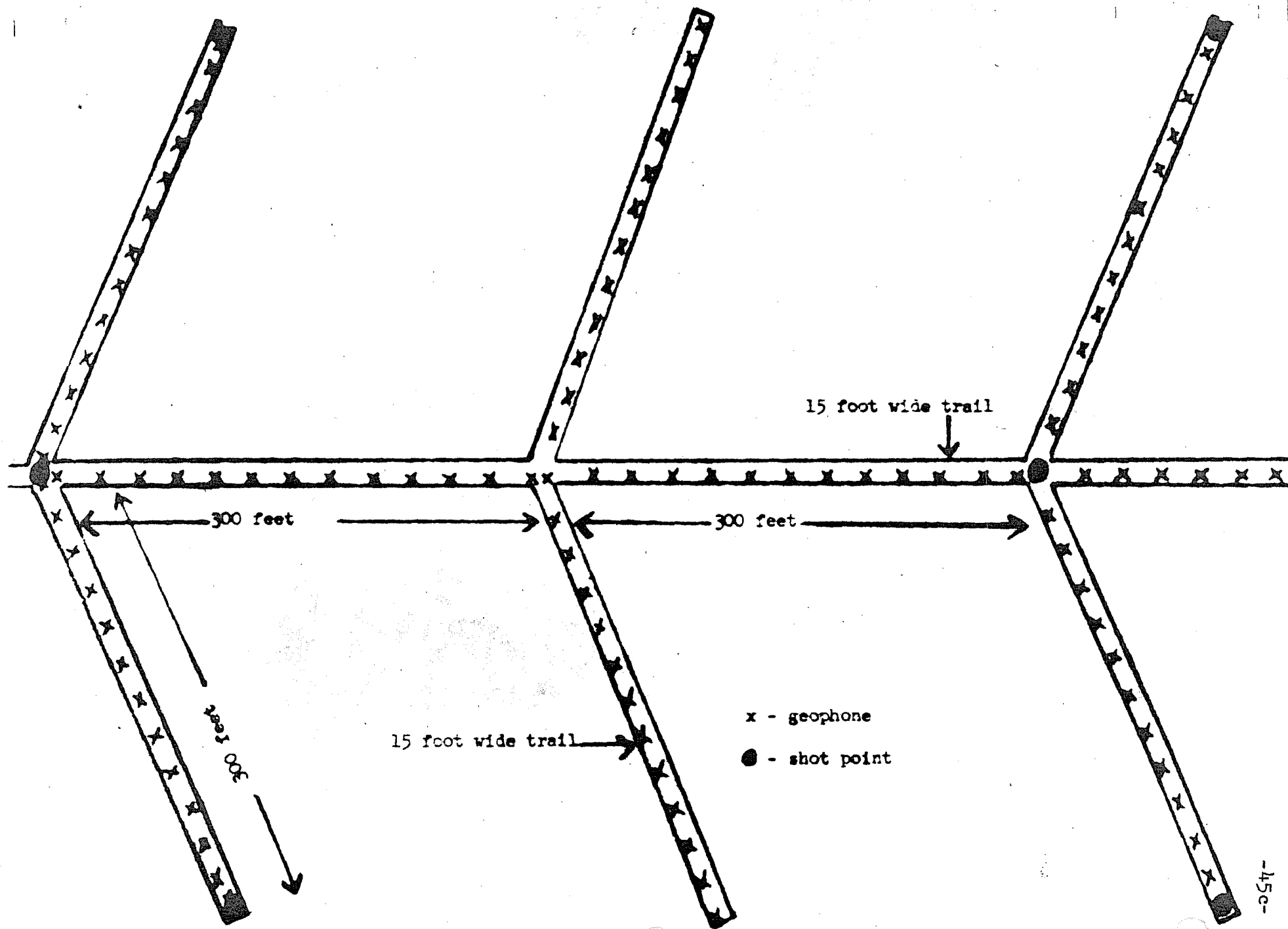


DIAGRAM: Seismograph Trail

specific place and only when the ice would hold their equipment. The tractor operator misjudged the ice and broke through. After his tractor was retrieved he proceeded upstream for  $\frac{3}{4}$  mile in company with another tractor and crossed the river, breaking through again, near the canoe portage from Gene Lake, then crossed the canoe portage. Assistant Refuge Manager Thayer discovered this about two hours after it's occurrence and suspended Texaco's seismic operation for 24 hours until the district landman could explain these actions. His explanation after many apologies was brief, "The tractor operator did not follow instructions."

Three weeks later they shot a seismic line  $\frac{1}{2}$  mile east of the route authorized, resulting in a line within the boundary of the Swenson River Canoe System Special Recreation Area (defined in the Recreation Plan). Their excuse for this action was, "the surveyor miscalculated."

Seismographic work is destructive and requires almost daily surveillance.

#### Drilling

An exploratory well was drilled near Grebe Lake and found to be dry. Two exploratory wells are in progress: Marathon Oil Company is drilling near Beaver Lake and Texaco is drilling north of Lark Lake. See Figure # 6.

During construction of well pads and winter roads, topsoil is stored for re-use and other provisions are made for summer restoration of the land.

If a well is discovered loss of Moose Range land will result through occupancy by production facilities.

### 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 27 and 28.

PERCENTAGE OF BROWSE USED ON PERMANENT PLOTS

Species	1962	1963	1964	1965	1966
Willow	98	23	65	94	93
Kenai Birch	92	7	71	92	85
Bwarf Birch	71	14	3	40	31
Aspen	31	0	0	10	32
Cottonwood	0	0	0	14	51
	69	9	40	63	72

Table 15 summarizes the utilization of browse taken by moose during the winter of 1965 and 1966 as obtained from permanent transects.

## 2. Browse Evaluation - Closest Plant Method

Using Cole's "Closest Plant Method" of browse evaluation four plots were surveyed in early May. This is the second year in a row that this method was tried. Table 16 presents a summary of this survey.

## 3. Dall Sheep Study - Surprise Mountain

The Dall sheep has a high aesthetic value among nature lovers and is also one of the most coveted trophies in North America. Although the trophy kill is low in relation to the total population, they provide an extremely high quality type hunt. The sheep on the Kenai National Moose Range have been steadily increasing in numbers since a population crash in 1945-46 and now number around 1,000. Historically, the sheep population in Alaska and on the Kenai have fluctuated widely, yet little is known about the causes of these fluctuations. The paucity of information available on the general population ecology of the Dall sheep and the relationship to its environment is readily apparent. It is essential to gather some of this basic information before we can adequately manage the sheep population on the Moose Range.

General population and range information have been gathered for some years; however more detailed work is necessary. The Surprise Mountain study was undertaken because a relatively confined sheep population is available for study on approximately 13 square miles of habitat and the area is fairly accessible.

This past summer Marsh Pittman was employed through the Alaska Cooperative Wildlife Research Unit to undertake lamb survival studies. Population and range data have also been gathered for several years by refuge personnel.

TABLE 15

MOOSE BROWSE UTILIZATION ON THE KENAI DURING THE WINTER  
OF 1965-66 AS DETERMINED FROM PERMANENT FORAGE PLOTS

Plot No.	Species	Location	Inches of Forage		Forage Used (inches)	Percentage of use	
			1965 Nov.	1966 April		1966	1965
1	Willow	Kasilof	56	2	54	96	100
4	Willow	Kasilof	132	8	124	94	85
5	Willow	Kasilof	236	12	224	95	94
8	Willow	Skilak	764	6	758	99	94
10	Willow	Skilak	536	64	472	88	96
13	Willow	Sterling	12	12	0	0	50
14	Willow	Sterling	2	2	0	0	94
15	Willow	Skilak	220	26	194	88	92
					1,826	93	
4	Kenai Birch	Kasilof	852	68	784	92	96
5	Kenai Birch	Kasilof	962	144	818	85	88
6	Kenai Birch	Kasilof	312	114	198	63	92
					1,800	85	
9	Dwarf Birch	Kenai	24	6	18	75	84
13	Dwarf Birch	Sterling	54	40	14	26	14
14	Dwarf Birch	Sterling	26	24	2	8	46
					32	31	
5	Aspen	Skilak	54	10	44	81	100
7	Aspen	Skilak	320	204	116	36	0
8	Aspen	Skilak	210	168	42	20	0
10	Aspen	Skilak	134	130	4	3	0
11	Aspen	Skilak	130	130	0	0	0
12	Aspen	Skilak	58	58	0	0	0
14	Aspen	Sterling	150	18	132	88	91
					338	32	
15	Cottonwood	Skilak	954	467	487	51	14
			6,198		4,483	72	63

TABLE 16

CLOSEST PLANT METHOD - BROWSE EVALUATION

LOCATION Year	<u>KASILOF AIRSTRIP</u>		<u>MILE 67 STERLING HWY.</u>		<u>NEAR SKILAK CABIN</u>		<u>SWAN LAKE ROAD</u>	
	<u>1965</u>	<u>1966</u>	<u>1965</u>	<u>1966</u>	<u>1965</u>	<u>1966</u>	<u>1965</u>	<u>1966</u>
Range Condition Rating	Very Poor 84	Very Poor 84	Poor 40	Good 16	Good 18	Good 18	Excell. 4	Good 14
Moose Utilization Percentage	63	30%	26	20	19	24	33	40
Average Current Plant Vigor	Poor to Very Good	Very Poor	Fair	Fair to Poor	Fair	Fair to Poor	Fair	Fair
Trend of Plants	Retro- gressive	Retro- gressive	Progressive to Static	Static	Static	Static	Static to Progressive	Progressive
Over Percentage of Dead Browse Material	53	51	14	10	7	7	2	2
Composition of Plot %								
Willow	90	90	6	4	22	26	6	12
Aspen	10	10	32	36	78	74	4	4
Birch	0	0	0	0	0	0	90	84
Dwarf Birch	0	0	62	60	0	0	0	0

### The Population

An aerial count of sheep on Surprise Mountain has been completed each year since 1952, except for 1953 and 1960. These counts are recorded in Table 17. These figures should be considered minimum numbers as often some sheep are not seen in the survey or large bands are under-estimated. Surveys indicate a very slow increase in the population from 1952 to 1959, and a relatively rapid increase the past four years. The 1965 aerial count was 237 animals, as compared to 62 in the 1952 survey.

Intensive efforts were conducted this year in an attempt to make a complete count. This was accomplished in the following manner: On August 25, Biological Aid Pittman was equipped with a small two-way radio while Refuge Manager Troyer flew cover with a Super-cub. In this manner the observer in the plane spotted the various bands of sheep and directed the ground observer to the bands. We believe this was the most accurate survey ever obtained. The counts indicated a population of 255 animals.

A number of attempts were made to obtain a composition of the population on Surprise Mountain. Calculations revealed 66 lambs, 39 yearlings, a minimum of 27 rams with at least four legal rams remaining in the population (Six legal rams and one adult ewe were removed during the hunting season prior to the count.) Thus 123 sheep were classified as ewes; however the percentage of rams in the population appears extremely small and probably some two-year old rams were classified as ewes. The rams in this age class are difficult to distinguish from ewes.

Lambs constituted 26 percent of the total population and assuming the 123 sheep classified as ewes is correct it gives a ratio of 54 lambs per 100 ewes. Most initial lamb mortality should already have occurred; thus indicating very good productivity and a rapidly increasing population. This is also verified by the 44 lambs counted in 1963 and a survival of 39 yearlings in the population to this spring. At present it appears the Ball sheep population on Surprise Mountain is entering a population explosion, and it will be interesting to follow this expansion. We might speculate that a sudden crash might occur; a migrational movement to another area is possible; or a population stabilization resulting from poor lamb survival.

Historical evidence indicates a large die off in 1945 and 1946. Residents indicate this was associated with severe icing conditions,

TABLE 1

THE DALL SHEEP POPULATION AND COMPOSITION ON SURPRISE MOUNTAIN  
AS DETERMINED FROM AERIAL AND GROUND COUNTS 1952-1966

Year	AERIAL COUNTS				GROUND COUNTS			
	Ewes & Yearlings	Lambs	Rams	Total	Ewes & Yearlings	Lambs	Rams	Total
1966	162	53	22	237	154 (39 yrlds.)	66	27	255
1965	111	39	26	176	105	44	30	179
1964				186	105	19	23	147
1963				122				
1962	78	14	8	100				
1961		16		117				
1960	No Survey							
1959	40	11	16	76				
1958	61	11	17	94				
1957	67	13	12	92				
1956		8		70	49 (10 yrlds.)	16	23	88
1955				76				
1954				71				
1953	No Survey							
1952				62				



making it impossible for sheep to paw through ice to vegetation below. No information is available as to the population status prior to the die off and whether it was as large or larger than at present. If lamb counts obtained from aerial surveys can be considered valid, then the low counts obtained in the 1950's indicate a much slower population growth than is presently in progress.

#### Mortality

Seven adult rams between  $3/4$  and  $7/8$  curl were removed during the hunting season. All were in the five, six and seven-year age classes indicating heavy hunting pressure as rams usually obtain legal horns at about 5 years of age. One adult ewe was accidentally shot and one lamb was accidentally killed in May when tagging was attempted. No evidence of predation or natural mortality was noted.

#### Movements and Habitat Use

Ground checks and aerial surveys during winter months, revealed sheep were primarily utilizing the wind swept slopes. Major winter concentrations were found on the southeast facing slopes of Russian Mountain and along the ledge from Lamb Gulch to the Skilak Glacier Meadows. The south, southeast and southwest facing slopes received most use. Very little activity has been noted on the northern side of the mountains.

As snows recede in the spring more range becomes available and sheep move about more freely. In May ewes start utilizing the rocky slopes above Skilak Lake and around Lamb Gulch apparently in preparation for lambing. Also vegetation greens rapidly on these steep south facing slopes.

During the summer sheep utilize the valleys which are covered by deep snows in winter. Pitman reported that usually sheep only remained in these areas during the day and moved onto the rocky open slopes during the night. The valley near the cabin and the northern slopes were utilized quite extensively during the summer, although winter range was also used.

It is interesting to note that when disturbed, sheep usually moved toward the Skilak Lake cliffs. Apparently this type of terrain is a necessary habitat requirement as it serves as an effective escape cover.

#### Rutting Period

On November 3 and 4, 1965 ground observations indicating the rutting period was beginning. Rams were constantly following ewes, but no breeding was observed. Marsh Pitman was on Surprise Mountain

November 20-26, 1966 and reported rutting activity was definitely in progress. Two attempts at copulation were observed.

### Lambing Period

On May 20, a total of 97 sheep were tallied on Surprise Mountain but no lambs were seen, although a few may have been present, but not observed. On May 24, thirteen lambs were sighted with a band of 40 adults and on May 30, Detlef Riefeld, a student from the University of Alaska, counted 42 lambs and a total of 171 adults, indicating most of the lambing had been completed.

### Tagged Lambs

Two lambs were successfully ear-tagged this spring; another was accidentally killed while attempting to tag.

Lambs were captured by cornering them in rocky ledges without escape routes. The lamb was killed on impact after jumping from a ledge and falling some distance. These lambs were several days old and extremely agile. Another lamb was tagged a few hours after birth and was still unable to run. In all cases when personnel approached the lambs, the ewes abandoned the area but returned several hours later.

Following is the data and tag records of the lambs captured:

	Lamb # 1	Lamb #2	Lamb # 3
Sex:	?	?	-
Date:			
Ear Tags	Killed	Color Ear Marks 110-111 (Green-Green) 107-106 (Red-Red)	
Area Tagged		Lamb Gulch	Lamb Gulch
Weight	8 lbs.		8½ lbs.
Total length	24 inches	22 inches	22½ inches
Shoulder Ht.	16½ inches	14½ inches	17 inches
Hind Foot (R)	9 inches	8 inches	9 inches
Neck Girth	6 inches	6 inches	6 inches
Shoulder Girth	13½ inches	13 inches	14 inches

The lamb with the red marks was observed a number of times during the summer. On May 29, four days after tagging, it was seen on the Skilak Cliffs, a distance of two miles from the tag site, indicating the ease of movement at an early age.

### Collections

The following biological material was collected during the year:

Six stomach samples; six jaws and one lamb skull.

Horn measurements were obtained from each ram, body measurements from four animals and the total weight of a five-year old ram was 190 lbs.

## VI. PUBLIC RELATIONS

### A. Recreational Use

The Kenai Peninsula has been called the "Playground of Alaska" and recreational surveys indicate public visitation on the Kenai National Moose Range continues to increase at a rapid rate.

Total visitor use for 1966 was 208,000 visitors, a whopping 45 percent increase over the preceeding year (Table 18). The additional number of Alaska and out-of-state visitors utilizing the many recreational facilities on the Refuge attest to the importance of this recreational area within a few hours drive of nearly half the State's population.

Traffic road counters were again utilized providing the continuous and accurate counts of all vehicles entering and departing recreational areas of the Moose Range. Aerial surveys and direct public contacts in these recreational areas supplemented road counter tallies providing blanket coverage of recreational activity.

Low temperatures and short daylight hours during January limited recreational pursuits, however skiing, both downhill and cross-country, and upland game hunting was active during this period. Ice fishing on the many frozen lakes of the range increased in popularity as additional daylight hours became available. Aircraft and snow-machines were frequently used to reach lakes too distant or otherwise inaccessible by road.

The ski-tow facilities at Soldotna Hill were enjoyed by numerous local skiers. The Soldotna Ski Club tow operated during weekends and Wednesday evenings. During hours, fifteen to thirty-five skiers were normally on the hill at any moment.

*From The Ski Capital of  
The East, That sounds  
like you have plenty of  
elbow room on the slope.  
EAC - Missesque*

*Hope they see  
better counts  
than road  
use*

TABLE 1<sup>o</sup>

1966 PUBLIC USE  
KENAI NATIONAL MOOSE RANGE

	Number of Visitors	Estimated Average Hours for Each Visit	Total Hours
A. Hunting			
Waterfowl	700	6	4,200
Upland Game	3,200	4	12,800
Big Game	46,000	17	782,000
Other	560	8	4,480
TOTAL	50,460		803,480
B. <u>Fishing</u>	46,000	30	1,380,000
C. <u>Miscellaneous</u>			
Nature Study	3,500	4	14,160
Driving & Sightseeing	34,200	2	68,400
Picnicking	3,000	3	9,000
Swimming	1,500	2	3,000
Boating	4,820	6	28,920
Ice Skating	200	4	800
Water Skating	60	6	360
Camping, Tent	17,100	50	855,000
Camping, Trailer or Camper	39,200	50	1,960,000
Camping, Group	200	144	28,800
Berry & Mushroom Picking	400	5	2,000
Other Uses			
Canoeing	1,100	68	74,800
Hiking	200	48	9,600
Skating	5,150	4	20,600
Snow Travelers	500	6	3,000
TOTAL	111,170		3,078,440
D. Grand Total of A,B,C	207,630		5,261,920
Total Hours divided by 12 equals number of Visitor days			438,493

Ice fishing remained excellent throughout April but winter sports quickly came to an end as May temperatures increased and unusually heavy rains rapidly eliminated snow coverage. By mid May, most lakes were free of ice, temperatures were in the 50's, grasses turned waysides green, waterfowl were in abundance, aircraft on floats instead of skis, and campers and fishermen were arriving in great numbers.

Spring cleanup of campgrounds, trails, and canoe route portages was barely accomplished before a large influx of visitors converged upon the refuge to celebrate the Memorial Day weekend. Crowded conditions prevailed at several campground areas and the canoe system also received its share of enthusiastic visitors. Fifty-eight canoeists registered during this sunny weekend but nearly one hundred visited the area.

This year, campgrounds were packed and many times overflowing as visitor use reached an all time high. Refuge personnel were limited in their attempts to continue planned recreational work programs because of demands upon them to maintain clean camping areas and other recreational facilities. The Russian River and Hidden Lake Campgrounds again were the two most visited by recreationists. These recreational areas were the only two of the thirteen campgrounds on the Moose Range that were "designated areas" under the Land and Water Conservation Fund Act. Posted as "Golden Eagle" campgrounds, fees were collected and Golden Eagle Passports required (Table 19). Only 153 passports (\$7.00 yearly passports) were sold this season indicating many campground users had their "Golden Passports" prior to visiting these areas. Undoubtedly there were many users who got by without paying. One factor which undoubtedly contributes to our missing uses is that campground work schedules did not coincide with the early morning and late evening use pattern. Another factor is limited time and personnel to handle this job. The time required to sell tickets, explain their purpose, and check compliance in the field is considerable. This was done with no increase of personnel, but undoubtedly decreased the amount of time normally spent by them on other important refuge work.

Visitor use continues to increase at such a rapid rate that campgrounds and other outdoor recreational facilities are overflowing. Over-crowded conditions continued to prevail at Russian River Campground during the peak salmon runs and holiday weekends. Visitor use and fishing pressure increased more than 100 percent over the 1965 season.

TABLE 19

THE 1966 DESIGNATED AREAS UNDER  
THE LAND AND WATER CONSERVATION FUND ACT\*

Kenai National Moose Range

	<u>1</u> Number of Visitors	<u>2</u> Total Visitor Hours	<u>3</u> Visitors Paying Fees <sup>1/</sup>	<u>4</u> Visitors Not Paying
A. Hunting	2,800	47,600	1,820	980
B. Fishing	33,800	709,800	21,970	11,830
C. Miscellaneous	16,000	176,000	10,400	5,600
<u>TOTAL</u>	<u>52,600</u>	<u>933,400</u>	<u>34,190</u>	<u>18,410</u>

<sup>1/</sup> This includes all persons who pay the daily entrance or admission fee, or who already have this sticker. It also includes persons under 16 years of age who are occupants of a fee-paying car.

\* Designated areas include Russian River and Hidden Lake Campgrounds.

More than 190 family units crowded into the 50-unit facility at Russian River. This is nearly 50 units more than the maximum use recorded during the preceding year. Even on weak days, counts of often more than one hundred family units were observed. During the five month recording period, an average of 208 persons visited this campground daily.

Hidden Lake Campground, where 40 good camping units were completed last year, had 100 family units jammed into the area during the Memorial Day weekend. Last year the maximum number was 75. More than thirty vehicles visited this area daily during the five month reporting period.

The 60-mile Swan Lake Canoe Route connecting 29 lakes with the Moose River continued its increase in popularity. Considerable effort was expended to complete the new Swanson River Canoe Route to accommodate additional canoeing enthusiasts and relieve some of the pressure on the Swan Lake Route.

The new Swanson River Canoe Route, Figure 9, was completed and officially opened in July. This 80-mile route connects 40 lakes and 47 miles of the Swanson River. Canoeists can enter the headwaters of the Swanson River and float down to the Swanson River Campground, a distance of 19 miles, or continue to its terminus at the North Kenai Road, 28 miles downstream. Nearly 200 canoeists used this route during the very short summer period following its opening.

Continued use of the recreation boxes at canoe route entrances provided valuable information concerning length of stay, route taken, name and address, in addition to many constructive remarks. More than 650 canoeists signed the registers this season indicating an increase of more than 55 percent in visitor use. Surveys have shown that many canoeists re-visiting the area, and few that visit for the first time, do not sign in. The total visitor use on the entire 145 mile canoe system was estimated to be 1,100 visitors.

July and August were the most popular months for canoeing. The average length of stay on the system was nearly three days per party.

Fishing was generally good to excellent throughout most of the canoe system. Many canoeists continue to utilize only the first few lakes of the two canoe routes. It is these areas that sustain heaviest portage use and require additional maintenance.

FIGURE 9

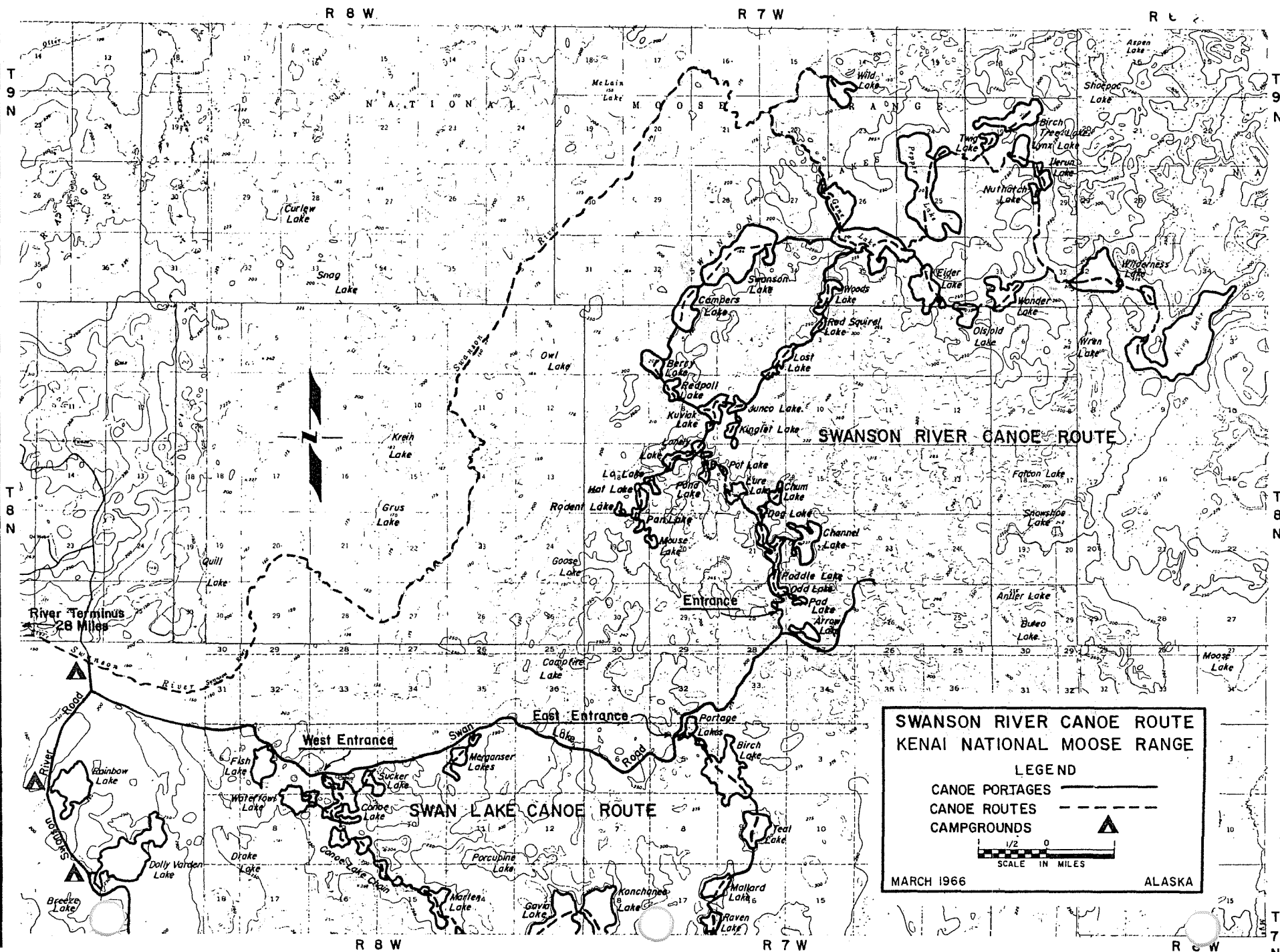


FIGURE 9



ADDITIONAL INFORMATION  
(Swanson River Canoe Route)

This canoe route links more than 40 lakes with over 48 miles of the Swanson River. The entire route (80 miles in length) can be traveled in less than one week. Canoeists can enter the head waters of the Swanson River (via Gene Lake outlet) and float down to the Swanson River campground, a distance of 19 miles, or continue to its terminus at the North Kenai Road 28 miles downstream.

From the entrance, one day's canoeing is required to reach Gene Lake by either the east or west route. This lake provides good fishing and a fine island campsite.

Portages are usually short and over level or medium terrain; the longest is nearly one mile in length. Proper footgear should be worn for soft wet areas near lake shores. Go light. Canned goods, bottles, and similar food items are heavy and not easily disposed without littering the lakes and portages.

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

Good fishing is found in all lakes of this canoe system with the exception of Berry Lake and Redpoll Lake.

Rainbow, Dolly Varden and steelhead trout and red, silver and pink salmon are found in most lakes and streams.

Camping sites are available in wilderness-type surroundings, with no restrictions other than "good-housekeeping" required. Please burn all trash. Deposit cans, foil, bottles and other non-burnables at roadside garbage cans or sites provided near portages. Won't you help us keep the lakes and portages clean?

An abundance of dead and down timber is available for campfires. The cutting of green trees is prohibited. Campfires are dangerous, especially in moss and peat areas which allow fire to creep underground. Be sure every portion of your fire is extinguished before leaving the campsite. Please do not build your fire on the portage.

Hunting and fishing must be conducted in accordance with the Alaska Department of Fish and Game laws and Federal regulations.

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

For additional information, write or contact:

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

A number of parking areas were constructed to access trails leading to lakes along the Swanson River Road and the Swan Lake Road. These trails opened rarely used lake areas to both summer and winter fishing. Several observations during winter months recorded snow-traveler use to reach these lakes via the trails and canoe portages for ice-fishing purposes.

Inclement weather during most of August considerably reduced public recreational use of the area. Campground use dropped rapidly when a reduced salmon run and the opening of hunting season diverted recreational pursuits.

Sheep, goat, black bear and ptarmigan seasons opened August 10. The moose season began ten days later drawing numerous hunters to the refuge, however hunting effort was lower than normal. Boats were sighted on rivers, roads were heavily traveled and aircraft were observed patrolling the lake shores for moose. An antlerless season during the last six days of September brought droves of hunters into the area with the usual hunting pressure and kill along road systems. Heavy snows did not occur during the late November season resulting in low hunter success.

Wildberry picking improved somewhat over the poor berry crop of the 1965 season. Numerous berry pickers were observed in favorite berry areas but the total take was nominal.

Freeze up occurred later this year and larger lakes did not freeze over until early December. Ice skating was limited as heavy snowfall accompanied the freeze.

The use of snow travelers increased measurable over last year. Local sales of these machines have nearly doubled, additional snow-traveler clubs have been organized, and many more weekend outings planned. Favorite weekend group trips have included overnight stops and longer travel routes. Races are now held most every weekend. These machines are commonly used for upland game hunting and in reaching remote ice fishing lakes. Operation of snow-travelers is permitted on the Moose Range only between December 1 through March 31, and cannot be used as an aid in the taking of big game.

Yeah  
It's a  
boom  
hok  
New En  
J.

Ahh shattered  
solitude and  
wildness !! DRP

#### B. Refuge Visitors

<u>Name &amp; Title</u>	<u>Organization</u>	<u>Purpose</u>	<u>Date</u>
			1965
Willard Stump	Alaska Pipeline Anchorage, Alaska	Business	1/20
Sam Crane	Japan Paper Mfg. Co. Tokyo, Japan	Business	1/20

Name & Title	Organization	Purpose	Date
Harvey Johnson	Western Geophysical Anchorage, Alaska	Business	1/20
Thor Wilcox	Marathon Oil Anchorage	Business	1/20
A. Earl Flourdo	State Forester Anchorage	Business	2/11
A.J. Wright	Texaco, Inc. Houston, Texas	Business	3/7
Claude Brown	Texaco, Inc. Anchorage, Alaska	Business	3/10
Hadley Roberts	USFW Seward, Alaska	Business	3/11
Loren W. Croxton	Alaska Dept. of Fish and Game, Anchorage	Business	3/28
Barney Castor	USFS, Anchorage	Business	5/4
John Galea	USFS, Seward	Business	5/4
Governor William Egan	State of Alaska	Visit	5/23
Larry Krafting	BSFW St. Paul, Minn.	Business	6/6
Charles M. Lavelle	BSFW Denver, Colorado	Business	6/6
Robert A. Rausch	Alaska Dept. Fish and Game, Fairbanks	Business	6/8
G. E. Bennett	BSFW Portland	Inspection	6/24
L. A. Woker	Texaco, Inc. Los Angeles, Calif.	Business	7/11
G.M. Lowler	Geophysical Ser. Inc. Inglewood, Calif.	Business	7/11
B.F. Barry	Geophysical Ser. Inc. Inglewood, Calif.	Business	7/11
Richard J. Barney	Forest Sciences Lab. College, Alaska	Business	7/12
George R. Fahnstock	Pacific NW Forest Exp. Station, Seattle, Wn.	Business	7/12
Art Brattle	Alaska Dept. Fish and Game, Anchorage	Business	7/21
John P. Ratterman	Anchorage Daily News Anchorage, Alaska	Business	7/21
Nate Greene	BSFW Training Officer Portland	Business	8/3
Alvin T. Williams	ECM Engineering Anchorage	Business	8/3

<u>Name &amp; Title</u>	<u>Organization</u>	<u>Purpose</u>	<u>Date</u>
Robert M. Rallou	BEPAN Washington, D.C.	Visit	8/17
W. B. Stewart	Alaska Dept. Fish and Game, Enforcement Juneau, Alaska	Visit	8/22
John R. Langanbach	BEPAN Portland	Business	8/24
Robert H. Bailou	BEPAN Washington, D. C.	Inspection	8/29
Albert Mechler, Jr.	Marathon Oil Co. Los Angeles	Business	8/30
Karl Abraham	The Philadelphia Bulletin Penn.	Visit	9/8
Glen Tillian	Alaska State Legislator Halibut Cove, Alaska	Visit	10/5
Carl T. Nadler	Alaska Water Lab. College, Alaska	Visit	10/10
Donald P. Blasko	U.S. Bureau of Mines Anchorage, Alaska	Business	10/26
James Scott	BLM Anchorage, Alaska	Business	10/26
Tom Paul	Texaco, Inc. Long Beach, Calif.	Business	10/27
D. G. Laswell	Standard Oil Anchorage, Alaska	Business	12/1
E. H. King	Texaco, Inc. Long Beach, Calif.	Business	12/12
John H. Heller	Mobil Oil Co. Anchorage, Alaska	Business	12/12
J. R. Root	United Geophysical Anchorage, Alaska	Business	12/12

#### C. Refuge Participation

Refuge Manager Troyer attended the Alaska Department of Fish and Game meeting in Anchorage January 3-7. He presented the Refuge game regulation proposals for the coming year.

Assistant Refuge Manager Thayer gave a slide talk on Refuge operations to the Alaska Department of Fish and Game Protection Training Session held at Copper Center, Alaska.

A picture story depicting the value of the Moose Range to Alaska was prepared for the Alaska Sportsman Magazine.

Display maps emphasizing recreational opportunities of the Moose Range were updated for the Kenai and Soldotna Tourist Centers.

Lack of funds brought the Kenai Neighborhood Youth Corps to a close at the end of February. The few youths working with the Refuge staff gained valuable experience this past winter.

On March 22, Refuge Manager Troyer participated in the Wildlife Society meeting at LaGrande, Oregon. On his return he visited the Regional Office and stopped in Seattle to hold discussions with Mrs. Margaret Murie and Mr. Roger W. Piques concerning wilderness areas of Alaska.

On April 8, Assistant Refuge Manager Wade attended a Forest Research meeting at the University of Alaska, College, Alaska.

On April 15, Mr. Dave Spencer and Mrs. Charle Stroud completed the ADVANCED Red Cross First Aid Course offered through the Kenai Community College. The course included the Medical Self-Help series.

On April 18, Refuge Manager Troyer participated in a TV show (KTVA Anchorage) concerning recreation on the Moose Range.

Assistant Refuge Manager Thayer represented the Moose Range at Alaska Department Fish and Game Advisory Board meetings at Seward and Tustumena.

Mr. Thayer is the Kenai Chairman of the Alaska Centennial Committee. He also participates on the Borough Campground Committee and the Statewide Committee for Historic Trails.

The Moose Range staff aided Refuge Supervisor Spencer in preparing an Alaska Refuges display for the Sixth Biennial Northwest Wilderness Conference in Seattle.

Refuge Manager Troyer and Assistant Refuge Manager Thayer were active in the organizational meeting of the Kenai Peninsula Chapter of the Alaska Conservation Society held in Soldotna on May 5.

Assistant Refuge Manager Thayer attended several local meetings between commercial fishermen and oil companies and reported on methods used by the Moose Range in reducing detrimental effects caused from oil operations.

Mr. Robert Murphy was present on July 1-5 to gather data for his forthcoming book on refuges.

The Moose Range staff prepared an extensive refuge display, with captions and photographs of all Alaska Refuges, for the Alaska Garden Clubs which held their annual meeting in Kenai, July 7-10. Refuge Manager Troyer presented a talk with slides, entitled OUR WILDERNESS GARDEN. Assistant Refuge Manager Wade also gave a talk about wild flowers and presented the film ARCTIC WILDLIFE RANGE.

A photo and map exhibit describing refuges in Alaska was displayed during the Kenai Days Celebration August 12-14. The judges awarded this display the blue ribbon for Excellence in the Educational Class.

Assistant Refuge Manager Thayer attended an oil pollution fact-finding meeting in Anchorage, Alaska. Attendance at this meeting was limited to State and Federal agencies. Represented were: Bureau of Land Management, U.S. Geological Survey, Corps of Engineers, Alaska Water Pollution Control Laboratory, State Division of Mines, Bureau of Sport Fisheries and Wildlife, Management and Enforcement Branch, the Branch of River Basins as well as the Alaska Department of Fish and Game.

Assistant Refuge Manager Thayer participated in the Multiple Use Seminar primarily concerning commercial fishing and oil interests. This seminar, arranged by the Alaska State Department of Natural Resources, was a series of talks given by oil personnel, commercial fishermen and other conservation groups in an effort to understand each others problems. This seminar was held in Soldotna on November 16 and again in Anchorage the following day.

Refuge Manager Troyer attended the Alaska Inter-Agency Moose Committee meeting held in Anchorage on November 29 and 30.

Several informative articles concerning Refuge activities were released to Alaska newspapers during the year. Bureau films were also shown to many interested groups. Several hundred persons viewed the films ARCTIC WILDLIFE RANGE, BALD EAGLE, GOONEY BIRD, and THE WHOOPIING CRANE.

#### D. Hunting

##### BIG GAME

<u>Species</u>	<u>Season</u>	<u>Limit</u>
Moose, bulls	August 20-September 30	1
	November 1-November 20	1

Moose, antlerless	September 25-September 30	1
Mountain Goat	August 10-December 31	2
Mountain Sheep	August 10-September 20	1 3/4 curl
Brown & Grizzly Bear	September 1-September 30	1
Black Bear	August 10-June 30	3
Wolverine	November 10-March 31	No limit

#### FUR ANIMALS

Mink, Marten, Fox & Weasel	November 10-January 31	No limit
Lynx & Land Otter	November 10-March 31	No limit
Muskrat	November 10-June 10	No limit
Beaver	February 1-April 30	40
Coyote	No closed season	No limit

#### MARINE MAMMALS

Seal	October 15-July 31	No limit
Beluga Whale	No closed season	No limit

#### SMALL GAME

Grouse	August 20-March 15	15/d-30 poss.
Ptarmigan	August 10-April 30	20/d-40 poss.
Hare	No closed season	No limit

#### WATERFOWL

Game Ducks, Geese, Brant, etc.	September 1-December 14	Same as Fed. Regs.
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The usual spring black bear hunters utilized the several mountain hiking trails in the Skilak-Hidden Lake area.

Inclement weather early in August reduced hunter effort during the opening of sheep, goat and moose seasons. Although moose season began ten days later than the sheep and goat season, most hunting effort was limited to the first week. Antlerless moose season was held during the early season this year, September 25-30. During this period sportsmen appeared in droves, most of whom were "road hunters".

The second moose season, November 1-20, resulted in a substantial bull kill. With the elimination of a antlerless second season this year, the total number of moose killed in November was considerably lower than during the past two winters.

The sheep season ended September 20 with an estimated 47 rams harvested on the Moose Range. Hunters were not concentrated as in past years; hunter effort being distributed throughout the season and therefore creating more high quality hunting opportunities.

Fall waterfowl hunting was limited although ducks appeared in large numbers early in the season. These large concentrations quickly moved southward and sizable groups of game ducks did not reappear in this area during the season. Waterfowl hunting on the Chickaloon Flats was minimal again this year due to difficult access into the area.

### E. Violations

#### CASES CLOSED

<u>Name</u>	<u>Charge</u>	<u>Fine</u>
Flumis Walter Moore	Taking moose during closed season	\$300
Ernest Midford Knight	Taking moose during closed season	\$250 with \$150 sus.
Mrs. Flumis W. Moore	Taking moose during closed season	\$300 with \$150 sus.
Flumis Walter Moore	Hunting brown bear during closed season	\$300
Ernest Midford Knight	Hunting brown bear during closed season	\$250 with \$100 sus.
Howard John Hunt	Taking illegal sheep	\$500 with \$300 sus.
Elvin Benjamin Jackson	Taking illegal sheep	\$500 with \$300 sus.

This sure is a change most areas! Good +

APR 1961  
SPECIAL MAN

### F. Safety

The refuge had accumulated 297 accident-free days prior to our only accident during the summer. On June 2, Mr. S. Glenn Erickson, while sawing a small tree at ground level, allowed the chain saw to slip into his boot resulting in a deep lacerated wound of the left foot.

We have accumulated 246 accident-free days since this accident.



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

The safety film "The Inner Mind of Walter Mitty" was shown to the refuge staff.

## VII. OTHER ITEMS

### A. Items of Interest

Cherie Stroud, clerk (typist) was employed on April 18, 1966 to replace Linda Groleske who resigned on April 20, 1966.

John Kodysz entered on duty as a maintenanceman on March 28, 1966 to fill a vacant position formerly held by Lesley A. Holt.

Robert Wade, Assistant Refuge Manager, transferred to the Moosehorn National Wildlife Refuge in Maine on August 29, 1966. The vacancy has not yet been filled.

Robert Richey, Assistant Refuge Manager was promoted from a GS-7 to GS-9 grade on July 31, 1966.

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

Name	Position	Dates Employed
Von Phillips	Laborer	May 23 - August 26
Marsh Pitzman	IAS-5	July 13 - August 29
Michael Johnson	Laborer	June 8 - September 16
Ray Williams	Laborer	September 14 - December 16
David J. Lamm	Cat Operator	September 19 - October 26
Jim Clymer	Laborer	May 23 - August 12
Glenn Erickson	Laborer	May 31 - August 12
Bill Krohn	Laborer	May 23 - September 6

Assistant Refuge Manager Richey attended the 5-week Basic Refuge Manager Course held in Minneapolis, Minnesota April 17 to May 20, 1966. *Hi Bob. Nice meeting you at A. den Hills! ORS*

Assistant Refuge Manager Wade received the following incentive awards:  
A \$25 award for suggesting information on the type and speed of film

to be placed on the back cover of a camera. Another \$25 award for suggesting the telephone number of the local fire department be placed on the telephones where it can be readily seen.

The manuscript AERIAL CENSUS OF MOOSE BY QUADRAT SAMPLING UNITS by Charles D. Evans, Willard A. Troyer and Calvin J. Lensick was published in the October, 1966 issue of the Journal of Wildlife Management. A reprint is enclosed.

Another manuscript REPRODUCTION IN THE FEMALE BROWN BEAR by Richard J. Hensel and Willard A. Troyer has been submitted for approval.

The new service quarters rental rates became effective on March 27, 1966. The rates for the different quarters were increased over 100 percent as shown below:

QUARTERS	OLD RATE	NEW RATE
Q-1	\$45.50	\$103.50
Q-2	\$29.00	57.50
Q-3	\$49.00	108.00

yes, we can  
try to make it so  
our own employees  
keep their moral  
ton

Political!!

TYPE

In addition an additional \$16.30 a year is charged if a deep freeze is used. Although the rate change was supposed to be effective for all government quarters; to date in the local area our Bureau is the only organization that raised rental rates.

Same at DWU

A Wilderness Study Report was completed for the Tuxedoi National Wildlife Refuge. This island refuge consisting of 6,400 acres, is located in Cook Inlet and was established to preserve its many colonial bird rookeries.

Mr. and Mrs. Robert Belous of Chatsworth, California, representing the Wilderness Society were on the Moose Range in late July and early August gathering material for several articles on wilderness area potentials within the Kenai National Moose Range.

Intensive aircraft activity during the hunting season resulted in a number of accidents. In March a 172 Cessna broke a landing gear while attempting to take off from Coyote Lake. Two planes ran into each other over Chickaloon Flats. One reached Anchorage safely with minor damages while the other cracked up and two individuals were killed. They were reportedly hunting coyotes from the air; an illegal act on the Moose Range. In July a float plane flipped over

while attempting to take off from Goose Lake. No one was injured and the plane was removed by helicopter. Another plane fell through the ice in the Shansou River area in the November moose season and sustained minor damages. Another plane was attempting to take off a lake with a heavy load of moose meat in November and flew into the trees, severely damaging the plane. During the August sheep season a Cessna nosed over on the Upper Fanny River Airstrip. On November 1 another J-3 flipped over on the Lower Fanny River Strip. All planes have been removed from the Range.

B. Photographs

A selection of photographs depicting Moose Range activities are included in the appendix. *Some very professional work!*

Submitted by:

*Will Troyer*  
Willard A. Troyer  
Refuge Manager

Approved

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

February 10, 1967

WAT:cs

MONTHS OF January TO April, 19 64

[illegible]

3 ( )  
Cont. NR-1  
(Rev. March 1953)

WATERFOWL  
(Continuation Sheet)

EFUGE      **Kenai National Moose Refuge**

MONTHS OF **January** TO **April**, 19 **66**

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production Broods: Estimated seen : total	
	11	12	13	14	15	16	17	18			
Ducks:	100	0					100		700		
Whistling	10	25	10	50	150	175	175		5,195		
Trumpeter											
Geese:	6					600	1,200		12,600		
Canada						75	300		2,825		
Cackling							200		1,400		
Brant											
White-fronted							300		3,300		
Snow											
Blue											
Other											
Geese:	150	150	150	180	200	400	800		22,610		
Mallard											
Black											
Hadwall							100		700		
Baldpate						1,000	300		20,800		
Pintail						100	500		4,830		
Green-winged teal											
Blue-winged teal											
Cinnamon teal							25		175		
Foveler											
God											
Redhead											
Long-necked											
Canvasback	100	100	100	200	200	300	500		14,000		
Taup	500	500	500	500	700	800	1,000		60,800		
Goldeneye											
Rufflehead											
Wuddy Merganser	100	100	100	100	100	100	500		14,700		
Other											
:											
				(over)							

	(5)	(6)	(7)
	Total Days Use	Peak Number	Total Production
ns	<u>6,195</u>	<u>875</u>	<u>-</u>
use	<u>21,173</u>	<u>2,200</u>	<u>-</u>
cks	<u>103,815</u>	<u>6,425</u>	<u>-</u>
ots	<u>-</u>	<u>-</u>	<u>-</u>

SUMMARY

Principal feeding areas Chickadee Bay, Fossil River,  
Lake, Moose River

Principal nesting areas Chickadee Bay, Lake and river.

Reported by Willard A. Troyer

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

- ) 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.
- ) Weeks of Reporting Period: Estimated average refuge populations.
- ) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.
- ) 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.
- ) Total Days Use: A summary of data recorded under (3).
- ) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.
- ) Total Production: A summary of data recorded under (4).

[illegible]





	(5) Total Days Use	(6) Peak Number	(7) Total Production
ans	27,890	700	136
ese			
cks			
ots			

# SUMMARY

Principal feeding areas Chickasaw Flats

Principal nesting areas Variety of lakes & marshes

Reported by Willard A. Traver

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

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.

Weeks of Reporting Period: Estimated average refuge populations.

Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.

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.

Total Days Use: A summary of data recorded under (3).

Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.

Total Production: A summary of data recorded under (4).

## W A T E R F O W L

**EFUGE** ~~Board National House Range~~

MONTHS OF September TO December, 1966

[illegible]

WATERFOWL  
(Continuation Sheet)

FUGE Great National Goose Range

MONTHS OF September TO December, 19 66

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production Broods: Estimated seen : total	
	11	12	13	14	15	16	17	18			
ans:											
Whistling	5	5							7,700		
Trumpeter	20	15	6	6	6	6	6	6	11,032		
ese:											
Canada, lesser									75,900		
Cackling											
Brant											
White-fronted											
Snow									15,400		
Blue											
Other											
cks:											
fallard	200	200	200	200	200	200	200		126,700		
Black											
adwall									65,200		
Baldpate									77,600		
Pintail									140,000		
Green-winged teal									32,200		
Blue-winged teal											
Cinnamon teal											
Shoveler									12,000		
ood											
edhead											
ing-necked											
anvasback											
caup	900	800	700	600	500	400	300		129,300		
oldeneye	900	800	800	800	800	800	800		120,400		
ufflehead	100	50	50	50	50	50	50		15,700		
uddy									14,000		
ther, Merganser	800	700	500	500	300	300	300		102,900		
t:											
				(over)							

	(5) Total Days Use	(6) Peak Number	(7) Total Production	SUMMARY
rans	10,732	501		Principal feeding areas
ese				
icks	815,100			Principal nesting areas
ots				
				Reported by

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).

NR-1A  
1945)

MIGRATORY BIRDS  
(other than waterfowl)

Refuge ~~Great National Waterfowl Refuge~~ Months of ~~January~~ to ~~April~~ 19~~5~~<sup>6</sup>

(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
<u>Water and Marsh Birds:</u>										
Sandhill Crane	3	4/20	200	4/30	Still Present					400
<u>Shorebirds, Gulls and Terns:</u>										
Lesser Scaup	1	4/20	20	4/30	Still Present					150
Rings-necked Plover	Were Present		400	4/30	"	"				1,000
Herring Gull	20	4/1	200	4/30	"	"				500
Lesser Gull	2	4/20	100	4/30	"	"				200
Booby's Gull	10	4/25	30	4/30	"	"				80

(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	150	1/15	still present	200
Duck hawk	Resident	300	1/15	" "	500
Horned owl	Resident	1,500	4/30	" "	2,000
Magpie	Resident	2,000	4/30	" "	4,000
Raven					
Crow					
Bald Eagle	Resident	150	4/30	" "	300
Osprey	Resident	300	1/15	" "	300
Black Owl	Resident	50	1/15	" "	100
Barren's Hawk	1 4/30	10	4/30	" "	20
Marsh Hawk	1 4/30	20	4/30	" "	40
Great Gray Owl	Resident	10	1/15	" "	15
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. 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.

MIGRATORY BIRDS  
(other than waterfowl)Refuge Kennel National Moose RangeMonths of May to August

1986

(1) Species	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production		(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Number	Total #	Estimated
<u>Water and Marsh Birds:</u>									
Black-bellied Grebe	Here	Present	600	6/15	Still present		20	20	800
Common Loon	1	5/3	1500	7/20	"	"			1800
Arctic Loon	2	5/3	200	7/20	"	"			300
Red-throated Loon	2	5/5	50	7/20	"	"			100
Horned Grebe	2	5/10	1200	7/20	"	"			1500
Red-necked Grebe	1	5/10	100	7/20	"	"			400
Double-crested Cormorant	2	5/3	10	5/10	1	6/1			30
<u>Shorebirds, Gulls and Terns:</u>									
Common Snipe	Here	present	300	8/30	Still	present			800
Glaucous-winged Gull	"	"	500	8/5	"	"			6000
Herring Gull	"	"	6000	8/5	"	"			8000
Mew Gull	"	"	3000	7/15	"	"			6000
Bonaparte's Gull	"	"	700	8/5	"	"			1000
Semipalmated Plover	1	5/11	800	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	800	6/15	1	6/20			300
Meadowlark	4	5/15	90	5/25	1	8/20			80
Spotted Sandpiper	5	6/1	1000	7/10	1	8/20			1500
Solitary Sandpiper	1	6/10	200	7/10	1	8/20			300
Arctic Tern	1	5/1	1500	7/10	Still	present			1500

(over)

MIGRATORY BIRDS  
(other than waterfowl)

Refuge ~~Lucas National Wildlife Refuge~~ Months of ~~September~~ to ~~December~~ 196 ~~66~~

(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
<u>Water and Marsh Birds:</u>										
Common Loon	None	present	900	9/1	3	9/30				1,000
Arctic Loon	"	"	10	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
Red-billed Crane	"	"	150	9/1	4	10/10				1,500
 <u>Shorebirds, Gulls and Terns:</u>										
Common Snipe	None	Present	1,500	9/1	15	10/11				6,000
Glaucous-winged Gull	"	"	1,000	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
Snowbirds'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					
Horned owl	Resident	250	9/20	Still present	250
Magpie	"	1,000	9/1	" "	1,000
Raven	"	1,500	9/1	" "	2,000
Crow Bald Eagle	"	150	9/20	" "	250
Osprey	"	250	9/1	" "	300
Hawk Owl	"	100	9/20	" "	150
Short-eared Owl	"	100	9/1	" "	100
Boreal Owl	"	300	9/1	" "	300
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. 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.

## 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.

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

WATERFOWL UTILIZATION OF REFUGE HABITAT

Refuge Kenai National Moose Range For 12-month period ending August 31, 19 66

Reported by Willard A. Troyer Title Refuge Manager

(1) Area or Unit Designation	(2) Habitat			(3)	(4)	(5)
	Type	Acreage		Use-days	Breeding Population	Production
Kenai National Moose Range	Crops		Ducks	1,553,780	1,200	5,000
	Upland	1,650,000	Geese	221,265	20	50
	Marsh	9,000	Swans	27,890	72	136
	Water	145,472	Coots			
	Total	1,804,480	Total	1,702,935	1,292	5,186
-----						
	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			
-----						
	Crops		Ducks			
	Upland		Geese			
	Marsh		Swans			
	Water		Coots			
	Total		Total			
-----						

(over)

Refuge ~~Denali National Preserve~~ Months of January to April, 19 65

(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	300			1:1	200			1,000	Rough estimate
Lemings	Alpine tundra and brush lowlands 1,700,000	377			1:1	300			4,500	Rough estimate

## 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.

Refuge Kenai National Moose Ranged Months of May to August, 1946

(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.
ruce Grouse	Spruce forest 900,000 acres	90			1:1	200			10,000	
umigan	Alpine Meadow, hardwood forest 300,000 acres	375			1:1				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.

Form W-17  
(April 1946)

UPLAND GAME BIRDS

Refuge Kosci National Moose Range

Months of September to December, 19 66

(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	99			1:1	600			9,500	Rough estimate
Ptarmigan	Alpine meadows and lowland brush	265			1:1	300			6,400	Rough Estimate



## 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.

3-1, 1955  
Form NR-3  
(June 1945)

Refuge Kennai National Moose Range Calendar Year 1966

(1) Species	(2) Density	(3) Young Produced	(4) Removals				(5) Losses			(6) Introductions		(7) Estimated Total Refuge Population		(8) Sex Ratio
			Hunting	For Re- stocking	Sold	For Research	Predation	Disease	Winter Loss	Number	Source	At period of Greatest use	As of Dec. 31	
Common Name	Cover types, total Acreage of Habitat	Number												♂ ♀
Moose	Lowland, timber, alpine brush 1,400,000 acres	2,000	1,000				30		100			8,600	7,500	1:4
Black Bear	Same as above	100	30						5			600	565	1:1
Brown Bear	Same as above	20	6									35	29	1:1
Bull Sheep	Alpine tundra 200,000 acres	190	30	18			10		12			1046		
Mountain Goat	Alpine 200,000 acres	25	6						5			119	113	1:1
Caribou	Lowland Marsh & Alpine 1,000,000	5	0						0	29	Helchian	30	30	1:3

Remarks:

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.

Refuge Kari National Moose Range Year 19 66

## Botulism

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

## Lead Poisoning or other Disease

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

ne 1960)

NONAGRICULTURAL COLLECTIONS, RECEIPTS, AND PLANTINGS

Refuge Kenai National Moose Range

Year 19 66

(1)

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 Loss
White Clover	150#	R	6/17	Purchase	120.00	0							
"	50#	R	5/13	Purchase	40.00	0							
Kentucky Bluegrass	50#	R	6/17	Purchase	37.50	0							
"	50#	R	5/13	Purchase	35.00	0							
Red Oats	1 Sack	R	6/17	Purchase	7.15	0							
"	4 Sacks	R	5/13	Purchase	28.60	0							
Red Clover	36#	R	6/17	Purchase	23.40	0							
"	50#	R	5/13	Purchase	32.50	0							
Red Clover Fertilizer	1100#	R	6/17	Purchase	77.08	0							
"	150	R	5/13	Purchase	102.50	0							
Red Clover Fertilizer	50#	R	5/13	Purchase	45.00	0							
Red Clover	50#	R	5/13	Purchase	22.50	0							
Red Clover Seeds					20.00	0							

TOTAL: \$596.23

Remarks: Soil and Moisture Project near Jean Lake

Fertilizer also used: 3 T - 8-32-16 \$450.00

33 Sacks 8-32-16 198.00

5 Sacks 8-32-16 30.60

10 Sacks 8-32-16 60.20

Total acreage planted:

Marsh and aquatic

Hedgerows, cover patches

Food strips, food patches

Forest plantings

Fish and Wildlife Service      Branch of Wildlife Refuges

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

**Figure 1**      **Figure 2**

No. of Permittees:	Agricultural Operations	Haying Operations	Grazing Operations
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
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29	29	29	29
30	30	30	30
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34	34	34	34
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36	36	36	36
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89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

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.

Form NR-11  
(2/46)

TIMBER REMOVAL

Refuge Kenai National Moose Range Year 1966

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
Swanson, E. J.	16-66	Swanson River Road	800	50,000 BF	2.50	125.00	Refuge Regulations	Spruce
Hilling, Louis	17-66	Swanson River Road	20	10,000 BF	2.50	25.00	" "	Spruce
McC, Bill	20-66	Pussy River	20	10 C	1.00	10.00	" "	Spruce
Johnson, John A.	1-67	Swanson River Road	20	200 X trees*	.05	10.00	" "	Spruce
Irwin, Harry	4-67	Mystery Creek	20	400 X trees*	.05	20.00	" "	Spruce
Wain, Dick	5-67	Chidvaloon Bay	100	50 pilings	.50	25.00	" "	Spruce
Irwin, Don A.	7-67	Mystery Creek	20	100 X trees*	.05	5.00	" "	Spruce
Christmas Trees								
Twenty-six Free Use Permits for		276 cords of dead and down fuelwood 973 bd. ft. house logs						

Total acreage cut over 400 Total income \$230.00

No. of units removed B. F. 176,000 Method of slash disposal log and scatter

Cords 286

Ties 700 Christmas trees



## 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.

8-1370  
NR-29  
(4/54)

# REFUGE GRAIN REPORT

Calendar Year 1965

Refuge Neenah National Moose Range

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.



KN 4B-35 - The proposed Andrew Simons Natural Area provides high quality opportunities for hiking and camping in remote mountain areas. The hiker is on Surprise Mountain looking at Skilak Glacier.

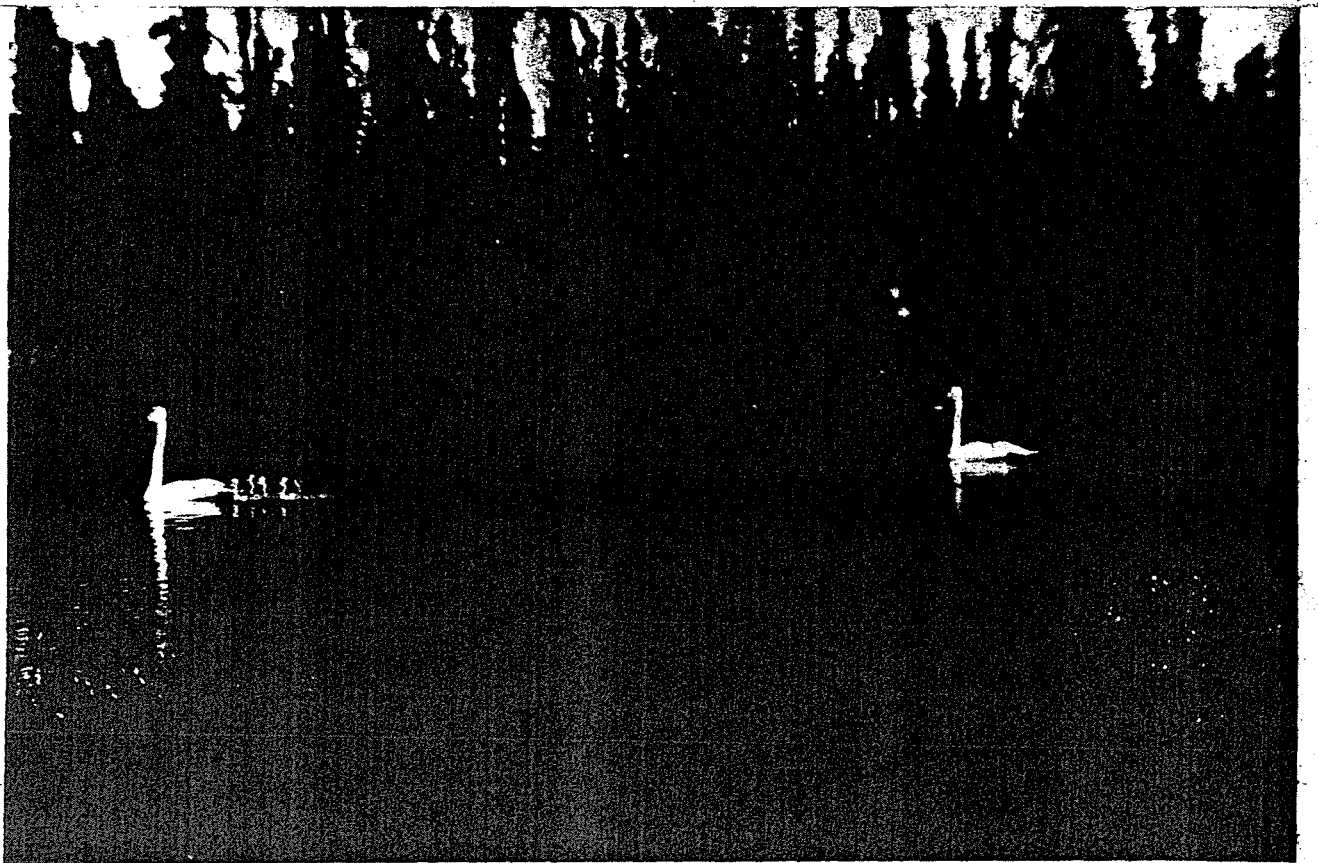
KN 58 - The many lakes and marshes provide nesting habitat for a wide variety of birds. The red-necked grebe is a common nester.

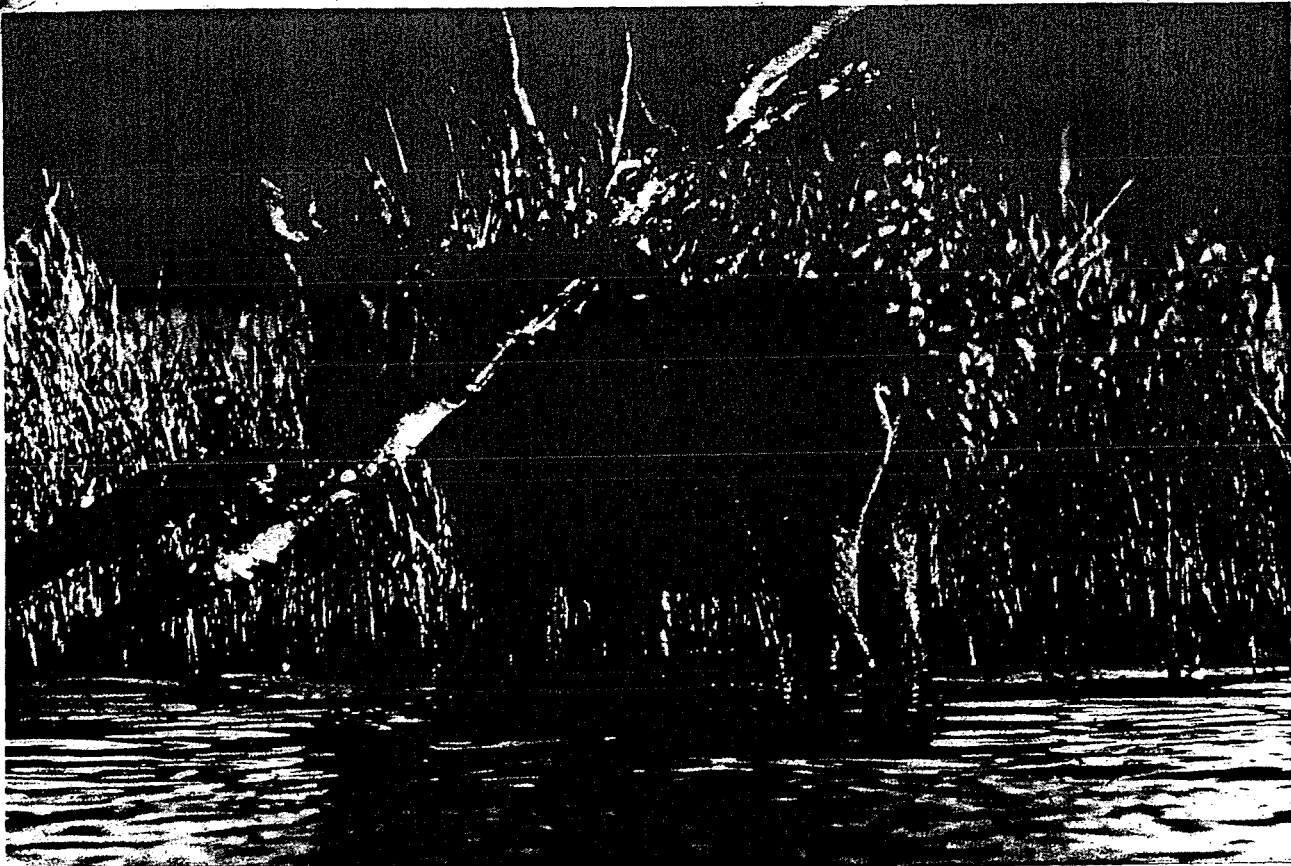
KN 58-17 - The arctic tern nests throughout the lowland area.



KN 5D-2 - The osprey is a rare nester, but an attraction to many visitors. This nest can be seen from the Swanson River Road.

KN 5A-35 - Thirty-six pairs of trumpeter swans nested on the Kenai and produced 137 cygnets.



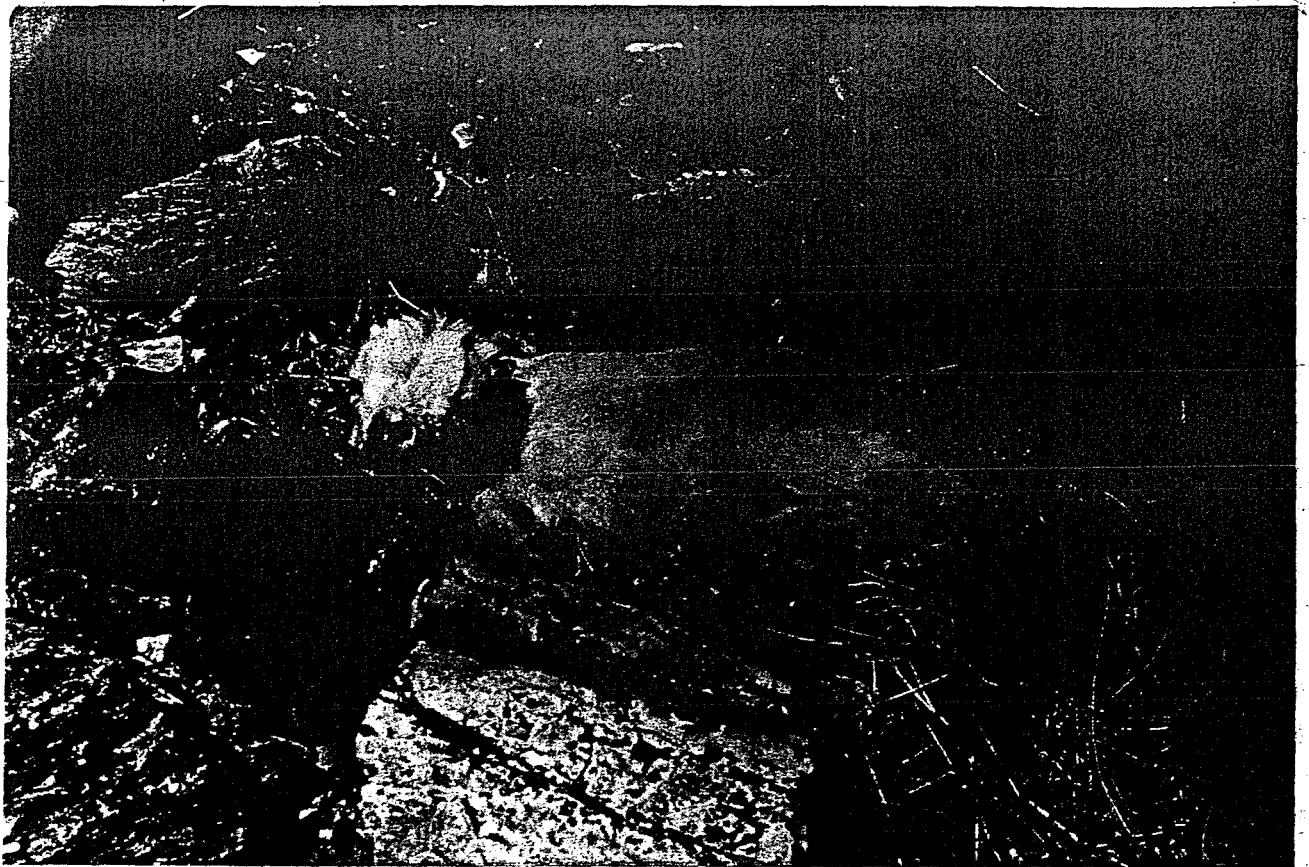


KN 6A-16 - The lowland marshes are important spring and summer ranges for moose. This yearling bull is just starting his new growth of antlers.

KN 6D-8 - A total of 1046 Dall sheep were counted on the Range this year and 19 percent were lambs. This is the highest count ever recorded.







KN 3A-3 - A young lamb rests on a steep rocky slope. The lamb is less than three days old yet can climb rocky slopes and run with speed.

KN 6D-19 - This group of ewes and lambs are using typical spring range. During the winter they often feed on these windswept slopes.

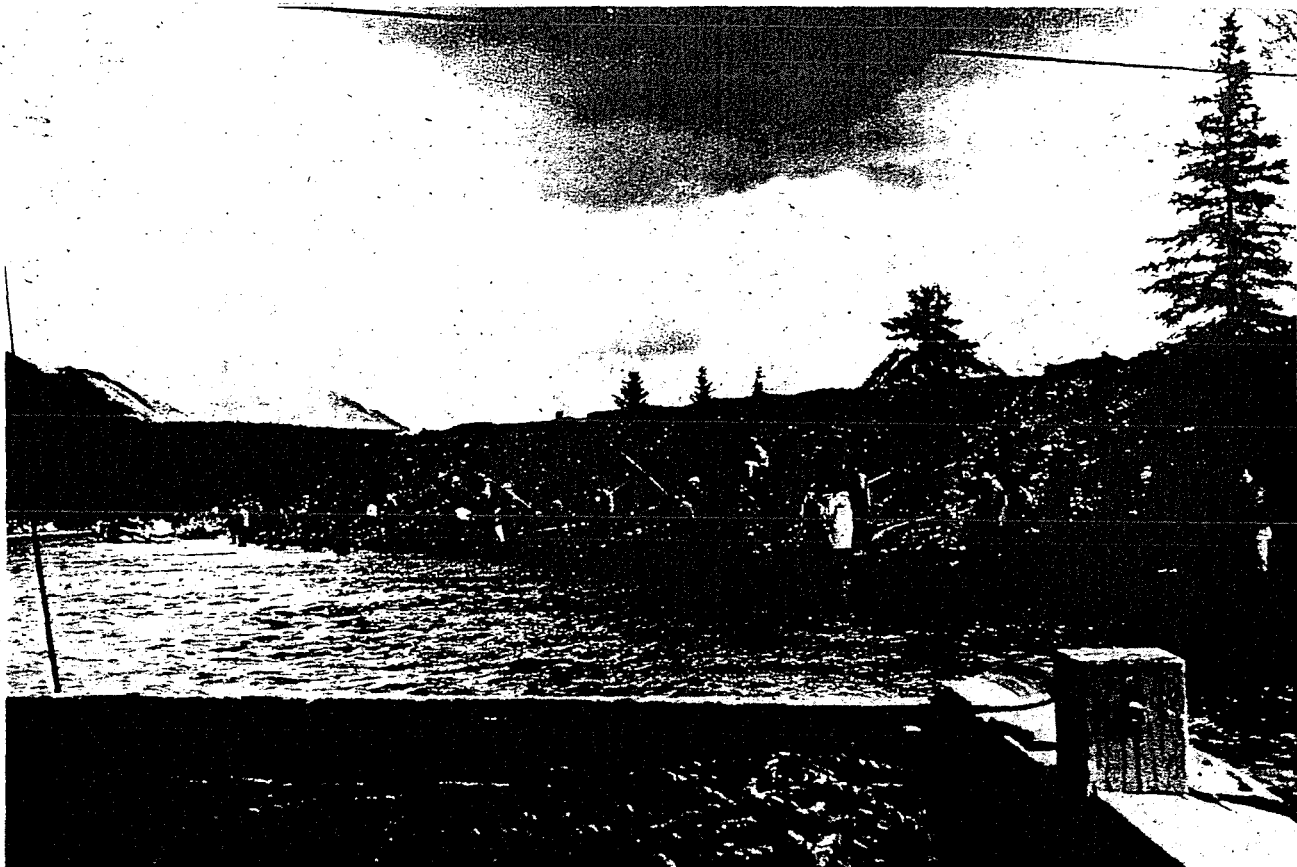


KN 4B-52 - The Swanson River Canoe ~~Area~~ added to the rapidly expanding canoe system. Over 1,000 canoes used this area last year.

KN 4B-31 - Fishing is one of the major outdoor recreational pursuits. The many lakes and streams provide good trout and salmon fishing for young and old alike.







KN 4B-56 - Large runs of salmon cause heavy concentrations of fishermen. This mass of anglers are fishing for red salmon on the Russian River.

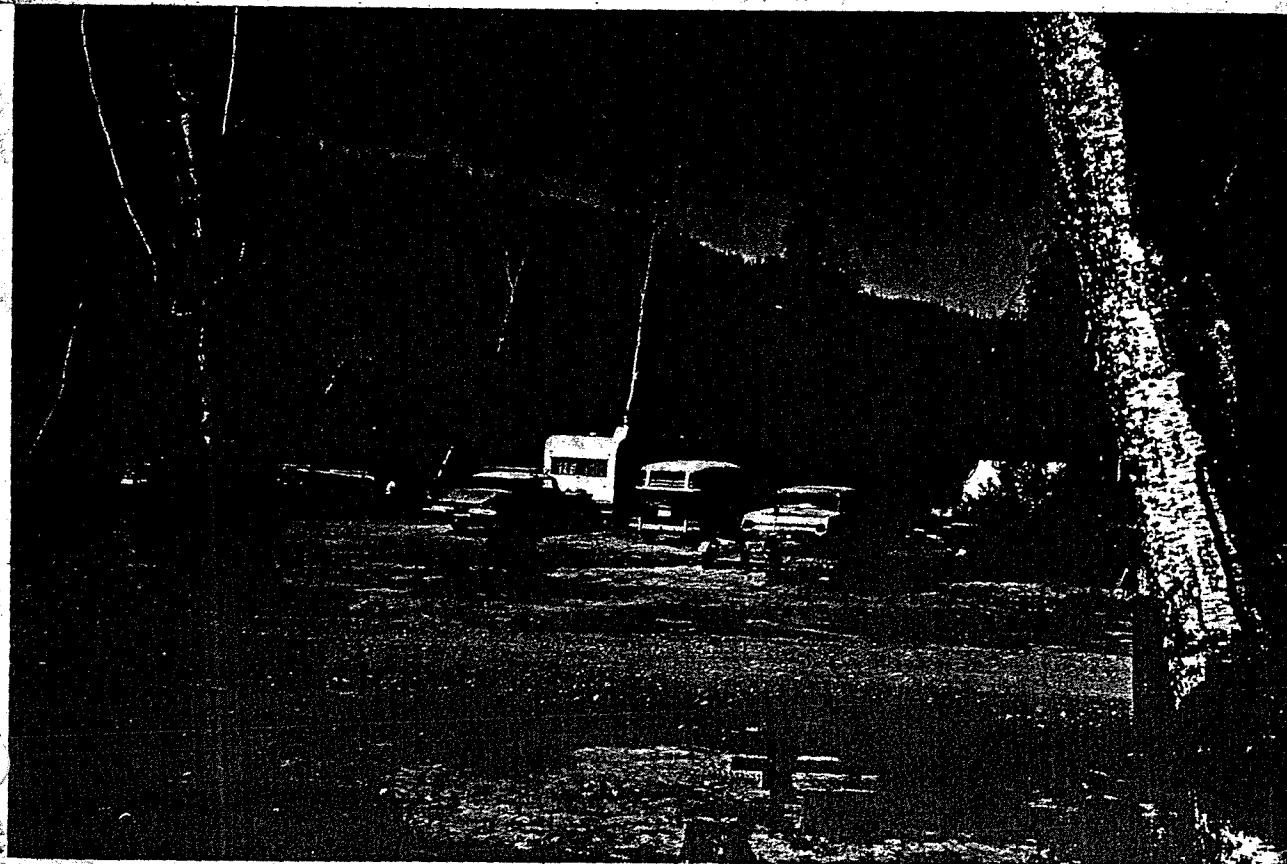
KN 4A-32 - An aerial view of Hidden Lake Campground on a busy weekend. Use at several campgrounds jumped almost 100 percent over the past year.





KN 4C-17 - Hunting big game is another major recreational use. Approximately 1,000 moose were taken last year.

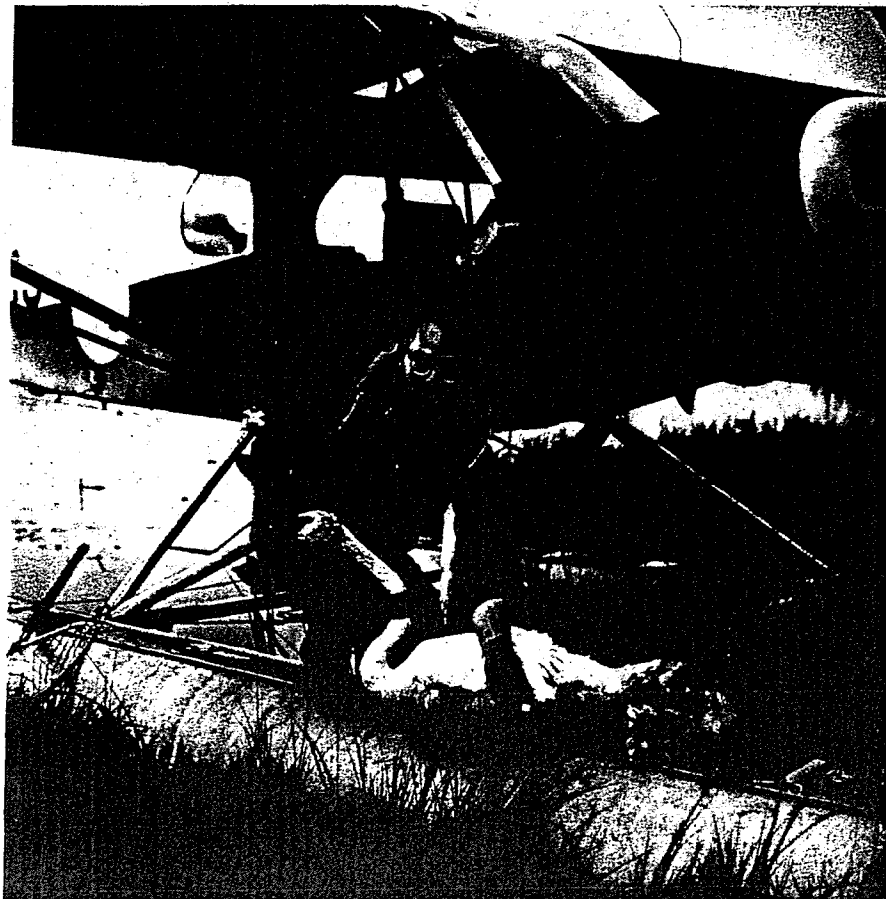
KN 4A-16 - Campgrounds near lakes provide camping facilities for many visitors. Visitor use days jumped from 267,000 in 1965 to 438,000 in 1966.





KN 3F-14 - Dall sheep composition counts are made each June to determine lamb reproduction and numbers of legal rams in the population.

KN 3A-2 - Several trumpeter swans were banded and marked to gain more knowledge of migration and nesting habits.

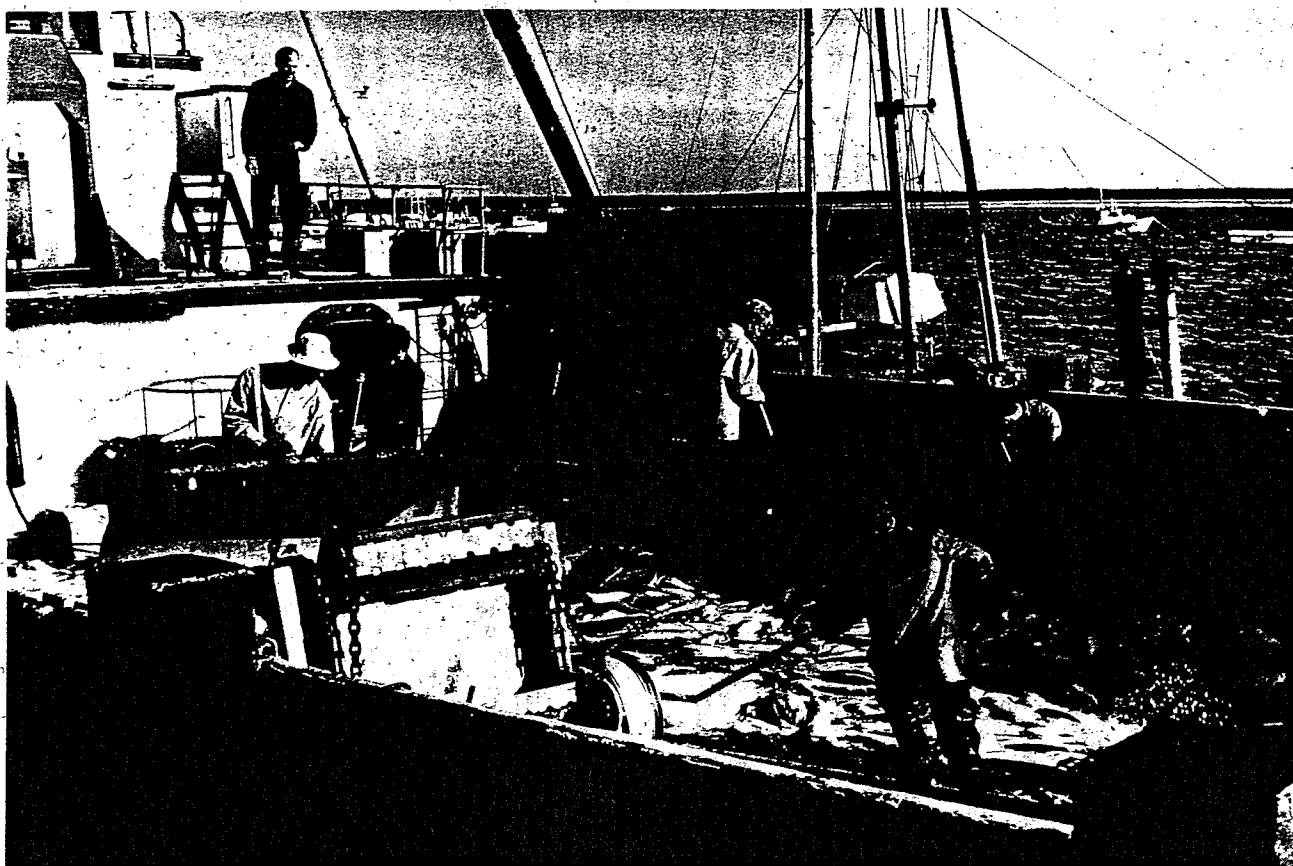




KN 12B-10 - The airplane is an indispensable piece of equipment on the Moose Range. Landing on remote mountain peaks saves much time.

KN 4F-35 - Graveling of the Skilak Campground camping units was contracted to a local construction firm.





KN 2F-6 - Commercial fishing in Cook Inlet is a multi-million dollar industry. Streams on the Moose Range provide spawning habitat for the salmon.



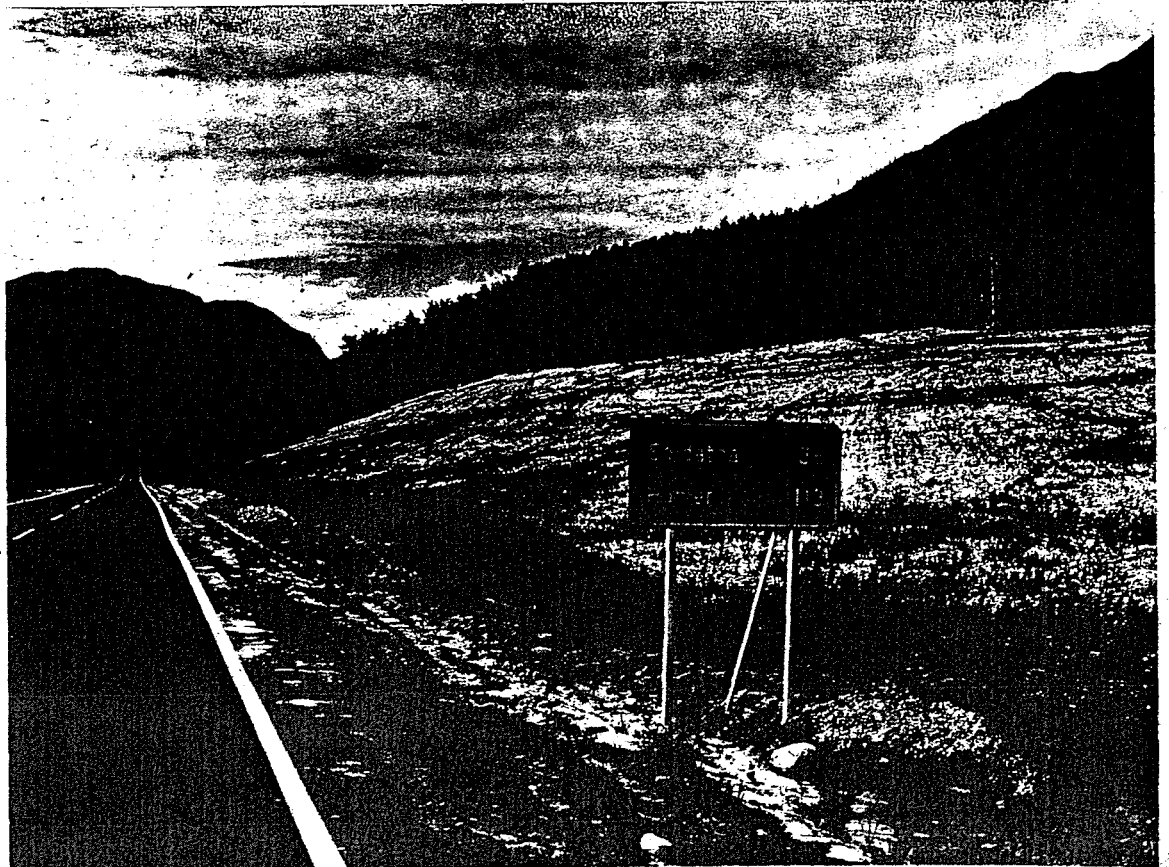


KN 2A-60 - Erosion causes silting of waters and is destructive to fish.



KN 1E-66 - Soil and Moisture funds were used to stabilize this eroded highway cutbank.

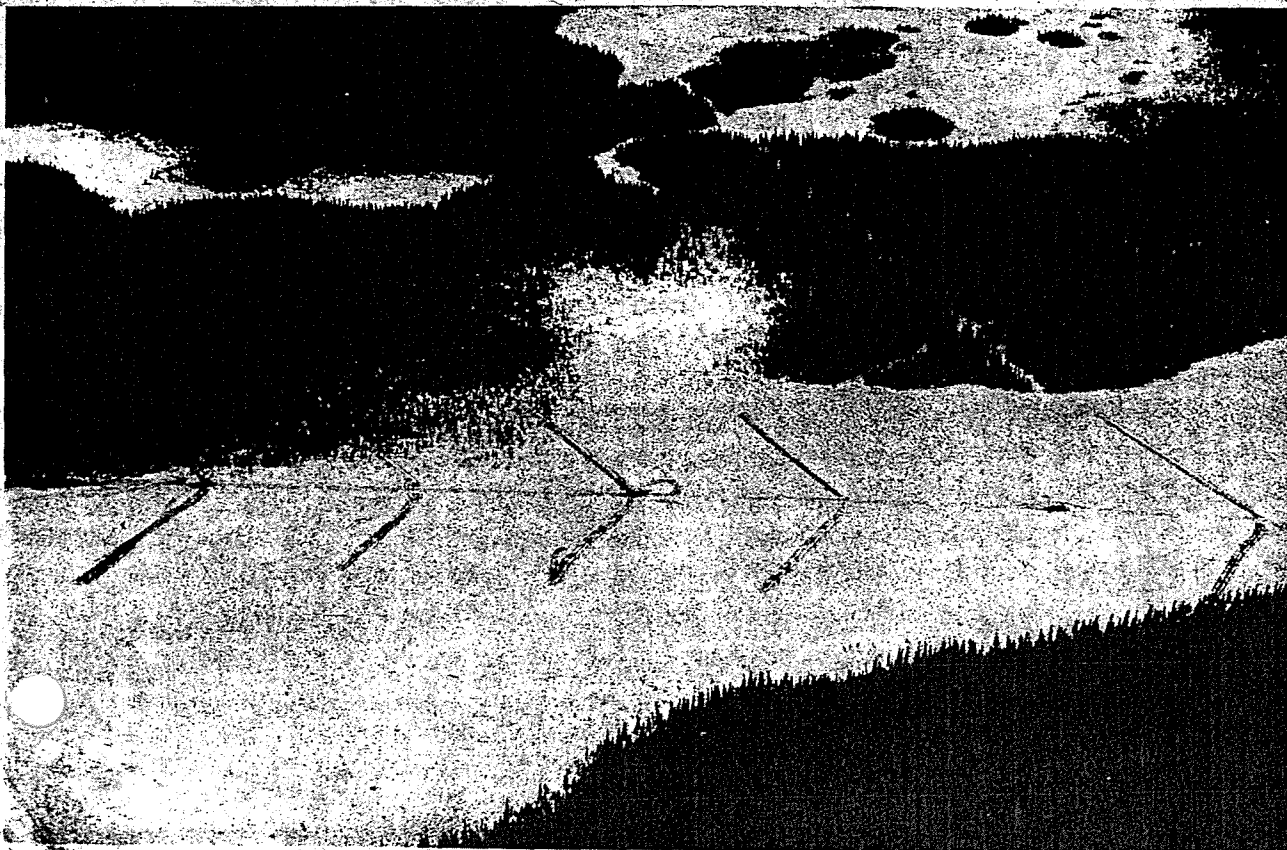
KN 1E-86 - Sloping and seeding not only stabilizes the soil but beautifies the area.





KN 2A-56 - Oil exploration is a continuing process on the Kenai. Over 1700 miles of trails such as these now crisscross the Range.

KN 2A-53 - A new type of seismic operation using wings as shown in the photo is three times as destructive as formerly.







KN 2A-60 - Seismic lines can cause serious erosion problems such as this in the Caribou Hills. This was a summer operation and was completed prior to the areas inclusion into the Moose Range.