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KENAI NATIONAL MOOSE RANGE

NARRATIVE REPORT

1969

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REFUGE NARRATIVE REPORT

1969

KENAI NATIONAL MOOSE RANGE

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TUXEDNI NATIONAL WILDLIFE REFUGE*

John B. Hakala	Refuge Manager
Robert A. Richey	Assistant Refuge Manager (Enforcement)
Robert K. Seemel	Assistant Refuge Manager (Timber & Range)
John E. Kurtz	Assistant Refuge Manager (Recreation)
Cherie E. Stroud	Administrative Clerk
John Kodysz	Maintenanceman To July 26, 1969
Ralph M. Mumm	Maintenanceman From October 5, 1969

U.S. DEPARTMENT of the INTERIOR
Bureau of Sport Fisheries and Wildlife
U.S. Fish and Wildlife Service
Kenai, Alaska 99611

* no report

TABLE OF CONTENTS

Page No.

I. GENERAL

A. <u>Weather Conditions</u>	1
B. <u>Habitat Conditions</u>	2
1. Water	2
2. Food and Cover	2

II. WILDLIFE

A. <u>Migratory Birds</u>	3
1. Waterfowl	3
2. Trumpeter Swans	3
Spring Breeding Population	3
Nesting	4
Nesting Period and Incubation	7
Clutch Size	7
Hatching Success	7
Survival and Mortality	7
Banding and Marking	9
Wintering Population	9
West Side Cook Inlet Surveys	9
3. Other Migratory Birds	9
B. <u>Upland Game Birds</u>	9
1. Spruce Grouse	9
2. Ptarmigan	10
C. <u>Big Game</u>	
MOOSE	10
1. Productivity	10
June Calving Inventories	10
Productivity from November Composition Count	11
2. Population Inventory	11
3. Population Composition	11
Spring	11
Fall	15
4. Movements	16
5. Tagging Program	16
6. Hunting Kill	16
Other	18
DALL SHEEP	
1. Population Surveys	18
Aerial Counts	18
Ground Counts	20
2. Hunting Kill	22
Trophy Value	22

MOUNTAIN GOAT	22
BEAR	24
1. Brown Bear	24
2. Black Bear	24
CARIBOU	24
D. <u>Fur Animals, Predators, Rodents and Other Mammals</u>	
1. Coyote	25
2. Beaver	25
3. Mink, Otter, Weasel, Lynx	25
4. Snowshoe Hare	25
5. Wolves	25
6. Wolverine	26
E. <u>Hawks, Eagles, Owls, Ravens and Magpies</u>	
1. Hawks	26
2. Eagles	26
3. Owls	26
4. Ravens	26
5. Magpies	26
F. <u>Other Birds</u>	26
G. <u>Fish</u>	26
H. <u>Reptiles</u>	27
I. <u>Disease</u>	27

III. REFUGE DEVELOPMENT

A. <u>Physical Development</u>	28
B. <u>Plantings</u>	
1. Aquatics and Marsh Plants	29
2. Trees and Shrubs	29
3. Upland Herbaceous Plants	29
4. Cultivated Crops	29
C. <u>Collections and Receipts</u>	
1. Seed or Other Propagules	29
2. Specimens	29
D. <u>Control of Vegetation</u>	
Browse Rehabilitation	30
E. <u>Planned Burning</u>	30
F. <u>Fires</u>	30

IV. RESOURCE MANAGEMENT

A. <u>Grazing</u>	33
B. <u>Haying</u>	33
C. <u>Fur Harvest</u>	33
D. <u>Timber Removal</u>	34
E. <u>Commercial Fishing</u>	34
F. <u>Other Uses</u>	34
G. <u>Oil Operation</u>	
Production	35
Exploration	36
Drilling	36
Seismographic	37

V. FIELD INVESTIGATIONS

A. <u>Progress Report on Studies</u>	
1. Moose Research Center	38
2. Moose Populations Study	38
3. Slikok Area Browse Plots	38
4. Dall Sheep Studies	38

IV. PUBLIC RELATIONS

A. <u>Recreational Use</u>	40
B. <u>Refuge Visitors</u>	44
C. <u>Refuge Participation</u>	47
D. <u>Hunting</u>	51
E. <u>Violations</u>	52
F. <u>Safety</u>	53

VII. OTHER ITEMS

A. <u>Items of Interest</u>	55
B. <u>Credits</u>	55
C. <u>Photographs</u>	55

TABLES

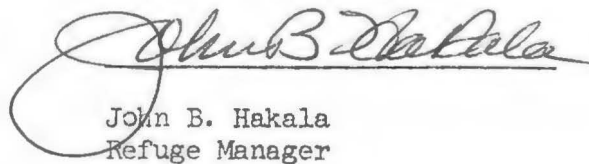
	<u>Page No.</u>
Table 1. Trumpeter Swan Nest Location, Production and Survival, Kenai Peninsula 1969	5
Table 2. Trumpeter Swan Pairs Nesting on the Kenai Peninsula 1957-1969	6
Table 3. Clutch Size of 25 Trumpeter Swan Nests on the Kenai Peninsula - 1969	8
Table 4. Moose Calf Productivity in the Moose-Chickaloon River Drainage As Determined From Aerial Surveys During the Last Two Weeks in June 1960-1969	12
Table 5. Composition of Moose Population - Kenai National Moose Range, November 1969	13
Table 6. Composition of the Moose Population in the Moose and Chickaloon River Drainages May-June 1969	14
Table 7. Distribution of Updated 1968 (1967) Moose Harvest - Game Management Unit 15	19
Table 8. Composition of Dall Sheep 1969 Ground Counts - Kenai National Moose Range	21
Table 9. Reported Sheep Harvest - Kenai National Moose Range	23
Table 10. Winter Browse Utilization 1968-69	39
Table 11. Recreational Visits	43

FIGURES

	<u>Page No.</u>
Figure 1. Fire Map, 1969	32
Figure 2. Recreational Visitors - Kenai National Moose Range, 1956-1969	41
Figure 3. Average Number of Visitors Per Day Kenai National Moose Range 1968-1969	42

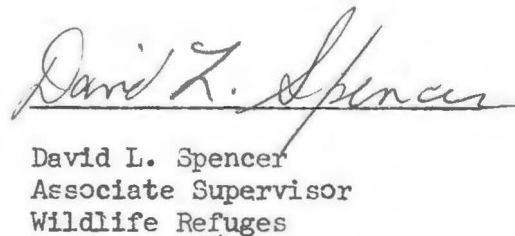
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Submitted By:


John B. Hakala
Refuge Manager

Date

Approved By:


David L. Spencer
Associate Supervisor
Wildlife Refuges

Date

3/24/70

Original signed by
VERNON EKEDAHL

3/36/70

JBH:cs

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US FISH & WILDLIFE SERVICE--ALASKA



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Form NR-1
(Rev. March 1953)

WATERFOWL

REFUGE . KENAI NATIONAL MOOSE RANGE

MONTHS OF JANUARY TO APRIL, 19⁷⁰

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Cont. NR-1

(Rev. March 1953)

WATERFOWL
(Continuation Sheet)

REFUGE KENAI NATIONAL MOOSE RANGEMONTHS OF JANUARY TO APRIL, 1969

(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			
Swans:											
Whistling											
Trumpeter			10	25	30	50	150		1,855		
Geese:											
Canada					50	100	200		2,450		
Cackling											
Brant											
White-fronted						20	50		490		
Snow							2000		14,000		
Blue											
Other					50	120	2250		16,940		
TOTALS											
Ducks:											
Mallard	50	50	50	60	100	100	500		7,420		
Black											
Gadwall							100		700		
Baldpate							500		3,500		
Pintail			20	20	50	50	250		2,730		
Green-winged teal						100	500		4,200		
Blue-winged teal											
Cinnamon teal											
Shoveler											
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup	50	50	50	50	50	50	100		3,850		
Goldeneye	50	50	50	50	50	50	100		3,850		
Bufflehead	20	20	20	20	20	20	20		1,400		
Ruddy											
Other, Merganser	40	40	40	40	40	60	80		3,220		
TOTALS	210	210	230	240	310	430	2150		30,870		
Coot:											
				(over)							

	(5)	(6)	(7)	SUMMARY
	Total Days Use	Peak Number	Total Production	
Swans	1,855	150	-0-	Principal feeding areas Chickaloon Bay and Kenai
Geese	16,940	2,250	-0-	River flats
Ducks	30,870	2,150	-0-	Principal nesting areas Chickaloon Bay flats, lakes
Coots	-0-	-0-	-0-	and rivers.
				Reported by John B. Hakala, Refuge Manager

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).

(Rev. March 1953)

WATER FOWL

MONTHS OF MAY TO AUGUST , 19 69

[illegible]

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Cont. NR-1
(Rev. March 1953)WATERFOWL
(Continuation Sheet)REFUGE KENAI NATIONAL MOOSE RANGEMONTHS OF MAY TO AUGUST, 19 69

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production : Broods: Estimated : seen : total	
	7/12 11	7/19 12	7/26 13	8/2 14	8/9 15	8/16 16	8/23 17	8/30 18			
Swans:									4900		
Whistling											
Trumpeter	195	190	190	185	185	180	180	180	19,985	27	95
Geese:											
Canada	50	50	50	50	50	50	100	100	32,900		
Cackling									6300		
Brant									700		
White-fronted									1575		
Snow									35,700		
Blue											
Other TOTALS	50	50	50	50	50	50	100	100	77,175		
Ducks:											
Mallard	300	300	300	300	300	300	300	1500	47,600		
Black											
Gadwall	10	10	10	10	10	10	50	100	3080		
Baldpate	80	80	80	80	80	80	100	200	13,580		
Pintail	800	800	800	800	800	800	800	1500	98,000		
Green-winged teal	800	800	800	800	800	800	1500	3000	119,700		
Blue-winged teal											
Cinnamon teal											
Shoveler	75	75	75	75	75	75	100	150	8750		
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup	150	150	150	150	150	150	150	200	19,250		
Goldeneye	700	700	700	700	700	700	700	1000	75,600		
Bufflehead									1050		
Ruddy											
Other, Merganser	1000	1000	1000	1000	1000	1000	1000	2000	98,000		
Common Goldeneye									2800		
Coot: TOTALS	3915	3915	3915	3915	3915	3915	4700	9659	487,410		
				(over)							

	(5)	(6)	(7)	SUMMARY
	Total Days Use :	Peak Number :	Total Production	
Swans	19,985	210	95	Principal feeding areas A variety of lakes and
Geese	77,175	5500	Unknown	marshes, Chickaloon Flats
Ducks	487,410	9650	Unknown	Principal nesting areas Lakes and marshes
Coots	-0-	-----	-----	
				Reported by John B. Hakala

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.
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- (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).

KENAI NATIONAL MOOSE RANGE

Narrative Report

January - December 1969

I. GENERAL

A. Weather Conditions

The weather on the Kenai for the year can only be termed "disastrous". (See separate report under Part III, F. Fires). Total precipitation was less than 12 inches for the second year, and the refuge area remains dry. The following table summarizes the data recorded at the Kenai FAA Station.

	<u>TEMPERATURES</u>			<u>PRECIPITATION*</u>			
	EXTREMES		Av. Mean	10-Yr. Av. Mean	This Month	10-Yr. Av. Mean	Snow- fall
	Max.	Min.					
January	27	-31	-3.2	19.8	.55	1.23	5.3
February	40	-32	13.1	24.3	1.23	1.08	15.0
March	46	-14	25.5	22.8	.31	.97	2.9
April	56	18	40.5	31.0	.07	.68	T
May	82	29	54.5	42.9	.71	.66	0
June	93	35	47.2	49.5	.63	1.47	0
July	72	35	56.7	53.3	1.65	2.45	0
August	70	31	53.1	53.2	.70	2.63	0
September	67	29	47.2	46.5	.70	3.60	0
October	61	9	39.7	35.0	1.48	2.80	0
November	44	-16	21.0	22.4	1.17	1.45	7.9
December	45	-7	29.8	9.5	<u>2.33</u>	1.01	<u>13.3</u>
TOTALS					<u>11.53</u>		<u>44.4</u>

* In inches

The above statistics show a trend on the Kenai of a "drought" condition. The total rainfall and snowfall for the past five years is listed below for comparative purposes:

<u>YEAR</u>	<u>SNOWFALL</u>	<u>TOTAL PRECIPITATION</u>
1969	44.4	11.53
1968	52.4	11.02
1967	59.6	23.8
1966	72.4	18.94
1965	60.8	23.66
1964	84.0	22.05

B. Habitat Conditions

1. Water. Water levels in the lakes in the lowland have dropped considerably due to the lack of precipitation. Many of the smaller, shallow lakes plotted on U.S. Geological Survey maps have completely dried up or have been reduced in size to the extent that they are difficult to recognize by observers in aircraft. The water shortage is very apparent to numerous local home owners who's wells have gone dry. Nearly all temporary potholes remained dry during the spring breakup.

Spring breakup came early with many of the lakes ice-free by May 1. Freeze-up was later this fall with many of the lakes still ice-free in late November.

2. Food and Cover. The abundance and condition of food has probably decreased as a result of the dryness. The availability of browse has remained good due to the shallow snow cover (4-6 inches in the lowlands at the end of the year). The berry crop was below normal and spotty due to dryness.

II. WILDLIFE

A. Migratory Birds

1. Waterfowl. A minimal spring waterfowl migration was the rule again this year most likely the result of a mild winter and rapid opening of water areas to the north. Small groups of ducks were first observed March 24 in the open water at Skilak outlet. The first calls of geese were heard April 3, and were later observed resting on the Kenai Flats April 12. On April 22, more than 1500 snow geese briefly utilized this area before continuing northward.

For the second season spring waterfowl concentrations were below normal. The Chickaloon Flats received very limited use while the Kenai Flats, Moose and Kenai Rivers were the major waterfowl resting areas.

Numerous refuge lakes and streams provided habitat for white-winged scooters, common and Barrow's goldeneye, green-winged teal and merganser families.

Immediately following the opening of the hunting season, September 1, large groups of ducks visited the refuge as they were disturbed by hunter's across Cook Inlet. These birds departed almost as quickly as they arrived.

The usual waterfowl migration south from mid-September to mid-October was again considerably lower in numbers than that of previous years. On October 19, large groups of geese passed over Kenai southbound. One observer - the following day counted 2300 Canada's, snows, and white-front's flying near his location during a five-hour period. During the third week of October a gathering of 12,000 geese were observed on the Chickaloon Flats.

An unusually late fall this year did not bring lake ice until October 23, and the continued mild weather prolonged completion of solidly frozen lakes until late November.

Waterfowl hunting was considered light.

2. Trumpeter Swans

Spring Breeding Population. For the second year no known trumpeter swans remained on the Kenai this winter. Although some swans arrived during March they were first observed in numbers April 3.

Swans usually arrive earlier during spring than other species of waterfowl. The Mink Creek Lake pair, first nesters on the Kenai for the past several seasons were nesting May 6. A number of other swan pair were located at a former nest site

territory at this time.

The Moose River, Kasilof River terminus, and Skilak Lake outlets were again favorite gathering places for swans. Several swans and few ducks were seen April 3 on Moose River. In mid-April above the Sterling Highway bridge the ice remained heavy and broken partially due to the January 18 Kenai River flood and resultant ice jams. Only two swan were seen on the Moose River, however, several swan pair were observed on the Upper Moose River, Skilak Lake outlet as well as Nest Lake. On April 22, thirty-three swans were seen resting on the Kasilof Flats. By May 5, we observed eighty whistlers, ten trumpeters and a few juveniles on Moose River above the bridge.

Several aerial nesting surveys during mid-May and the first two weeks in June located the majority of nesting swan pairs, their nest site and size of clutch. At the completion of these surveys thirty (30) nesting pair has been located. The largest clutch observed contained eight eggs at Tony's Lake. Later surveys located one additional swan family on the Upper Killey River. This family has been equally elusive during the early surveys of past years.

Nesting. Thirty (30) active nest sites were located this summer although the Killey River site not found is most probably existent (Table 1). This is an increase of one site over last year's nest count and somewhat above average for the thirteen year counting period (Table 2).

Only fifteen (15) nesting sites utilized during 1968 were again active this season. New nest sites were constructed at Hunter's, Mackey's, Gagara, Mink Creek, Beaver, Tony's, Moose Point, Angler, Diamond, Moose Pasture and Moosehorn Lakes. Some nests were located at lakes used by nesting pairs during the 1968 season, other lakes were utilized for the first time in several seasons.

The Fox River pair returned to their old nest site near the river's west bank. A clutch of five eggs was observed during an early June survey, but on September 16, only one cygnet could be located with adults on the lake and a coyote sitting in the grass nearby.

Various intrusions near last season's nest sites displaced some nesting pairs. A new road at Tony's Lake, gas pipeline right-of-way at Moose Point, and fishermen at Nest Lake. Perhaps additional disturbances of some nature were the result of new nest sites at Beaver Lake, Angler Lake, Mackey's Lake, Gagara Lake and the nest east of Moose River and Moosehorn Lake.

TABLE 1.

TRUMPETER SWAN NEST LOCATION, PRODUCTION AND SURVIVAL

KENAI PENINSULA - 1969

Nest #	Location	Clutch Size	HATCHING SUCCESS		SURVIVAL	
			Date Checked	Cygnets	Date	Cygnets
1	Clam Gulch (2½ mi. SE)	7	Unknown	-	Unable to locate	-
2	Fox River	5	Unknown	-	9/16	1
3	Hunter's Lake	unknown	6/12	7	Unable to locate	-
4	Bay Lake (2 mi. W)	5	6/12	1	9/1	0
5	Pollard's Lake	7	6/9	6	9/23	3
6	Brood Lake	unknown	6/13	1	9/16	2
7	Upper Moose River	6	Unknown	-	Unable to locate	-
8	Nest Lake	1	Abandoned	-	-	-
9	Mackey's Lake	6	7/5	5	9/23	4
10	Gagara Lake	5	6/6	2	9/14	1
11	Cow Lake	5	7/5	5	9/23	4
12	Elephant Lake	6	Unknown	-	10/15	4
13	Mosquito Lake (1 mi. W.)	5	7/5	4	9/29	4
14	Mink Creek	4	7/5	4	9/29	3
15	Beaver Lake	6	Abandoned	-	-	-
16	Plover Lake (2 mi. E.)	5	Unknown	-	9/16	4
17	Tony's Lake	8	7/6	5	9/15	3
18	Moose Lake (1 mi. NW)	5	7/6	1	9/23	1
19	Two Island Lake (1 mi. N.)	5	7/6	4	9/23	3
20	Dipper Lake	5	7/6	5	9/15	2
21	Quill Lake	4	6/7	2	Unable to locate	-
22	Krein Lake	7	Unknown	-	9/15	1
23	Curlew Lake (1 mi. NE)	5	7/6	1	9/15	0
24	Moose Point (2½ mi. SE.)	6	7/5	5	9/15	1
25	Angler Lake	7	7/23	4	9/15	2
26	Diamond Lake	5	6/23	5	9/15	5
27	Moose Pasture Lake	unknown	7/6	3	9/23	3
28	Gray Cliff (1 mi. SE.)	5	7/6	4	9/16	1
29	Moosehorn Lake (2 mi. ENE)	5	Abandoned	-	-	-
30	Hook Lake (1 mi. W.)	Unknown	Unknown	-	9/23	5
31	Killey River	Unknown	8/17	3	9/16	2

TABLE 2

TRUMPETER SWAN PAIRS NESTING
ON THE KENAI PENINSULA 1957-1969

<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
1967	28
1968	30
1969	31

Nesting Period and Incubation. Additional refuge demands limited the aerial surveillance required for accurate and complete information about incubation periods.

As early as March 29, one swan pair returned to their nesting site at Pollard's Lake. Only a very small area of open water was existent on the lake at this time. By mid-April a swan pair was observed in open water at Nest Lake and another pair on the Upper Moose River drainage. The Mink Creek pair, our earliest known nesters, were apparently incubating May 6, one day earlier than last year.

The first cygnets of the season were observed June 6 at Gagara Lake. The following day two cygnets were seen with adults at the Quill Lake nest site.

On June 9 the Pollard's Lake pair hatched five cygnets. One additional cygnet hatched in the early morning hours the following day. This clutch hatched six days earlier than last year and thirteen days earlier than those cygnets of the 1967 season.

Clutch Size. The known clutch size of twenty-six trumpeter swan nests was recorded on the Kenai Peninsula this year. The largest clutch contained eight eggs. Although one nest recorded contained only one egg, it is believed that nest was abandoned before the clutch could be completed. The mean clutch size for the remaining twenty-five nests was 5.6 eggs per nest (Table 3).

Hatching Success. Nest sites at Beaver Lake, Nest Lake, and that site northeast of Moosehorn Lake was abandoned prior to hatching. A minimum of 161 trumpeter eggs were laid on the Kenai this season. Of the ninety-two (92) eggs recorded in seventeen (17) nests, sixty-three (63) cygnets produced a hatching success of sixty-seven (67) percent. This percentage is somewhat more than the sixty-one percent success of last season but considerably less than the seventy-nine percent of 1967.

Survival and Mortality. The annual fall trumpeter swan survey for the Kenai Peninsula was conducted September 15 and 16. A total of 137 birds were recorded in the forty-one (41) observations. These included twenty broods and forty-eight (48) cygnets compared to the past season's fall count of twenty-one (21) broods and sixty-five (65) cygnets.

From the thirty-one recorded nesting sites this season fifty-nine (59) survived and reached flight status. Additional aerial surveys were conducted September 23 and 29 as well as October 15. The single cygnets from nest sites at Bay Lake

TABLE 3.

CLUTCH SIZE OF 25 TRUMPETER
SWAN NESTS ON THE KENAI PENINSULA - 1969

<u>CLUTCH SIZE</u>	<u>FREQUENCY</u>
8	1
7	4
6	5
5	13
4	2
3	0
2	0
1	0

Range 4-8

Mean 5.56 eggs per nest

and Curlew Lake apparently did not survive. We were unable to relocate those swan families at Clam Gulch, Hunter's Lake, Upper Moose River, and Quill Lake, however, they may have survived.

No adult mortalities were recorded this season. (Please see Section VI, Public Relations, sub-section E. Violations.)

Banding and Marking. No banding or marking was conducted this season. Thirteen swans were banded on the refuge in 1967 with Monel #9 BSF&W bands. Four adults and five cygnets received red-plastic neck bands. Although banded birds were observed during the 1968 season no sightings were recorded this year. Again, the lack of sufficient aerial surveys may undoubtedly be responsible.

Wintering Population. A trumpeter swan (bird-of-the-year) was picked up on January 1, near the North Kenai Road. The swan was released January 3 at open water on the Kenai River just below Skilak Lake outlet. There were no additional wintering swans recorded on the refuge this season.

West Side Cook Inlet Surveys.

This sample area on the west side of Cook Inlet was not surveyed this season.

3. Other Migratory Birds

The first northbound sandhill crane were observed April 25 during a flight of fifty birds near the Moose Research Center. These birds were seen in numbers through the first week in June. Fifty-two crane were located May 15, resting one mile northeast of Moose Lake.

Sandhill's were again observed during the summer northeast of the Kenai Airport. Eleven birds remained in the general area during the 1968 season. On August 24, eight adults and young were seen in the area.

Several flights of crane were observed near Fox River on September 16. One southward bound flight included more than 600 birds.

B. Upland Game Birds

1. Spruce Grouse. Larry Ellison returned from his academic life at the University of California to continue his four-year studies on movements and behavior of the Alaskan spruce grouse.

These studies are conducted on a four-square mile area near Finger Lakes. Unfortunately, the Swanson River fire burned through all the study area, only a few-acre island of untouched trees and forest floor remain. Mr. Ellison is continuing as best he can with the few remaining birds in this area.

Spruce grouse broods of two to eight in number, average five per brood, were observed in July.

The fall hunting season was a considerable success for most hunters due to the spruce grouse population increase. Birds were available in numbers along the Skilak Lake, Mystery Creek, Swanson River, and Swan Lake Roads. Hunters generally preferred early morning hunts.

2. Ptarmigan. The ptarmigan populations especially in mountain regions has noticeably increased. Huge flocks were observed in the Caribou Hills. Veteran hunters said they had not encountered such sizable groups of birds for many seasons.

All three species of ptarmigan: willow, rock, and white-tailed can be observed in the Kenai Mountains.

Hunting pressure was considered moderate.

C. Big Game

MOOSE

1. Productivity. Two aerial surveys were conducted this year to obtain productivity and composition information of moose. The annual calving inventory was flown between mid May through June. A composition count of pre-selected areas was conducted during November.

June Calving Inventories. Calving inventories were flown in the Moose and Chickaloon River drainages between May 15 and June 26. These surveys were flown by Assistant Manager Richey using a PA-18 Supercub aircraft between the hours of 4:30 and 9:00 a.m. (Alaska Daylight Saving Time).

This season's calving inventories began before known drops to observe calving peaks during the period. Surveys were flown in groups of two or three days. The first calf observation of the season occurred on May 16 (May 17 - 1968 season) one mile west of Bear Lake. Peak calving periods during this survey occurred between late May and early June and again in the third week of June.

The calf-cow ratio during late June was 54:100, third highest ratio for the ten year recording period (Table 4). This was considerably above the 45:100 calf-cow ratio of last year and below the 63:100 ratio of 1967, the ten year high.

Calves represented 21.2 percent of the population surveyed. Yearlings included 27 percent of the total animals surveyed, somewhat below the 30 percent recorded last year. (The refuge experienced a second season of mild winter conditions eliminating some probable calf loss). For every one hundred cows with calf, fourteen had produced twins as compared with sixteen per hundred during 1968.

Productivity From November Composition Count. A composition count of selected censusing units was conducted during mid November. Six units were flown in Game Management Unit 15A (Table 5).

That region immediately north of Skilak Lake and those censusing areas which include the two canoe routes provided most moose numbers for this count. Of the 705 moose recorded in these areas, 57 bulls, 428 cows, 210 calves and 17 yearlings were tabulated. There were forty-eight (48) calves and thirteen (13) bulls for each one hundred cows at the time of this survey.

The calf-cow ratio reflects a reasonable loss of five calves per 100 cows during the summer months. The cow-bull ratio appears equally reasonable, registering a decrease of 17 bulls per 100 cows or slightly more than one-half of the bull population censused during the early summer survey in June. The early August-September hunting season had passed and the November season (November 1-20) had essentially come to a close. These particular lowland censusing areas annually receive the greatest hunting pressure on the refuge. The tabulations of this fall survey amply express the sportsman's successful efforts.

2. Population Inventory. Winter conditions on the Kenai Peninsula were recorded as the mildest in fifteen years. Extremely poor snow cover during the year, especially in lowland regions precluded the annual moose population censusing.
3. Population Composition

Spring. As discussed earlier under this section, a spring population composition was obtained during the calf survey conducted in June (Table 6). Nearly 1100 moose were tabulated in the Moose-Chickaloon River drainage during flights of June 24, 25, 26. Recorded were 139 bulls, 430 cows, 233 calves and 297 yearlings during 13.9 hours of count time. The percentage breakdown for these tabulations indicate 13 percent bulls, 39 percent cows, 21 percent calves and 27 percent yearlings. These results compare favorably with those tabulations of the

TABLE 4.

MOOSE CALF PRODUCTIVITY IN THE
MOOSE - CHICKALOON RIVER DRAINAGE
AS DETERMINED FROM AERIAL SURVEYS
DURING THE LAST TWO WEEKS IN JUNE 1960 - 69

Year	No. Calves/100 cows	Percent Calves
1960	58	18
1961	41	14
1962	28	16
1963	45	17
1964	44	18
1965	38	19
1966	29	14
1967	63	22
1968	45	18
1969	54	21
<hr/>		
Ten Year Average	45	17

TABLE 5.

COMPOSITION OF MOOSE POPULATION - KENAI NATIONAL MOOSE RANGE

NOVEMBER, 1969

Date	Unit	♀ w/o	♀ w/1	♀ w/2	Lone Calves	Total Calves	%Calves of total	Total ♀	Total ♂	Total Yrlg ♂	% Yrlng ♂ of Total	♂ w/3	Total Moose	R A T I O Calves: ♀:♂
11/18	9A	7	13	2	0	17	43.5	22	0	0	0	0	39	77:100:0
11/20	11	42	37	3	0	43	33.0	82	5	2	1.5	0	130	52:100:6
11/18	12A	43	21	1	0	23	23.9	65	8	1	1.0	0	96	35:100:12
11/20	12B	28	20	0	1	21	30.0	48	1	0	0	0	70	44:100:2
11/18	18A	50	36	3	0	42	29.1	89	13	3	2.0	0	144	47:100:15
11/19	18B	73	54	5	0	64	28.3	132	30	11	4.8	0	226	48:100:23
<hr/>														
Game Management Unit 15-A		243	181	14	1	210	187.8	438	57	17	9.3	0	705	48:100:13
11/19	5	97	18	2	0	22	10.6	117	67	10	4.8	0	206	19:100:57
11/18	7	74	48	3	0	54	25.3	125	33	16	7.5	1	213	43:100:26
11/18	10	102	65	3	0	71	26.1	170	28	12	4.4	2	271	42:100:16
11/12	15B	60	13	3	0	19	15.8	76	25	10	8.3	0	120	25:100:33
<hr/>														
Game Management Unit 15-B		333	144	11	0	166	20.4	488	153	48	5.9	3	810	34:100:31
11/19	I	120	17			17	07.2	137	81	10	4.2	0	235	12:100:59
North Caribou Hills portion of Game Management Unit 15-C														

Total Flight Time 26.7 hrs.Total Count Time 16.4 hrs.

TABLE 6.

COMPOSITION OF THE MOOSE POPULATION IN THE MOOSE
AND CHICKALOON RIVER DRAINAGES MAY-JUNE 1969

Date	Single Cows	♀ 1C	♀ 2C	Total Calves	% Calves of Total	Total Cows	Total Bulls	Total Yrlg.	% Yrlg. of Total	Total Moose	R A T I O Calves:Cows:Bulls
5/15	148	0	0	0	0	148	13	30	15.7	191	0 :100 : 9
5/16	122	1	0	1	0.5	123	14	57	29.2	195	0.8:100 :11
5/22	86	11	10	31	15.2	107	12	54	26.5	204	29:100 :11
5/23	96	12	3	18	8.9	111	19	55	27.1	203	16:100 :17
5/26	49	13	3	19	13.8	65	14	40	29.0	138	29:100 :21
5/28	96	30	4	38	15.4	130	15	64	25.9	247	29:100 :11
6/5	68	49	12	73	21.5	129	41	95	28.0	339*	57:100 :32
6/13	36	13	4	21	14.5	53	27	44	30.3	145	40:100 :51
Sub- Total	701	129	36	201	12.8	866	155	439	26.4	1662	23:100 :18
6/24	71	61	10	81	20.9	142	51	113	29.2	387	57:100 :36
6/25	66	46	7	60	19.0	119	45	91	28.9	315	50:100 :38
6/26	89	68	12	92	23.2	169	43	93	23.4	397	54:100 :25
Sub- Total	226	175	29	233	21.2	430	139	297	27.0	1099	54:100 :32
Grand Total	927	304	65	434	15.7	1296	294	736	26.7	2761	34:100 :23

*Includes one single calf.

Total Count Time: 41.9 hours

preceeding year. By comparison, the 1968 records of the same count area indicate an increase of 2 percent bulls, 3 percent calves, and a percentage decrease of 2 percent cows, and 3 percent for the yearling class.

Fall. A survey of selected areas was flown November 12, 18, 19 and 20 to determine the current moose composition of those sections. Outlined unit areas for past total population counts were surveyed in Game Management Unit 15A, four in Unit 15B and the Caribou Hills Moose Range area above treeline in Unit 15C.

These surveys were conducted by strip flying the selected unit area and recording composition of moose observed. A detailed search to record total moose of any area was not conducted.

Unit areas were selected on their probability of good moose numbers. A total of 705 moose were sighted in the six areas flown in Game Management Unit 15A. For every one hundred cows, forty-eight (48) calves and thirteen (13) bulls were recorded.

These ratios compare quite favorably with the known fifty-four (54) calves per one hundred cows during the June calf count this year and also with past surveys indicating the low bull ratio in this region.

Moose concentrations in four areas were surveyed in Game Management Unit 15B. A total of 810 moose were recorded, the majority observed in the lowlands. Apparently, benchland populations had earlier continued a slow migration into the lower regions.

As anticipated, the calf-cow ratio was somewhat lower than that of the more northerly unit areas. Recorded were thirty-four (34) calves per one hundred cows while the bull ratio increased to thirty one (31) per one hundred.

For Game Management Unit 15C only a portion of the above treeline area in the Caribou Hills was surveyed. Groups of eight, ten, and fifteen to twenty moose were observed. Classification was difficult because of the large concentrations within this five-square mile area.

During the fifty minute survey 235 moose were classified. Only seventeen (17) calves were recorded at this time, a ratio of twelve (12) calves per one hundred cows. The bull ratio was a high fifty-nine (59) bulls per one hundred cows.

Total count time for the November survey was 16.4 hours. Supercub aircraft piloted by Refuge Manager Hakala and Assistant Manager Richey were used for all flights. Observers included Assistant Managers Seemel and Kurtz and Brian Shafford of our refuge staff, as well as assistance from Robert LeResche of the Alaska Department of Fish and Game.

4. Movements. Mild winter conditions for the second year failed to produce the usual mass migration of moose from mountain foothills into the lowland areas.

Large groups of migrating moose were not observed as in past seasons. Numerous animals, however, were again sighted throughout the 1947 burn west of Skilak Lake. On November 12, 120 moose were recorded in this immediate area.

During November many moose, some in small groups, were observed paralleling the ridges between the Funny and Killey Rivers as they migrated toward Lower Funny River. Many of these animals later contributed to the hunting season then in progress. Nearly one hundred moose were seen November 15 in the Slikok Range Rehabilitation area.

On November 19, 235 moose were recorded at Caribou Hills during a survey of about six square miles of treeless area. Eighty-one members of this grouping were male, some possessing quite large racks. They, with the others, later moved into river drainages to the west and southwest to winter.

Information received by the Alaska Department of Fish and Game from Mr. Dick Woodrow of the U.S. Forest Service: A male moose was tagged on the Chickaloon Flats June 9, 1960. It was a twin. This animal was killed on September 10, 1969 at the junction of Resurrection and Hungry Creeks in Game Management Unit 7. Antlers of this nine-year-old animal measured 54 inches at greatest spread.

5. Tagging Program. The October 1968 moose tagging program in the Upper Mystery Creek drainage has proved surprisingly rewarding.

In an attempt to delineate one of several sub-populations on the Moose Range and record their movements, twenty-six (26) adult moose were tagged and collared.

Several observations of these tagged animals were reported during 1969, many of the sightings from passerby traveling the Sterling Highway. Most observations were recorded between the Kelly-Petersen Campground access road and Gwin's Roadhouse on the Highway. A few sightings were tabulated from Mystery Creek Road, the calving areas southeast of Moose Lake, and that region of undulating hills between the Sterling Highway and Hidden Lake.

6. Hunting Kill. Hunters in Game Management Unit 15 were again permitted, during the usual two season periods, one bull moose.

The early season included August 20 through September 30 except in Sub-unit 15A ending September 20. The second season was scheduled for the first 20 days in November for all sub-units.

A permitted antlerless season was also programmed for the three sub-units but was not opened until January and February of the following year.

Sub-Unit 15A was again closed to the use of aircraft as an aid in hunting during the beginning twenty-two days of the season. This additional ten days over the 1968 season was gratefully received by the many ground hunters utilizing the numerous rivers, lakes and trails available. Harassment by aircraft during a ground hunt has been a source of undesirable competition for many seasons.

Sub-Unit 15A was further restricted to hunting because of the disastrous Swanson River Fire and the numerous fire fighters, aircraft and additional equipment associated with suppression and mop-up. That portion of sub-unit 15A north of the Kenai River west of Swanson River Road and a line to Moose Point was closed to hunting the entire first season. This season, ending September 20 in sub-unit 15A as earlier discussed, did allow ten days use of aircraft (Sub-Units 15B and 15C were not restricted to aircraft). Numerous planes were utilized during this period and as usual were highly successful. One locally owned non-commercial aircraft assisted in the harvest of seventeen moose from the Owl Lake area. These bulls were unfortunately surrounded by lakes connected by easily accessible seismic trails. A single aircraft is frequently used by many hunting companions. The efficiency of these machines is without question. It was reported that one commercial aircraft operator at Cooper Landing, Unit 7, assisted in the harvest of thirty-nine bull moose all taken from Juneau Lake.

The late moose season opened November 1, and terminated November 20. All Unit 15 was open this period except the Swanson River Fire Area in Sub-Unit 15A. This section was re-opened to hunting November 9.

Hunter success increased along the Funny River Road as moose moved through this section on their journey from timberline. Nearly one hundred moose were available in the Slikok Rehabilitation Area but few hunters chose the two mile hike along an established road. A few individuals hunted by horseback in this area as they did during the first season.

A gradual migration of moose from Mystery Creek Basin to the lowlands failed to provide numbers of animals near Mystery Creek Road as in past seasons. The Caribou Hills had a limited number of animals near the Refuge boundary but were readily available in large concentrated groups three miles east.

Hunting regulations require each moose hunter to obtain a harvest ticket prior to hunting moose. The hunter is then required to return this form with information including the location, area, sex, date and method of transport used in obtaining his moose.

Unsuccessful hunters must also return these harvest forms.

Unfortunately, moose harvest for the 1969 season has not been tabulated at this time but hunter success was estimated about equal to that of last year. The 1968 harvest was considered the lowest recorded for many years. Revised tabulations indicate total harvest was 850 animals (Table 7).

A late fall, mild winter and lack of deep snow failed to drive mountain populations downward providing available moose for the hunter. The moose just were not available in plentiful numbers, although hunters were! Poor hunting success was also attributed to the lack of bulls in the lowland population.

Other. Road killed moose were less of a problem this year than that of last season, both to the moose and vehicles involved. Only four reported kills were tabulated for October and November, however, December brought the usual increase of road kills to 15 as compared with 21 during the 1968 season.

DALL SHEEP

1. Population Surveys

Aerial Counts. An aerial Dall sheep composition of the Surprise Mountain population was conducted January 22, 1969 by Lyman Nichols of the Alaska Department of Fish and Game. Clouds and weather limited a total count, however, 160 sheep were observed. As many as ten fly-overs were conducted to ascertain correct composition. Those observations included fifteen (15) young rams, no legal rams, 107 ewes and yearlings, and thirty-eight (38) lambs. This 160 total is considerably less than the 275 sheep counted the year before. Undoubtedly, weather was a contributing factor for the low count.

Sheep surveys for the remainder of the Refuge were flown August 1-3. Weather counting conditions were good, but the survey was curtailed before completion because of personnel demands for the then raging Swanson River Fire.

A total of ninety-nine (99) sheep were tabulated during this consecutive three day count. The survey area included that mountain-glacier region in the refuge between the Sterling Highway and the Killey River. Those refuge lands south of the Killey River were not surveyed this year and poor weather conditions prevented a re-count of the Surprise Mountain population.

TABLE 7.

DISTRIBUTION OF UPDATED 1968 (1967) MOOSE HARVEST

GAME MANAGEMENT UNIT 15

	<u>♂</u>	<u>♀</u>	<u>UNK</u>	<u>TLT.</u>
<u>Sub-Unit 15A</u>				
North of the Kenai River	253 (265)	1	5	259
<u>Sub-Unit 15B</u>				
Between the Kenai River and Kasilof River	101 (75)	6	2	109
<u>Sub-Unit 15C</u>				
Tustumena-Kasilof River South	386 (60)*	20	5	411
<u>Sub-Unit Unknown</u>	70	0	1	71
 TOTALS	 810	 27	 13	 850

* Harvest on Refuge only.

Composition of the ninety-nine sheep recorded included twenty-four (24) legal rams, twenty-six (26) sub-legal rams, forty-one (41) ewes and yearlings, and only eight (8) lambs.

The total count time for this survey was 9.3 hours.

Ground Counts. A sheep ground survey was conducted June 21 through June 30 by three two-man teams. One survey area included the Green Lake-South Fork Indian Creek in which 197 sheep were classified by observers Refuge Manager Seemel and seasonal employee Brian Shafford. During their survey, two University of Alaska students, Spencer Linderman and Robert J. Langlotz passed through the survey area June 24, and 25. Student Linderman visited the area in search of salt lick stations as subject material for his Master's thesis. Four licks were located on the South Fork and one on the North Fork of Indian Creek. During their search, the two students counted and partially classified 190 sheep in the survey area, a count paralleling that of Seemel and Shafford's.

A second survey area originated at Lake Emma and continued above treeline eastward along the North Fork Indian Creek to Indian Glacier. Only fifty-four (54) sheep were classified on this route by seasonal employees Bill Cheney and Bob Wood. A total of thirty sheep observations in these two survey areas were unclassified.

The mountainous region surrounding Twin Lakes was selected as the third survey choice. The two man team of John Kurtz and Tom Corr searched this area and located only eleven (11) sheep, and no legal rams. Aerial surveys five weeks later did attest a lack of sheep in the immediate area, however, numerous sheep were observed on the north facing slopes west of Benjamin Basin and the north slopes above Killey River.

The Surprise Mountain sheep population was ground surveyed between June 25 and 30 by Will Troyer. More than 250 sheep were sighted but because of their precipitous location along the Skilak Cliffs only 243 were classified by Mr. Troyer. His observations included 122 ewes, 67 lambs, 26 yearlings and 28 rams. Lambs represented 27.6 percent of the classified population. This percentage compares favorably with the total Surprise Mountain population.

Final tabulations from all ground sheep surveys this season totaled 524 animals. Only thirty (30) sheep remained unclassified. The lamb crop and yearling survival indicates a healthy herd continuing to increase in total numbers. The composition breakdown was 185 ewes, 124 lambs, 64 yearlings, and 121 rams. The ram total included 41 $\frac{1}{4}$ -curl, 66 $\frac{1}{2}$ -curl, 11 $\frac{3}{4}$ curl, 2 full-curl, and the one $1\frac{1}{4}$ curl sighted above Lake Emma.

TABLE 8.

COMPOSITION OF DALL SHEEP 1969 GROUND COUNTS

KENAI NATIONAL MOOSE RANGE

Area	Ewes	Lambs	Yearlings	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	Full	Total Rams	Total
Green Lake - South Fork of Indian Creek	44	40	32	26	47	7	1	81	197
Lake Emma - North Fork of Indian Creek	19	17	6	2	4	4	2*	12	54
Surprise Mountain	122	67	26	13	15			28	243
TOTAL	185	124	64	41	66	11	3	121	494

* $1\frac{1}{4}$ curl ram above Lake Emma

(See Table 8).

The lamb-ewe ratio was 67:100.

2. Hunting Kill. Sheep hunting season for this region began August 10 and ended September 20. Thirteen hunters were checked in at Green Lake for the opening day. Each hunter was permitted one ram with horns of 3/4 curl or larger and also required to obtain a sheep harvest tag prior to his hunting effort. The tag is completed with information about the hunt and returned to the Alaska Department of Fish and Game.

At least 20+ sheep were harvested this season (Table 9). Hunter success was highest at Green Lake and the South Fork. Two or three sheep were transported from Lake Emma and one from Twin Lakes. One ewe was illegally killed as a nanny between Green Lake and Tustumena Glacier. Hunter use at Twin Lakes was quite minimal this season. Additional sheep were harvested south of Tustumena Glacier and at least twelve hunters visited this area. All but two used Tustumena Lake as route of initial access. One known lamb was killed in this area during the early hunt and left to rot.

Hunting was discouraged this season when the Moose Range was closed to public access between August 16 and September 9 because of the extreme fire danger.

Trophy Value. Horn measurements were obtained from seven sheep this season and are on file. Average horn length was a poor 27.7 inches.

MOUNTAIN GOAT

The annual goat survey is conducted in conjunction with the aerial sheep count but was incidental to this count of August 1-3. The survey area this year extended from the Sterling Highway south to the Killey River and was not completed because of the demands of the Swanson River Fire.

Only ten goats were observed between the Killey River and Skilak Glacier. However, seventy (70) goats were sighted north of Skilak Glacier to the Sterling Highway. Forty-eight (48) of these animals were located on the southern edge of Goat Mountain above Skilak Glacier.

Goats were not reported on Surprise Mountain this year.

Hunting was considered light. Most goats were taken incidently by those hunting for Dall sheep. Known harvests were recorded at Green Lake and Twin Lakes. Hunters were permitted two goats, either sex, during the August 10 to December 31 season.

TABLE 9.

REPORTED SHEEP HARVEST
KEMAI NATIONAL MOOSE RANGE

<u>Year</u>	<u>Sheep Harvest</u>
1957	45
1958	27
1959	22
1960	18
1961	31
1962	31
1963	38
1964	26
1965	36
1966	48
1967	47
1968	52
1969	25+

BEAR

1. Brown Bear. Few observations of brown bear were recorded this year. The population on the Kenai Peninsula is relatively low although numerous sightings by the flying public occur.

Two Brown bear families were sighted during mid-May in the lowlands between Bear Lake and East Fork of the Moose River. One sow was accompanied by two yearlings, the other sow by one. On June 13, a "Brownie" was observed near Swan Lake Road and another lone bear was recorded October 16 two miles south of Lower Funny River Strip.

Most Soldotna residents were unaware of the Brown bear sow and two cubs that passed immediately south of their airport July 10.

2. Black Bear. The Black bear is very common to this area and numerous sightings were recorded during the year. Earliest recorded sighting occurred April 29 in Pen #1 at the Moose Research Center. One sow was observed July 5, east of Swan Lake accompanied by three cubs. Twenty bear were recorded throughout the refuge during the summer in addition to the concentration of Black bear tabulated during the August sheep-goat survey. A total of thirty-four (34) bear were observed in the mountains between Killey River and Sterling Highway. Twelve of these were located on Goat Mountain between the two and three thousand foot level in an abundance of berries. Two adults were sighted October 30 in the Mystery Creek headwaters region before winter snow had accumulated.

CARIBOU

Numerous sightings of the small caribou herd north of the Kenai Airport were again recorded. As many as seventeen animals, including four calves, were observed here during the year. Earliest sightings were recorded February 18 about three and one-half miles northeast of the airport. On this same date thirteen caribou (2♂, 7♀, 4 yearlings) were observed one-and-one half miles southwest of Bear Lake. This particular herd was not again sighted by the staff during 1969 although several flights were conducted in the area.

A local resident on March 7 reported one caribou at Mile 4.5 on the Kenai Spur Road. Other sightings included, two adults and one yearling one mile east of Swan Lake May 16, and on May 23 in this general area two large adult bulls moving westward plus one cow with new calf two miles southeast. During the early morning moose-calf surveys a female caribou was observed with calf one mile south of Moose Lake.

The Swanson River Fire and associated activities during August may have disturbed the caribou herd north of Kenai Airport. Nine animals including three calves were observed bedded down and surrounded by fire and smoke during the fire's advance northeast of the airfield. One September 5, eleven caribou were observed in this area and again on September 17 seventeen caribou were photographed, all appeared healthy. One caribou was reportedly seen October 25 near Funny River Road.

D. Fur Animals, Predators, Rodents and Other Mammals

1. Coyote. Coyotes are common throughout the Refuge. They are frequently sighted both summer and winter crossing road systems, frozen lakes and visiting all sections of the lowlands.
2. Beaver. Beaver populations are present throughout the Moose Range. Activity is frequently observed but a total inventory has not been conducted since 1967.
3. Mink, Otter, Weasel, Lynx. There are again no apparent population changes of mink, otter and weasel this season. Lynx numbers have however, increased markedly on their upward cycle.
4. Snowshoe Hare. The hare population has increased substantially this season. Numerous sightings have been recorded by the staff and local residents.
5. Wolves. Observations of wolves this year were nearly as numerous as all those recorded during the past decade. During the second week in December 1968, two wolves were observed crossing frozen lakes near Point Possession by North Air pilot Jay Hume. On February 16, thirteen miles northeast of Kenai along the Standard Oil - NEA right-of-way, a reported seven wolves were sighted by private pilot Bob Norene. There were five black and two light in this group. The following month at Lake Tustumena two sightings were made on March 14. Two wolves (blacks) were observed near Point Lake along the north Tustumena shoreline. Eight miles west of this initial sighting, an unknown number of wolves were observed feeding on a moose that had become trapped in the ice.

During a wilderness hike August 4 above the North Fork of Indian Creek at Marmot Pass, Will Troyer and Joe Mazzoni observed five wolves in the Pass. Troyer was able to obtain some distant pictures.

During an Alaska Department of Fish and Game wildlife survey, Royce Perkins with pilot Jay Carroll, sighted nine wolves (4 black, 5 grey) shortly before they entered the timber near Fox River. Perhaps this group is associated with the ten member group observed November 21, two miles east of Timberline Lake.

Additional sightings have undoubtedly been made and unreported to this office. Trapper Joe Megargel has frequently observed wolf tracks along the sixty-five mile shoreline of Tustumena Lake.

6. Wolverine. Several wolverine observations were recorded this year from the Moose Pen in the lowlands to the mountainous region at Surprise Mountain. Significant population changes of the estimated 150 animals on the refuge were not apparent.

E. Hawks, Eagles, Owls, Ravens and Magpies

1. Hawks. Several hawk species are common to this area but nest sites were not apparently located. A rough-legged hawk and one marsh hawk were observed March 29 near Coyote Lake.
2. Eagles. Active nesting sites were located at Moosehorn Lake, Trapper Joe Lake, and Camp Island Lake. Numerous sightings of eagle activity were observed along Kenai River, Skilak Lake and many additional lake and river systems.
3. Owls. No report.
4. Ravens. The common raven is indigenous to this region. One nest site was located at Camp Island Lake.
5. Magpies. No report.

F. Other Birds. Additional observations included Common Redpolls, Pine Grosbeaks, Snow Buntings, Myrtle Warbler, Downy Woodpecker, Lapland Longspur, Northern Shrike, Black-Backed Three-Toed woodpeckers, Parasitic Jaeger, Kingfisher, and several swallow species.

G. Fish. Salmon fishing continues to be the most popular sport fishing activity. Fishing pressure for red salmon at Russian River was reduced from over 17,000 man-days in 1968 to nearly 14,000 in 1969. The catch was reduced to only 6,535 salmon.

Both the catch and effort were substantially lower at Russian River. The peak of the early red salmon run, which normally contributes about 70% of the seasonal harvest passed upstream during the Russian River Fire. That part of the Moose Range was closed to public use during the fire. The sport fishery on the late run red salmon was closed by the Alaska Department of Fish and Game for thirteen (13) days to permit adequate escapement. The fire, plus the emergency closure were undoubtedly responsible for the reduced catch and effort.

During the Swanson River Fire, on August 12, a total of over 700 adult silver salmon and numerous juvenile silvers and rainbow trout were found dead in the lower 8-10 mile stretch of the Swanson River. Water samples were sent to the Federal Water Pollution Control Administration to determine the cause of the die-off.

Ocean-fresh salmon moved into the Swanson River within four days after the die-off. Apparently whatever killed the fish was no longer present at a toxic level. To allow for adequate escapement the Swanson River and tributaries were closed to fishing by the Alaska Department of Fish and Game for the remainder of the year.

Surveys were completed of three lakes in the northern part of the Moose Range by the Alaska Department of Fish and Game. Neckshortka Lake and Tangerra Lake had the largest population of rainbows. Phalarope Lake contains rainbows but the population appears very low. Iceberg Lake was also surveyed and was barren, but it may be able to support a self-sustaining grayling population.

Twin Lakes were stocked with 273 sub-adult grayling in 1965 and 1966. The population was sampled by gill net on June 28. Age I and Age II grayling were captured. Numbers indicate that the introduction is well on its way to develop a self-sustaining population.

Alaska Department of Fish and Game also sampled five lakes to determine survival and growth of transplanted red salmon. Sunken Island, Portage and Upper Jean all contained large populations of these land-locked salmon. Bottinentnin contains only a few, and Rock Lake (formerly the best red salmon producer) was barren this year.

Skilak Lake was used as a donor for a lake trout transplant by the Alaska Department of Fish and Game. The trout were released in Upper Summit on the Chugach National Forest.

- H. Reptiles. Contrary to last year's report, we do have frogs here. As far as we know, there are no other reptiles on the Moose Range.
- I. Disease. No report.

III. REFUGE DEVELOPMENT

- A. Physical Development. Even though construction funds were available, actual construction projects were minimized because of fire fighting and fire patrols.

Maintenance of facilities was also minimal because of lack of qualified personnel during most of the year, and the fire effort.

REAL PROPERTY

1. Quarters #2 removed, sold, and excavation filled and leveled.
2. Replaced frozen waterline to Quarters #3.
3. Repaired kitchen in Quarters #1 & bathroom in Quarters #3.

RECREATION

1. Tustumena Campground
 - a. Spread 6" pit-run gravel on entrance road, loop road and camping spurs.
 - b. Erected 10 firegrates with 10' diameter gravel pad.
 - c. Placed barrier posts along road and camp spurs.
 - d. Erected informational signs.
 - e. Rebuilt and leveled boat ramp.
2. Russian River Campground
 - a. Constructed concrete pad and drain for well.
 - b. Removed hazardous trees and grubbed stumps.
 - c. Hauled gravel for camping pads.
 - d. Erected informational signs.
 - e. Placed log barriers along river edge.
3. Replaced pump, Lower Skilak Campground.
4. Brushed road right-of-way on recreational roads.
5. Routed informational and directional signs.
6. Trail, canoe portage, campground and other recreational facility maintenance.
7. Cut and peeled 200 12' logs for barrier posts in recreational areas.
8. Relocated, cleared and brushed historic Moosehorn Trail between Skilak and Tustumena Lakes.

OTHER

1. Routed and erected three large refuge boundary signs.
2. Rebuilt and relocated Mystery Creek Road gate.
3. Posted isolated boundary areas, closed unauthorized airstrips, repaired isolated cabins, and removed miscellaneous debris from refuge with contract helicopter.

4. Seeded and fertilized dozed firebreak lines on Russian River Fire.
5. Inventory and marked refuge hand tools.
6. Repaired radio under contract.
7. Overhauled D-8 and started on D-4.
8. Performed routine maintenance on other refuge facilities.
9. Restoration and rehabilitation of major firebreaks, Swanson River Fire, was completed by BLM.
10. Restoration of well pad sites and other oil activity damage continued:
 - a. Seismic lines restored by seeding, fertilizing, tree planting and limited equipment grading.

Standard Oil	38 acres
Gulf Oil	10 acres
 - b. Continued restoration of Texaco's Point Possession, and Swanson Lake drilling pads and airstrip was completed during the last week in October. Final clean up, the seeding and fertilizing of nearly ten acres was approved November 7.

B. Plantings

1. Aquatics and Marsh Plants. None attempted.
2. Trees and Shrubs. None attempted by refuge (see section on oil operations).
3. Upland Herbaceous Plants. Approximately 200 acres of dozed firelines and heliports on the Russian River Fire were seeded to various mixtures of grass as the fire was brought under control.

On the Swanson River Fire, 115 miles of dozed line were rehabilitated by scattering the berm piles back on the line--about half of this or approximately 400 acres was seeded to annual ryegrass.

Revegetation accomplished by the oil companies is reported in that section.

4. Cultivated Crops. Nothing to report.

C. Collections and Receipts

1. Seed or Other Propagules. No seed collections were made. The grass seed used on the Russian River and Swanson River Fires was purchased by the USFS and the BLM.
2. Specimens. Nothing to report.

D. Control of Vegetation

Browse Rehabilitation. None accomplished during the past year.

E. Planned Burning. None attempted.

F. Fires. The lack of precipitation (less than 12 inches annually for the past two years) has created an extreme fire hazard.

The Moose Range was closed to open fires from May 28 to September 4. Because of the extreme dryness and the tremendous effort being used to fight the Swanson River Fire, the entire Moose Range was closed to entry from August 16 to September 4.

Ten recorded fires occurred on the Moose Range this past year compared with 19 last year and 12 total for the previous fire years.

Approximately 86,000 acres were burned this year compared to 22 acres last year.

Two of the fires are of major significance in terms of area burned and effort expended in control. They are the Russian River and Swanson River Fires.

The Russian River Fire started from a camp fire on U.S. Forest Service lands adjacent to the Moose Range on June 14, 1969. This was on the same day that a new maximum temperature of 93 degrees was recorded at Kenai. The fire was declared controlled on the morning of June 15. Shortly afternoon the winds picked up to 10-15 knots in spite of the forecasted calm. By 2:30 p.m. the winds increased to 30 knots, the fire ran, jumped the Russian River, and was burning on the Moose Range. At 6 p.m. it was about 1200 acres in size. The wind was gusting to 40 knots at midnight. The winds then calmed until late in the afternoon of the following day, June 16th. The winds then picked up from the east and the fire ran and crossed the Kenai River and the Skilak Loop Road.

With no more runs, this fire was finally brought under control at 6 p.m. on June 20th and declared out on July 25th. The total area of the fire was 2570 acres with 2300 acres on the Moose Range. A few underground fires were found and extinguished in August.

One thousand men were on the fire at one time. The cost of suppression was nearly one million dollars.

The Swanson River Fire began from an abandoned camp fire on the bank of Swanson River on August 3rd. It was about 150 acres in size on August 4th, and was surrounded by fire lines. Late in the afternoon of the 4th, the winds picked up from the south and carried the fire 5 miles NE along the west side of the Swanson River Oil Field. On August 6th, it ran SE about one

mile. On August 7th, it ran SW about 8 miles. On August 9th, it ran north 4 miles. On August 13, the east side of the fire ran south 13 miles and the west side ran south 11 miles. When the fire was brought under control on August 28, it was 17 miles long and 14 miles wide. The total area burned was approximately 87,000 acres with 83,000 acres of this on the Moose Range. Fire mop-up continued until October 8. Over 4,000 men were on the fire at one time. One-hundred-and-ten dozers constructed and later rehabilitated 115 miles of fire line on the Moose Range. The cost of suppression was in the vicinity of 20 million dollars.

Every time the winds reached 25 knots or more, these fires ran regardless of the natural or man-made barriers. Two staff members saw the Swanson River Fire cross the river and ignite a mile and a half ahead of the fire front in the time it takes a SuperCub to make a 360 degree turn. Spruce needles and birch leaves in the form of ash were carried 50 miles beyond the fire.

Figure 1 shows the location of the fires. The following is a listing of the fires:

Date	Cause	Acres	Name	Number
6/6	Cooking	Unk, small	Hidden (Island)	9197
6/7	Cooking	Unk, small	Kenai River	9201
6/14-7/25	Cooking	2570 (2300 on M.R.)	Russian River	9206
6/16	Cooking	10	Island (Hidden L.)	9207
7/3	Cooking	3	Scenic Lake	9267
8/3-10/8	Cooking	87,000 (83,000 on M.R.)	Swanson River	9311
9/8	Warming	Unk, small	Bottenintnin	9851
9/9	Warming	Unk, small	Upper Skilak	9852
9/11	Warming	Unk, small	Kenai River	9853
9/25	Warming	Unk, small	Fuller Lake Trail	_____

KENAI NATIONAL MOOSE RANGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

ALASKA

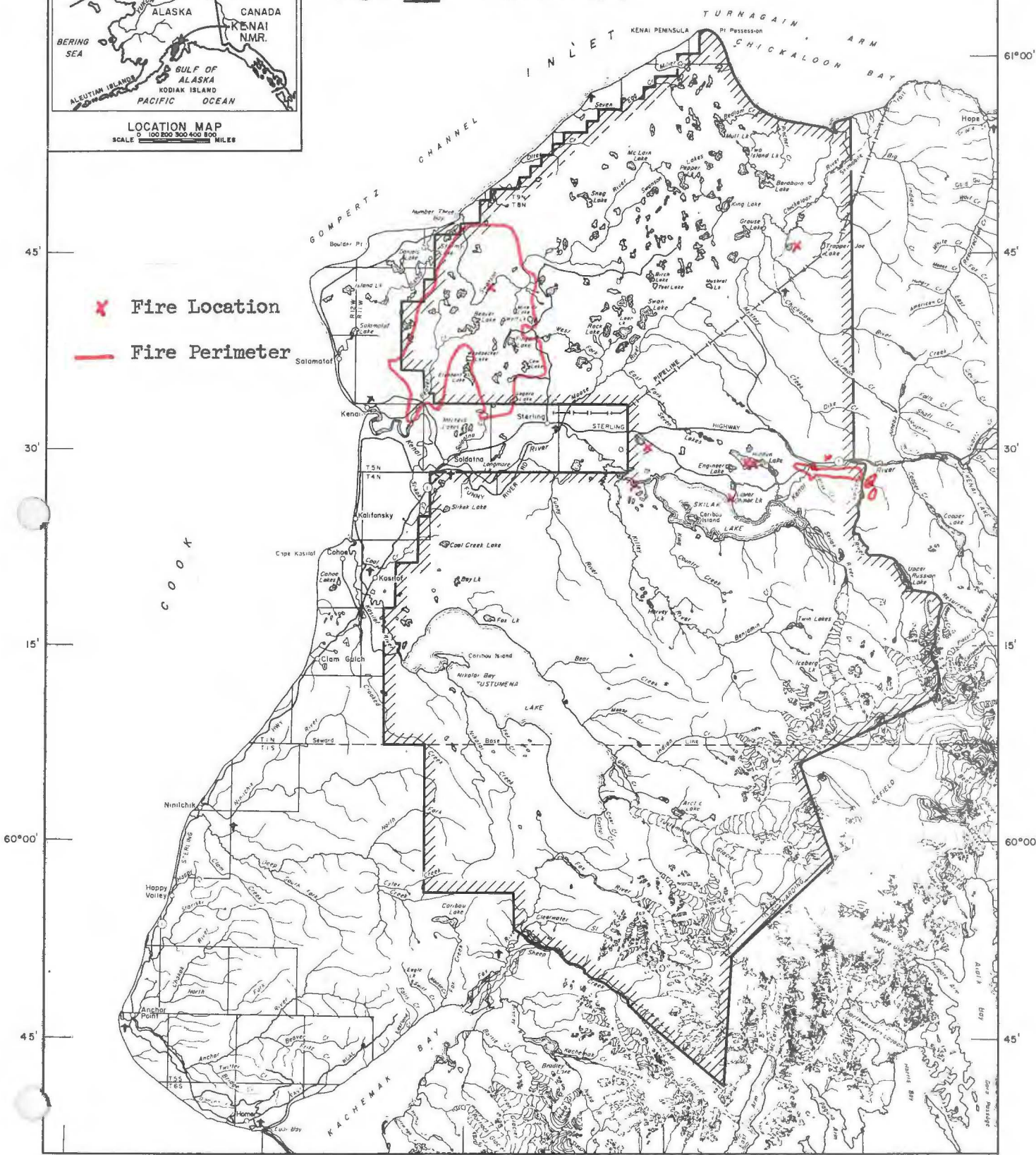
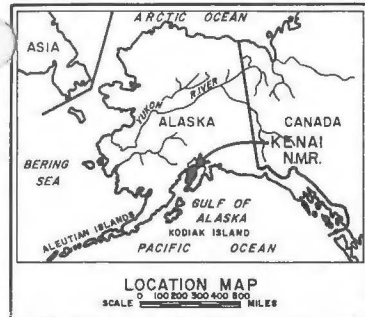
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

151°00'

30'

150°00'

Figure 1 FIRE MAP 1969



COMPILED IN THE DIVISION OF ENGINEERING
FROM SURVEYS BY U.S.G.S & B.S.F. & W.

32

SEWARD MERIDIAN



TOWNSHIP
DIAGRAM



MEAN
DECLINATION

PORTLAND, OREGON

Scale 5 0 5 10 15 20 25 MILES

IR ALASKA 362 408

IV. RESOURCE MANAGEMENT

- A. Grazing. Not permitted.
- B. Haying. Not permitted.
- C. Fur Harvest. The trapping program was conducted in accordance with the approved fur management plan. The entire Moose Range is open to all trappers in accordance with State regulations. A free-use permit and report of catch is all that is required.

Twenty-two trappers received free-use permits during the 1968-69 season. Following are the results of the 1968-69 trapping season.

Did not report	1
Did not trap	9
Trapped but no success	3
Successful trappers	9

SUCCESSFUL TRAPPERS

	Beaver	Coyote	Mink	Muskrat	Land Otter	Wolverine	Weasel	Lynx
Herb Clark	7	44	48	207	9	-	78	17
Nathan Bagley	-	-	2	-	-	-	-	-
Basil Bolstridge	-	-	3	-	-	-	-	-
John Brown	-	-	1	-	-	-	2	-
Dean Osmar	3	-	-	-	-	-	-	-
Tom Gordon	-	-	-	-	-	-	1	-
Walt Hart	4	-	-	-	-	-	-	-
Darrell Buckmier	-	-	-	-	1	1	-	-
Lawrence C. Meyer	-	-	-	-	-	-	-	1
Total	14	44	64	207	10	1	81	18

So far in the 1969-70 season, 36 permits have been issued. The increase in trappers probably is due to the extremely warm winter we have had so far. The results will be reported in next years Narrative Report.

D. Timber Removal. Timber operations were limited to:

23 Free-use permits for fuelwood for personal use	50 cords
18 Free-use permits for house logs for personal use	63,000 b.f.
10 Free-use permits for fence posts for personal use	10 cords
2 Free-use permits for cesspool logs for personal use	2 cords
2 Free-use permits for Christmas trees for public use	175 trees

Only house logs, cesspool logs and Christmas trees were green timber. The Christmas trees were cut by the high school (25) for decorations, and the Civil Air Patrol Cadets (150) for sale.

E. Commercial Fishing. No commercial fishing permits were issued on the Moose Range during the past year.

Data relating to salmon escapement, etc., is reported in Section II, under G.

F. Other Uses. Standard Oil Company of California, unit operator at Swanson River Oilfield, removed 14,500 yards of gravel during the period December 1, 1967 through December 31, 1969. Gravel removal and use was within the participating area and at the Mink Creek exploratory well site. This exploratory site required 9600 yards of gravel obtained from the old Halbouty Strip. About 3500 yards were used during cleanup of the April 18, 1969 oil line break near Swanson River. The balance was utilized throughout the oil participating area. A company check of \$3,625 for gravel used during the period was received February 9, 1970.

Commercial tent camp sites of Messrs. William Cunningham, Henry Rust, and Lloyd Hall were active again this season. Mr. Cunningham retained his four camp sites at King Lake. Lloyd Hall removed his camps at Gene Lake and established a new camp at Bedlam Lake. He also operated two camps at Mull Lake and two at Sportfish Lake. Mr. Rust, of Rust's Flying Service, continued his use of a camp at Bird Lake and also operated two camps at Pepper Lake and one camp at Scenic Lake in conjunction with Mr. Ketchum of Jim's Flying Service. Mr. Rust and Mr. Ketchum apparently each hold half interest in Jim's Flying Service. The camp at Scenic Lake later in the season was destroyed by fire.

Campsites at Clam and Scenic Lakes previously managed by Marshall Farmer were abandoned this year. The three tent frames on Clam Lake Island were mostly removed by the Refuge summer staff.

Unauthorized use of a camp site at Swanson Lake by Rust's Flying Service necessitated its removal. Mr. Rust had been requested to remove his property by June 30, 1967. The camp was not removed and although used, was unauthorized. Our several requests for removal were ignored, so the Kenai staff was subsequently forced to cleanup the site, during June-July 1969, at an expense of \$215.61. Mr. Rust was requested to submit the Bureau's expenditure for removal and restoration of the Swanson Lake commercial tent camp site.

Special Use Permits were issued to Messrs. Walt Pedersen, Jess Willard and George Pollard for four commercial hunting tent camps.

During the year Snelson, Inc. constructed for the Homer Electric Association a 115-KV transmission line from Kenai to Bernice Lake at North Kenai. This new line parallels the existing 69-KV transmission conductor which passes through approximately thirty-one miles of refuge lands. Construction of the new right-of-way necessitated removal of trees and brush along a new one hundred foot swath. Construction was completed September 24.

Special Use Permit KN 9-69 was issued to the Department of the Army for use of lands in the SE $\frac{1}{4}$, Section 33, T6N, R10W, S.M. for maintenance of clearing the Soldotna Radio Relay Site.

Mr. Kenneth Olsen was issued Special Use Permit KN 12-69 for operation of a small passenger ferry on the Kenai River near Sportsman's Lodge during the 1970 calendar year. A fee of \$300 was charged.

G. Oil Operation.

Production. During the year there was an average of forty-eight (48) producing wells at the Swanson River Oilfield. Crude oil was produced at an average rate of 38,000 B/D from the Hemlock Zone. More than 275,000 B/month of water was also produced with the crude. Of the forty-eight production wells, ten were on gas lift and the balance flowing.

Accumulative crude oil production for this field exceeded 100,000,000 barrels on November 14, 1969. The State of Alaska has received an average of \$2 million annually for their share of royalties and land rentals from Moose Range lands during the past twelve years.

Completion during 1968 of a large compressor plant of 6000 psi capacity provided gas surface injection at nine wells. These wells, with injection pressures ranging from 4800-5000 psi, average 185/MCF/D. The natural gas is purchased and piped in from the gas field south of Kenai.

Vapor recovery facilities placed in operation in early 1967 are, according to Standard Oil, conserving nearly one million cubic feet of rich vapors per day. Nearly 300,000 cubic feet are recovered from the 13,000 barrel surge tank at tank #22. These vapors, piped to the compressor plant, provide the source for the propane recovery facilities. These facilities have, since May, produced about 250,000 gallons propane each month.

Portable drilling rigs were moved over five locations (12-4, 14-34, 21-4, 32-9, 34-5) for remedial drilling. Tubing was pulled from the well and sections of sand accumulation cleared. Multiple packers were installed along tubing sections for production control.

A new telemetry circuit was installed at the Oilfield this summer to permit Kenai Pipeline Company use of microwave links between Nikiski and Soldotna Creek Pump Station.

Three men oil wells were drilled in the Swanson River participating area this season. All three were slant drilled from existing well sites 34-5, 34-9, and 41-9. Connecting flow lines were also installed from the new well heads to main flow lines nearby. A fourth drilling pad with reserve pit was constructed at existing well site 243-8 but drilling did not commence during this period.

Two new flow lines were installed during November at Swanson River to handle production from the new wells, SCU 14-5 and SCU 12-10.

A new centrally located emergency gas flare in the Soldotna Creek area of Swanson River Oilfield was installed late in the year. Completion and utilization is scheduled for March 1970. The purpose of this installation will be to flare gas, as required, to protect facilities in the Soldotna Creek gas recovery system. Flaring equipment at individual tank settings will be retained as a back-up, however, Standard says, flaring will be eliminated or reduced to an absolute minimum at those locations.

On February 26 a crude oil line break was observed by Assistant Manager Richey flying over SCU 41-9 well site. A flange on the automatic shut-off valve, washed out from sand erosion, caused the leak. Crude, sprayed in the wind covered a hundred yard circumference from the "Christmas Tree."

On Friday, April 18, the Standard Oil Company reported a crude oil line break in the Soldotna Creek Unit (SCU) of the Swanson River Oilfield. The pipeline crosses Swanson River from tank settings 3-34 and 1-4. The main force of the break blew crude across Swanson River and on the river ice. Containment and skimming booms were installed, the crude removed from the ice and open water, and total cleanup plus rehabilitation of river banks completed. About two acres of land and river were involved. Apparently a Dresser coupling parted when line pressure exceeded the coupling's working limit.

Exploration

Drilling. Three new wells SCU 12-10 (near 41-9) SCU 14-5, 31-16, 34-9 wells were drilled on the Moose Range during the period. All were located at Swanson River.

In addition, Standard Oil and Forest Oil submitted requests to drill two exploratory wells. Standard constructed an ice-road from existing well site 34-8 two miles south to their Mink Creek exploratory well location 14-20. During this same December period, Forest Oil Corporation of Denver received approval to construct a five mile ice road east of the Oilfield to Sunrise Lake. Forest Oil is drilling for lease holders Phillips-Pan American, Standard Oil, Atlantic-Richfield, and Mobil Oil.

Texaco crews returned in late fall to ~~complete~~ cleanup and restoration of previously disapproved access routes, airstrip and drill pads at their Point Possession locations. Following additional cleanup efforts, re-seeding, fertilizing, structural removal, and sloping at these locations, approval was granted.

Seismographic. Standard Oil and Gulf Oil were the only companies conducting seismic work on the Refuge this year. Both Marathon Oil and Continental Oil had submitted seismic programs but cancelled out before they became active.

Each company requesting a permit for seismic activity on the Refuge was informed of the 1964 Wilderness Act which requires the evaluation of refuge lands and the associated restrictions limiting their operations to existing trails, prohibiting use of dozer equipment for construction of new seismic trails or allowing the felling of trees.

Standard Oil conducted an ambitious fifty-one mile shot-line program south and east of the Swanson River Oilfield and west throughout the Swan Lake Canoe System. Their original program request involved more than one hundred miles of trails, however, their efforts were restricted to fifty one miles of existing trails. Many additional connecting seismic lines were used for access to the shot lines. Alaska Geophysical conducted the seismographic work for Standard.

The Gulf Oil Company conducted twenty-six of a forty-eight mile program on those fragile lands in the Caribou Hills. Deep snow drifts and high gradients prevented Western Geophysical, the seismic contractor, from completing the proposed program. Gulf's total program extended from Refuge lands well into Alaska State lands to the south. Although our staff, during numerous personal contacts, attempted to convey an appreciation for State land resources, the dozers were fast at work once seismic effort was complete on the Moose Range. As a result, Western Geophysical received a court stop-order for their unwarranted destruction of stream banks and river bottoms along the valuable Deep Creek fishery resource.

Seismic cleanup programs were conducted by Standard and Gulf during the summer. Standard's program was approved, but the lack of defined trails following breakup in the Caribou Hills limited complete cleanup by Gulf Oil. As a result, Gulf's program has not yet been approved until all shot holes have been located and plugged properly.

V. FIELD INVESTIGATIONS

A. Progress Report on Studies

1. Moose Research Center. (Wildlife Management Study Outline #3).
Winter browse utilization was measured in enclosures 1 and 2 during late April and early May. The browsed twig count method was used. The following table (Table 10) shows utilization by species and type for each of the two enclosures. This utilization represents removal of approximately 25 percent of the annual growth. Indications are that the populations will not increase to the point where they will utilize all the annual growth available. Enclosure 1 was originally stocked with eleven (11) moose and enclosure 2 was stocked with fifteen (15) moose. The present population in these enclosures are seven (7) and twelve (12) **respectively**. Enclosures 3 and 4 have twelve (12) and eighteen (18) moose.
2. Moose Populations Study. (Wildlife Management Study Outline #4)
The 26 moose tagged at the headwaters of Mystery Creek during October 1968 have provided some interesting observations. Some of these animals were sighted in the lowlands as late as July 1. One large bull was observed on May 23 near Moose Lake in the lowlands and was observed in September at the same spot where he had been tagged the previous year.

A total of 27 observations have been recorded in this office most of which were made by Bureau personnel. Alaska Department of Fish and Game has many more observations which they received from the public.
3. Slikok Area Browse Plots. No report.
4. Dall Sheep Studies. No report.

TABLE 10.

WINTER BROWSE UTILIZATION 1968-69

Enclosure 1

<u>Type</u>	<u>Acres</u>	P O U N D S					
		<u>Bir.</u>	<u>Will.</u>	<u>Asp.</u>	<u>Cott.</u>	<u>Vib.</u>	<u>Rose</u>
Dense Birch Regrowth	113	6365	238	116	-	42	-
Medium Birch Regrowth	95	3742	379	35	-	-	-
Thin Birch Regrowth	69	2808	237	8	-	-	-
Spruce Birch Regrowth	40	1304	192	-	-	-	-
Spruce Regrowth	89	407	103	67	-	-	-
Mature Hardwoods Dense	54	188	--	30	-	55	136
Mature Hardwoods Thin	46	704	34	75	16	6	-
TOTAL		15,517	1184	330	27	104	136

Total Utilization 17,299 lbs.

7 Moose, 210 days 12/lbs./moose/day

Enclosure 2

<u>Type</u>	<u>Acres</u>	P O U N D S					
		<u>Bir.</u>	<u>Will.</u>	<u>Asp.</u>	<u>Vib.</u>	<u>Alder</u>	<u>Dwarf/Bir.</u>
Dense Birch Regrowth	71	8766	217	13	-	-	-
Medium Birch Regrowth	80	6215	116	72	-	-	-
Thin Birch Regrowth	82	6409	123	105	-	209	-
Spruce Birch Regrowth	35	2645	24	36	-	-	-
Spruce Regrowth	106	1023	290	96	-	-	3584
Mature Hardwoods Dense	107	485	6	269	6	-	-
Mature Hardwoods Thin	170	1625	111	446	46	-	-
TOTAL		27,168	887	1037	52	209	3584

Total Utilization 32,937 lbs.

13 Moose, 210 days 12/lbs./moose/day

VI. PUBLIC RELATIONS

- A. Recreational Use. Recreational use during 1969 exhibited a marked reduction from the past few years (Figure 2). The reduction can be attributed to closures due to high fire danger, and to the poor salmon run.

The year began with an increase in the numbers of winter users. Record high use continued until mid-June when the refuge was closed because of the Russian River Fire. Periodic closures and fire bans were in effect throughout the remainder of the summer. Figure 3 graphically illustrates the difference between the daily use in a normal year and the daily use in 1969.

The only activities that showed an increase were: small game hunting (excellent weather and high populations of grouse and snowshoe hare), Picnicing, Hiking, Photography and Horseback Riding. (Table 11).

Overcrowded conditions still exist even with reduced use. The conditions at Kenai-Russian River Campground are deplorable during the salmon run.

Most work was completed on Tustumena Campground. All that is needed is about 3000 yards of crushed gravel for final surfacing. Public use of this campground continues to increase as it becomes more well known.

Popularity of the Moose Range is not restricted to Alaska residents. During 1969 we wrote 137 letters answering inquiries about canoeing, camping, fishing, hunting, etc. Most letters came from the "lower 48".

Dr. Harold Steinhoff, Professor of Wildlife Management, Colorado State University, completed a study of recreational values while on sabbatical. This study was conducted in cooperation with the BSF&W and the Alaska Cooperative Wildlife Research Unit.

The report attempts to place a dollar value on wildlife oriented recreation. Questionnaires were sent to 3908 family units who were observed using the Moose Range. Other questionnaires were sent to random selected people who did not visit the Moose Range, and to managers and administrators (A copy of this report is attached --See Appendix)

Reports such as this help managers to determine the views of the average citizen. Too often we hear from only the vocal minority who usually are in opposition to present management practices. A realistic look at the views of all citizens is essential to manage refuges in the national interest.

RECREATIONAL VISITORS
KENAI NATIONAL MOOSE RANGE
1956 - 1969

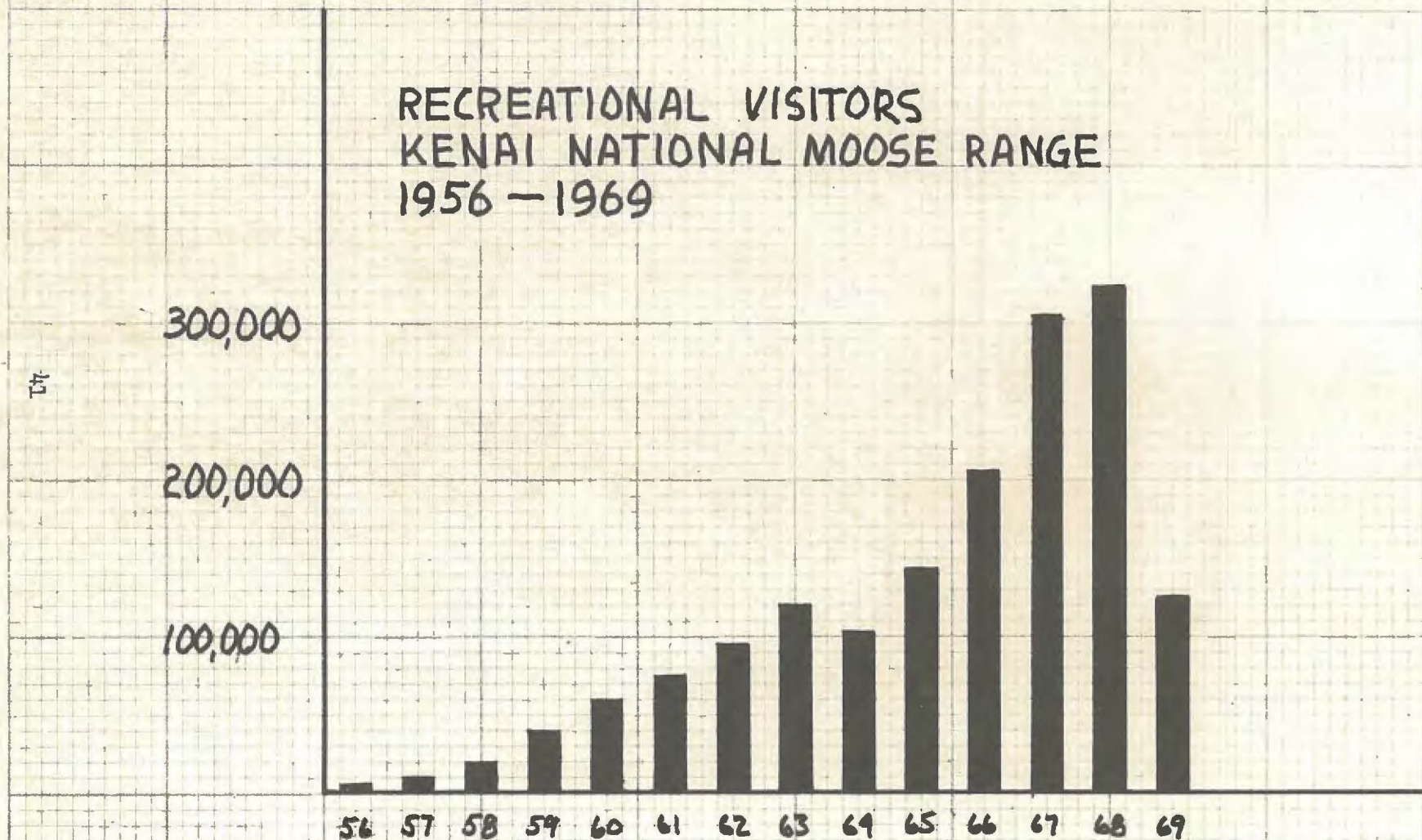
300,000

200,000

100,000

56 57 58 59 60 61 62 63 64 65 66 67 68 69

FIGURE 2.



AVERAGE NUMBER OF VISITORS PER DAY KENAI N.M.R. 1968-1969

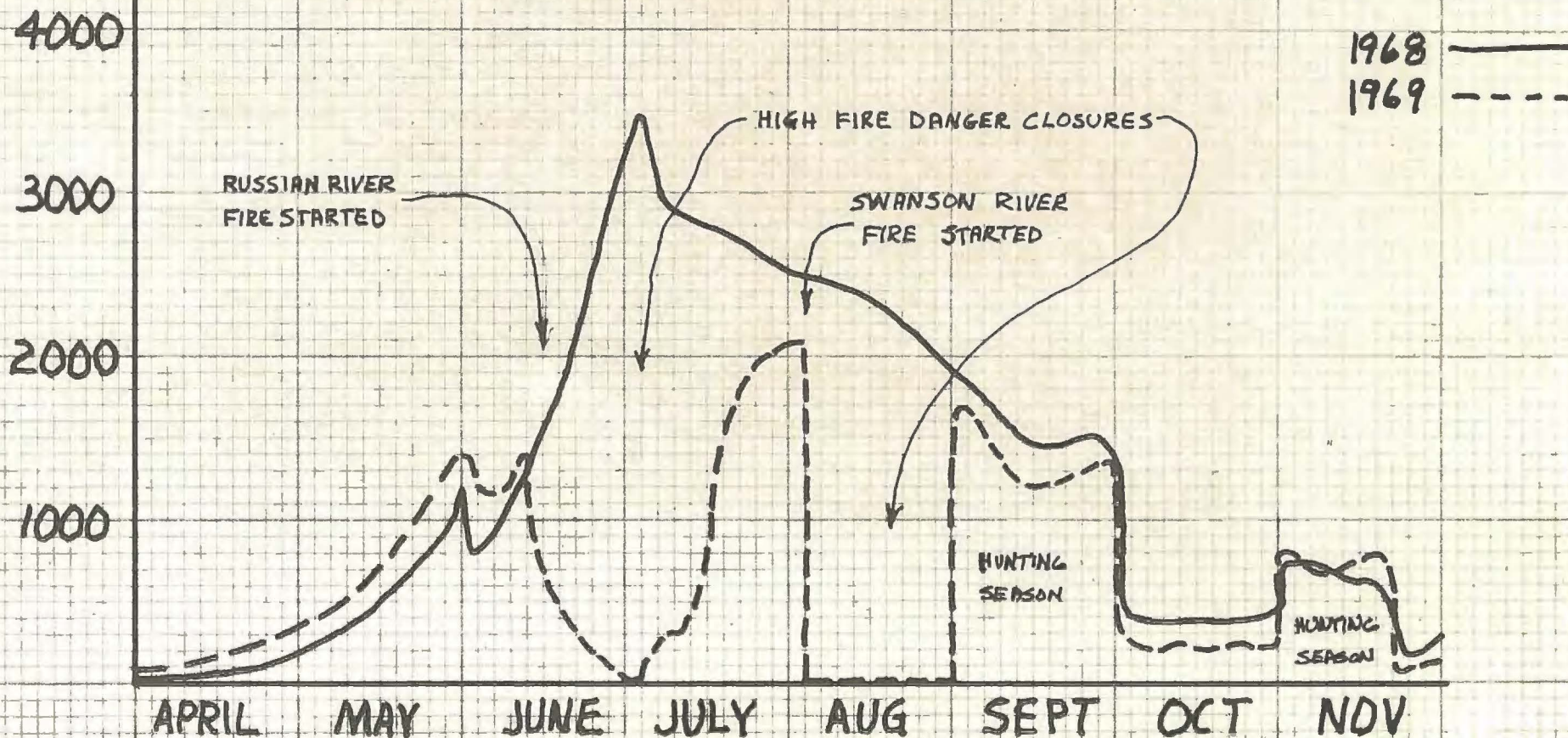


TABLE 11.

	RECREATIONAL VISITS				
	<u>1 9 6 5</u>	<u>1 9 6 6</u>	<u>1 9 6 7</u>	<u>1 9 6 8</u>	<u>1 9 6 9</u>
HUNTING					
Big Game	30,000	46,000	46,900	45,740	23,915
Small Game	3,000	3,200	4,000	5,800	7,964
Waterfowl	800	700	700	800	635
Other	340	560	20	40	32
FISHING	42,750	46,000	75,200	79,600	50,575
CAMPING	29,550	56,500	101,400	108,500	62,601
PICNICING	1,000	3,000	1,000	5,200	10,620
WATER SPORTS					
Boating	1,000	4,820	5,550	7,150	3,630
Canoeing	710	1,100	3,800	4,700	2,900
Swimming	100	1,500	1,600	2,800	665
Water Skiing	50	60	50	450	225
WINTER SPORTS	3,900	5,550	6,550	8,210	1,360
OTHER					
Berry Picking	400	400	1,500	8,400	3,330
Hiking	200	200	400	1,000	1,200
Photography			1,500	1,550	2,089
Horseback Ride				320	552
Other Misc.	28,700	37,740	55,820	42,900	27,650
TOTAL	142,500	207,630	305,970	323,160	125,984

B. Refuge Visitors

Official visitors from the USDI and the BUREAU are listed below in date order:

3/6	David L. Spencer	BSFW	Anchorage, Alaska
4/23	Don Combs	BSFW	Anchorage, Alaska
4/23	Ray Tremblay	BSFW	Anchorage, Alaska
4/16	Walt Rust	FLM	Anchorage, Alaska
6/10	John B. Van den Akker	BSFW	Portland, Oregon
6/10	Ed Smith	BSFW	Portland, Oregon
6/10	Lee R. Jacoby	BSFW	Portland, Oregon
6/19	Harold Preston	BSFW	Portland, Oregon
7/31	Ray Tremblay	BSFW	Anchorage, Alaska
8/12	Jim Cheatham	FLM	Anchorage, Alaska
8/21	Pete Cizmich	FLM	Anchorage, Alaska
8/18	Jim Gritman	BSFW	Washington, D. C.
8/18	Don Distner	BSFW	Portland, Oregon
8/18	Jim Cheatham	FLM	Anchorage, Alaska
8/19	Albert L. Comiskey	FLM	Anchorage, Alaska
	Fire Weatherman		
8/29	Richard E. Traylor	FLM	Falsom, California
9/3	Jim Scott	FLM	Anchorage, Alaska
9/3	C. McVee	FLM	Anchorage, Alaska
9/3	Jim Richardson	FLM	Anchorage, Alaska
9/3	Mr. King	FLM	Anchorage, Alaska
9/8	John E. Lewis	FLM	Anchorage, Alaska
9/8	John Merick	FLM	Anchorage, Alaska
12/18	Edgar Bailey	BSFW	Cold Bay, Alaska

Visitors from Other Federal Agencies

6/5	Pete Jarnes	FAA	Kenai, Alaska
6/5	Hugh Becor	FAA	Anchorage, Alaska
6/5	John H. Hummel	FAA	Kenai, Alaska
5/7	Tom Sering	FHA	Anchorage, Alaska
11/11	John Bugli	FHA	Soldotna, Alaska
3/19	Richard Warren	USFS	Anchorage, Alaska
3/19	K. J. Metcalf	USFS	Anchorage, Alaska
7/17	John C. Crupper	USFS	Anchorage, Alaska
8/28	Ray Clark	USFS	Anchorage, Alaska
8/28	George F. Roskie	USFS	Anchorage, Alaska
9/9	Dr. & Mrs. L. Robertson	USFS	Juneau, Alaska
12/10	John Galea	USFS	Seward, Alaska
12/10	D. M. Sensinerer, Chief Space Req. Branch	GSA	Auburn

3/11	Bill Wunnicke	USGS	Anchorage, Alaska
3/11	Don L. McGee	USGS	Anchorage, Alaska
3/12	Gary Anderson	USGS	Anchorage, Alaska
5/6	Gary Anderson	USGS	Anchorage, Alaska
5/6	Bill Barnwell	USGS	Anchorage, Alaska
7/15	Hank Hayward	USGS	Anchorage, Alaska
7/15	Stan Jones	USGS	Anchorage, Alaska
7/15	Gary Anderson	USGS	Anchorage, Alaska
7/17	Richard M. Hurd	USGS	Juneau, Alaska
12/10	Art Hawks	SCS	Homer, Alaska

Other Agencies

1/14	Ron Somerville	ADF&G*	Anchorage, Alaska
1/14	Royce Perkins	ADF&G	Homer, Alaska
3/18	Royce Perkins	ADF&G	Homer, Alaska
4/2	Ed Martin	ADF&G	Homer, Alaska
4/2	R. A. Rausch	ADF&G	Fairbanks, Alaska
4/2	Dennis Bromley	ADF&G	Moose Pen, KNMR
4/10	Kaarlo Kokko, Board Member	ADF&G	Kenai, Alaska
4/25	Bob Weinhold	ADF&G	Anchorage, Alaska
5/15	Ronald J. Charles	ADF&G	Soldotna, Alaska
5/15	Alan C. Havens	ADF&G	Soldotna, Alaska
5/21	Robert E. LeResche	ADF&G	Moose Pen, KNMR
5/23	Sterling Eide	ADF&G	Anchorage, Alaska
5/23	Royce Perkins	ADF&G	Homer, Alaska
5/23	Paul A. LeRoux	ADF&G	Anchorage, Alaska
5/28	Phillip D. Havens	ADF&G	Anchorage, Alaska
5/28	Paul A. LeRoux	ADF&G	Anchorage, Alaska
8/12	Larry Engel	ADF&G	Soldotna, Alaska
10/21	Joseph R. Blum	ADF&G	Anchorage, Alaska
10/22	Ron J. Somerville	ADF&G	Anchorage, Alaska
10/22	Sterling H. Eide	ADF&G	Anchorage, Alaska
10/22	Royce Perkins	ADF&G	Homer, Alaska
10/22	Paul A. LeRoux	ADF&G	Soldotna, Alaska

*Alaska Department of Fish and Game

9/4	T. R. Fleming	ADH**	Anchorage, Alaska
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** Alaska Department of Highways

3/11	Karl L. VonderAhe	SDO&G***	Anchorage, Alaska
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*** Alaska State Division of Oil and Gas

Oil and Geophysical Company Representatives

Alaskan Geophysical

3/19	Lawson Snodgrass		Anchorage, Alaska
3/19	Bob Sauer		Anchorage, Alaska

Alaska Pipeline Company

10/10	Harold Schmidt		Anchorage, Alaska
10/16	Perry L. Johnson		Anchorage, Alaska

10/16 Don R. Meierhoff		Anchorage, Alaska
10/22 Perry L. Johnson		Anchorage, Alaska
<u>Forest Oil Corporation</u>		
12/5 Dale F. Dorn		Anchorage, Alaska
12/5 Keith W. Calderwood		Anchorage, Alaska
12/17 H. E. Snider		Denver, Colorado
12/17 Dale F. Dorn		Anchorage, Alaska
12/29 John Reynolds		Anchorage, Alaska
<u>Drilling Service, Inc.</u>		
12/22 O. E. "Yank" Sumpter		Anchorage, Alaska
12/22 Ken Willits		Anchorage, Alaska
12/29 Kenneth L. Willits		Anchorage, Alaska
<u>Marathon Oil Company</u>		
6/5 Morris Lowman		Anchorage, Alaska
6/5 A. Socha		Kenai, Alaska
<u>Snelson Construction Co.</u>		
2/5 Jim McFarland		Kenai, Alaska
4/3 Jim McFarland		Kenai, Alaska
<u>S & G Construction</u>		
12/29 Ed Spalinger		Soldotna, Alaska
12/29 Leroy E. Foster		Soldotna, Alaska
<u>Standard Oil Company</u>		
3/11 John Carson		Anchorage, Alaska
11/25 Leroy Post		Anchorage, Alaska
11/25 T. Nichols		Anchorage, Alaska
12/16 W. C. Morrison		Anchorage, Alaska
12/29 Don Eck		Anchorage, Alaska
<u>Western Geophysical</u>		
12/29 George E. Underwood		Anchorage, Alaska
12/29 Merle J. Walker		Anchorage, Alaska
12/29 Don L. Dart		Anchorage, Alaska
<u>Students</u>		
4/28 S. A. Linderman	U of A	Fairbanks, Alaska
Bruce W. Johnson		
Clifford M. Wright		
Patrick O. Corr		
Dennis Knutson		
Marilyn Modafferi		
Jurn Weinstrls		
Dr. Dave Klein		
Jerry Hok		
Leo J. Salo		
Carl McLlroy		
Les Pengelly		
6/24 Spencer Linderman	U of A	Fairbanks, Alaska
6/24 Robert J. Langlotz	U of A	Fairbanks, Alaska

7/17	Laurence C. Walker Stephen Austin State University	Nacogdoches, Texas
7/17	Rudy M. Kallender Oregon State University	Corvallis, Oregon
7/17	Clarence M. Skau University of Nevada	Reno, Nevada
7/17	John A. Zivnuska University of California	Berkeley, California

Other Visitors

1/13	Jess Willard (Guide)	Caribou Lake, Alaska
2/6	Jim Nordale Kenai Peninsula Borough Legal Council	Soldotna, Alaska
3/18	Dave Harper Harper Real Estate	Kenai, Alaska
4/3	Glen Williams Williams Excavating	Kenai, Alaska
4/15	Ed Garnett, Manager Trans-America Title Co.	Kenai, Alaska
5/8	Henry B. Rust (Commercial camp operator)	Anchorage, Alaska
5/8	Lloyd L. Hall (Commercial camp operator)	Anchorage, Alaska
5/8	Bill Cunningham (Comm. camp operator)	Anchorage, Alaska
5/15	Mrs. L. W. McConnel	Kenai, Alaska
6/5	Nels Kjelstad Acting City Manager	Kenai, Alaska
8/25	Don Artz Artz Aerial Sparying	Jordon, Montana
8/29	David Webster Daily Times	Anchorage, Alaska
9/10	Dr. and Mrs. Anthony Bubenik Wildlife Research	Switzerland
8/11	Leo J. Salo Dept. of Agriculture & Forest Zoology	Helsinki, Finland
9/22	Kojo Tanaka Photographer of Wildlife	Tokyo, Japan
10/2	Steve Smith (former employee)	Anchorage, Alaska
10/3	Bob Ture Eagle River Preservation Society	Eagle River, Alaska
10/21	William K. Wyant St. Louis Disptach	Washington, D. C.
12/10	Jess Haggard LeTourneau Corp.	Longview, Texas
12/10	Bill Nolen LeTourneau Corp.	Longview, Texas

- C. Refuge Participation. On January 2 and 14, staff members discussed hunting proposal with Alaska Department of Fish and Game representatives; and on January 6 and 7 attended the Game Division meeting in Anchorage.

Two staff members attended meetings of the Alaska Conservation Society on 1/8, 1/11, 2/11, and 2/28.

Assistant Manager Richey in charge of oil-enforcement went on a "Show Me" trip to the North Slope with Standard Oil Company on 2/5.

Assistant Refuge Manager Kurtz explained conservation work and professional requirements to a Cub Scout and his father on 2/14.

Staff attended an annual meeting with USFS to discuss mutual problems on 2/17 and 18.

Assistant Manager Kurtz gave recreational talk to local Boy Scouts concerning summer hiking program on 2/16.

Approximately 10,000 leaflets (Kenai NMR and Alaskan Wildlife Refuges) and maps were sent to Los Angeles for the Alaska Trade and Travel Fair at Century City at the request of the Kenai City Manager on 3/11.

Assistant Managers Seemel and Kurtz attended TAP (Technical Action Panel) meeting and field trip on 3/11.

Assistant Manager Kurtz presented a slide talk to the Kenai Chamber of Commerce on 3/12 concerning Kenai NMR recreational program.

Assistant Manager Kurtz presently serving on publicity committee Kenai Chamber of Commerce.

Staff went on "Show Me" trip to Juneau Flats with USFS on 3/15.

Assistant Manager Kurtz presented a slide talk to the Soldotna Chamber of Commerce on 3/18 concerning the Kenai NMR recreational program.

Two films, CONSERVATION HERITAGE and ARCTIC WILDLIFE RANGE were shown to 60 third graders at Sears Elementary School on 3/19.

Refuge personnel are involved with Kenai Peninsula Borough School System researching and assisting in developing a conservation-education curriculum which is scheduled for incorporation into the school system this fall. Library material and conservation-education curricula currently in use elsewhere in the "States" were furnished the Kenai Peninsula School District to aid them in developing their curriculum for the coming school year.

Assistant Manager Kurtz attended Boy Scout meetings on April 10 and April 24.

Assistant Manager Kurtz discussed hiking with the Boy Scouts on April 16.

Assistant Managers Kurtz and Seemel attended the Kenai Chapter of the Alaska Conservation Society meeting with 35 members present on April 17.

Assistant Manager Kurtz attended the Public Relations Committee meeting of the Kenai Chamber of Commerce on April 21, of which he is a member.

Assistant Manager Kurtz met with authors of Kenai Pamphlet Committee on April 22.

From April 29 to May 2, Refuge Manager Hakala and assistants Seemel and Kurtz met with University of Alaska students for field trips on the refuge.

Assistant Manager Kurtz talked with eight Cub Scouts on May 9, and another troop on May 21.

Assistant Manager Richey attended an ACS (Kenai Chapter) meeting on May 9.

Refuge Manager Hakala talked with Cub Scout Troop #8 on May 14.

Refuge Manager Hakala and assistant Seemel and Richey met with USFS discussing mutual summer projects on May 14.

Assistant Manager Richey met with two Wildwood Air Force Base men concerning wildlife management and conservation on the refuge on May 21.

Assistant Manager Richey discussed recreational use on refuge lands with Sgt. Willets of Elmendorf AFB and other service personnel on May 22.

Refuge Manager Hakala attended a public hearing on the Kenai River Bridge location held on May 27, and presented wildlife conservation facts.

Assistant Manager Seemel toured the campgrounds and North Road facilities with 40 members of the National Wildlife Federation, and explained Moose Range projects on May 27.

Refuge Manager Hakala and Assistant Manager Richey met with City Manager, FAA officials, and Marathon Oil Company on June 4 for a meeting and inspection of Beaver Creek Road.

Refuge Manager Richey appeared on KHAR-TV for a half-hour presentation of the canoe system on the Kenai NMR, 6/24.

Refuge Manager Hakala met with US Forest Service, VIS planning on July 14.

Intermittent employee Bruce West (Kenai High School Coach) discussed Moose Range activities at the Kiwanis Weekly Club meeting. Sixteen people attended, on July 22.

Refuge Manager Hakala attended an Associated State Colleges and Universities Forestry Research Organization meeting on July 17. Oil briefing and tour of Swanson River Oilfield followed.

Assistant Manager Richey attended the Alaska Conservation Society, Kenai Chapter, Director's meeting on September 26.

Assistant Manager Kurtz served on conservation panel, Methodist Mariners' Club October 5. 41 present.

Assistant Managers Seemel and Kurtz attended Environmental Education Workshop in Seward on October 8.

Assistant Managers Seemel and Kurtz attended an Environmental Education Committee meeting October 13.

Staff met with Alaska Department of Fish and Game on October 22.

Assistant Manager Kurtz gave a slide talk to 19 Girl Scouts on October 20.

Assistant Manager Kurtz gave a slide talk to the North Kenai Elementary School on October 23. 230 present.

Assistant Manager Kurtz gave a slide talk to the Kenai Elementary School on October 24. 150 present.

Assistant Manager Kurtz spoke on refuge objectives at the October 29 Kenai Chamber of Commerce meeting. 40 present.

Assistant Manager Kurtz attended Environmental Education Committee meeting on November 17.

Assistant Manager Richey and Seemel attended USFS Russian River Fire Review in Anchorage on October 27 and 28.

Staff met with Alaska Department of Fish and Game in Anchorage on November 21.

Assistant Manager Kurtz showed film SO LITTLE TIME to Soldotna Chamber of Commer on November 26. 32 present.

Assistant Manager Kurtz showed film SO LITTLE TIME to the residents of Thompson Park. 23 present on November 30.

SO LITTLE TIME film was loaned to the Kenai Junior High School on December 1-3. 250 viewed the film.

Assistant Manager Kurtz discussed recreation potential of Moose Range to Kenai Development Committee on December 3. 13 present.

Asst. Manager Kurtz attended Enviornmental Education Sub-Committee Meeting on December 4. 4 present.

Assistant Manager Richey attended Alaska Conservation Society's Director's meeting (Kenai Chapter) on December 5.

Asst. Manager Kurtz discussed refuge objectives at Homer Chamber of Commerce on December 8. 21 present.

Assistant Managers Seemel and Kurtz attended Environmental Education Meeting at Sterling on December 15. 31 present.

Assistant Manager Kurtz discussed conservation at Kalfonski Nordic Ski Club Meeting on December 22.

D. Hunting

BIG GAME

<u>Species</u>	<u>Season</u>	<u>Limit</u>
Moose (bulls) Unit 15A	Aug. 20-Sept. 20	1
	November 1-20	1
Moose (bulls) Unit 15 B, C	Aug. 20-Sept. 30	1
	November 1-20	1
Caribou	No open season	
Mt. Goat	Aug. 10- Dec. 31	2
Mt. Sheep	Aug. 10-Sept. 20	1 3/4 curl ram
Brown Bear	Sept. 1-30	1
Black Bear	Aug. 10-June 30	3

UPLAND GAME

Grouse	Aug. 10-April 30	15/da., 30 poss.
Ptarmigan	Aug. 10-April 30	20/da., 40 poss.

WATERFOWL

Game ducks, geese & brant	Sept. 1-Dec. 14	Federal
Common Snipe	Sept. 1-October 31	Federal
Little Brown Cranes	Sept. 1-October 15	Federal

Serious public hunting on the Refuge begins in late March when emergent black bear provide the earliest big game hunting. Spring arrived early this year, the Coyote Lake was ice-free on April 28, and most refuge lakes were ice-free by May 3. Following this early spring hunting effort for black bear, public hunting pressure remained minimal until the moose-sheep-goat seasonal opening in mid-September. At this time, several bears are usually harvested during late August through September.

Thirteen sheep-goat hunters arrived at Green Lake by opening day August 10. The following day successful hunters returned with two legal sheep, one goat and an illegal ewe mistakenly harvested for a goat. Following seven days of hunting a total of thirty-seven known hunters had visited the area and harvested six legal rams.

Several hunting parties traveled by boat to the head of Tustumena Lake and hunted those mountain regions south of Tustumena Glacier. A few hunters flew into Lake Emma and even fewer visited Twin Lakes. One legal ram, two goat and two black bear were harvested at Twin Lakes during the first hunting week. Two camps were also observed at Iceberg Lake. Upper Funny River Strip was closed to all aircraft use this season. Normal hunter access at this site was probably shifted to Lake Emma.

Enforcement men were again stationed at Green Lake, Twin Lakes, and Surprise Mountain during the first week or two of the sheep season. The two men at Surprise Mountain recorded only one legal ram taken during their stay.

Because of severe fire danger throughout the Refuge, the Moose Range was officially closed August 16 to all public use. Hunting was curtailed sharply as hunters slowly departed the mountains.

The public use ban was continued through September 3 limiting moose harvest substantially during the early season which opened August 20. That area west of Swanson River Road to Moose Point and bounded by the Kenai River on the south and Cook Inlet to the west, remained closed to all hunting during fire-fighting operations. The ban in this section was lifted October 9.

Mild weather and a limited bull moose population throughout the lowlands provided poor hunter success for the usual mass of road hunters. Very few moose were available along Mystery Creek Road during both the early and late seasons this year. During the late moose season, however, moose became readily available as they moved into the Funny River area during the last ten days of the November hunt.

Use of aircraft was somewhat curtailed because of the Refuge closure. However, aerial hunters quickly harvested numerous moose near the lowland lakes following re-opening of the Moose Range to public use September 3. The lake ice was considered unsafe during the early November season, however, several aircraft were observed on refuge lakes between November 15-20.

Two hundred antlerless permits were issued for each sub-unit in Game Management Unit 15 but mild weather and the unavailability of moose near access routes postponed these hunts until January-February 1970.

- E. Violations. The usual unauthorized vehicle use off established roads was minimal this year. Additional news releases, sign posting, and aerial patrol kept violations to a minimum.

The Caribou Hills is especially vulnerable to unauthorized vehicle use because of existing seismic trails along the Refuge boundary. Although numerous cross-country vehicle types utilized the State lands during big game hunting season this year, only two minor vehicle use violations were observed on Refuge lands. Frequent aerial patrols were probably responsible for these negative results.

During the September moose hunt, three hunters were observed in the Tustumena Lake area, using a Amphi-Cat vehicle to haul out a moose which they had killed approximately one mile from the lake. The tracks made by this vehicle on the virgin tundra will be visible for many years. The three hunters were taken before the U.S. Commissioner's Court and found guilty on charges of willful and unlawful use of a vehicle on refuge lands prohibited to vehicular use. The three Messrs. Ralph A. Ovalle, Arthur L. Spooner, and Gerald A. Kitchen were each fined \$500 with \$250 suspended.

Fires became a constant problem on the Refuge this year. A group of campers on the large island at Hidden Lake were unable to contain a campfire they had constructed, so departed the island and let the fire take its course. The Bureau of Land Management extinguished the fire but not before several virgin acres of timber had turned to ash. The violators were contacted and the case presented to the FBI.

A contact was made with Mr. Mike Roddy, a Soldotna bartender, at his tent camp on South Fork of Indian Creek. Mr. Roddy apparently wished to depart civilization for a time and had friends helicopter he and his portable hydraulic dredge into the area. This small mining venture was quickly stopped and Mr. Roddy requested to depart.

- F. Safety. During 1969 the accident rate on the Moose Range exhibited a significant decrease over past years. Following is a summary of 1969 accidents.

Government Personnel. None (last year three)

Government Equipment. Floats on N.766 government owned Beaver aircraft damaged on rough water landing.

Private Aircraft. Only four accidents were reported this year compared to 13 last year.

Three accidents resulted in no injuries. One of the aircraft was demolished and the other two were able to fly out after repairs.

On June 24 a military H-21 helicopter crashed with nine persons aboard while assisting with the fire fighting effort. There was one fatality and five injuries reported. The helicopter lifted into the air, but experienced difficulty in gaining altitude. The pilot attempted to return to the landing pad when the helicopter struck some nearby trees and was demolished.

We feel that our closure of sub-marginal lakes and strips to aircraft landings and closure of aircraft hunting during most of the early season have been factors contributing to the reduction in accidents.

Other. The son of a refuge employee received minor abrasions when a picnic table tipped over on him. There were many cuts, burns, etc., sustained by the five to six thousand fire fighters on the Moose Range fires. Copies of accident report forms have been requested from BLM and USFS. To date no replies have been received.

Bureau employees, mostly intermittent laborers hired for summer maintenance, spent a total of 1525 man-hours on fire lines; no injuries were sustained by any of our employees.

A comparison of this year's safety record with last year's follows:

	<u>1968</u>	<u>1969</u>
Employee Injuries	3	0
Fatalities	7	3
Aircraft Accidents	13	3
Boating Accidents	1	0

Safety meetings were held weekly while intermittent employees were on the payroll and monthly during the remainder of the year. Subjects discussed were as follows:

Home Hazards	Fire Control
Emergency vehicle repairs	Boating Safety
First Aid	Fire Fighting
Search & Rescue	Bears in Campgrounds
Arctic Survival	Safety equipment in vehicles
Axe and Chainsaw use	Campground sanitation
Defensive Driving	Lawnmower safety
Protective Equipment	Public safety
Driving Safety	Lifting
Dogs and Children in Campgrounds	

We feel that weekly SAFETY meetings contributed to the reduction of accidents to employees.

All staff members completed Defensive Driver Training, First Aid and Radiological Monitoring courses. Managers Kurtz and Seemel completed the Air Force Arctic Survival Course.

VII. OTHER ITEMS

A. Items of Interest

John Kodysz terminated employment with the Bureau on July 26, 1969.

Ralph M. Mumm was appointed to fill the vacancy on October 5, 1969.

B. Credits

Credit should be given to the following persons for their work on the following sections of this report.

Robert A. Richey

II. Wildlife, Section A, B, C, D,
E, F, and I.

IV. Resource Management, Section
F & G.

VI. Public Relations, Section D & E.

Robert K. Seemel

I. General, Section B.

III. Refuge Development, Section B, C,
D, E, and F.

IV. Resource Management, Section A, B,
and D.

V. Field Investigations

John E. Kurtz

II. Wildlife, Section G & H

III. Physical Development, Section A.

IV. Resource Management, Section C & E.

VI. Public Relations, Section A & F.

Cherie E. Stroud

I. General, Section A.

VI. Public Relations, Section B & C.

C. Photographs

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

3-1750
Form NR-1
(Rev. March 1953)

WATERFOWL

REFUGE KENAI NATIONAL MOOSE RANGE

MONTHS OF SEPTEMBER TO DECEMBER, 19⁶⁹

		(2)									
		Weeks of reporting period									
(1)		9/6	9/13	9/20	9/27	10/4	10/11	10/18	10/25	11/1	11/8
Species		1	2	3	4	5	6	7	8	9	10
Swans:											
Whistling Trumpeter		180	180	140	100	50	50	25	15	15	15
Geese:											
Canada		100	100	100	150	300	700	12,000	100	100	
Cackling											
Brant											
White-fronted											
Snow											
Blue											
Other	TOTALS	100	100	100	150	300	800	12,150	200	100	
Ducks:											
Mallard		1500	1500	500	200	200	200	200	200	100	100
Black											
Gadwall		200	100	50							
Baldpate		500	200	100	50						
Pintail		1500	500	100	50						
Green-winged teal		3000	500	500	200	50					
Blue-winged teal											
Cinnamon teal											
Shoveler		200	100	50							
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup		400	400	200	100	50	50	50	50	50	50
Goldeneye		1000	600	300	300	300	100	100	100	100	100
Bufflehead		100	50	50	20	20	20	20	20	20	20
Ruddy											
Other											
Coot: TOTALS											
		8400	3950	1850	920	620	370	370	370	270	270

-3 -175

Cont. NR-1
(Rev. March 1953)WATERFOWL
(Continuation Sheet)REFUGE KENAI NATIONAL MOOSE RANGEMONTHS OF SEPTEMBER TO DECEMBER, 1969

(1) Species	(2) Weeks of reporting period								(3) Estimated waterfowl days use	(4) Production : Broods: Estimated : seen : total	
	11/15	11/22	11/29	12/6	12/13	12/20	12/27	18			
Swans:											
Whistling											
Trumpeter	15	15	15	15	10	5			5915	20	48
Geese:											
Canada									95,550		
Cackling											
Brant											
White-fronted											
Snow									2450		
Blue											
Other									98,000		
Ducks:											
Mallard	100	100	100	100	100	100	100		37,800		
Black											
Gadwall									2450		
Baldpate									5950		
Pintail									15,050		
Green-winged teal									29,750		
Blue-winged teal											
Cinnamon teal											
Shoveler									2450		
Wood											
Redhead											
Ring-necked											
Canvasback											
Scaup	50	50	50	50	50	50	50		12,250		
Goldeneye	50	50	50	50	50	50	50		23,450		
Bufflehead									2,380		
Ruddy											
Other											
Coot:											
TOTALS	200	200	200	200	200	200	200		131,530		
				(over)							

	(5)	(6)	(7)
	Total Days Use	Peak Number	Total Production
Swans	5,915	180	48
Geese	98,000	12,150	Unknown
Ducks	131,530	8,400	Unknown
Coots	-0-	----	----

SUMMARY	
Principal feeding areas	Lakes and marshes in the lowlands, Kenai, Kasilof and Chickaloon Flats
Principal nesting areas	NA
Reported by	John B. Hakala

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).

-1751
orm NR-1A
Nov. 1945)

MIGRATORY BIRDS
(other than waterfowl)

Refuge KENAI NATIONAL MOOSE RANGE Months of January to April 19 69

(1) Species	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Number
I. <u>Water and Marsh Birds:</u>										
Sandhill Cranes	50	4/25	100	4/30	Still Present					400
Common Loon	4	4/26	100	4/30	Still Present					200
Red-necked Grebe	2	4/29	50	4/30	Still Present					100
II. <u>Shorebirds, Gulls and Terns:</u>										
Common Snipe	1	4/21	1000	4/30	Still Present					5000
Glaucous-winged Gull	Were	Present	400	4/30	Still Present					150
Herring Gull	14	4/1	200	4/30	Still Present					500
Mew Gull	4	4/24	100	4/30	Still Present					200
Bonaparte's Gull	8	4/25	30	4/30	Still Present					80
Greater Yellowlegs	4	4/29	50	4/30	Still Present					100
Lesser Yellow legs	1	4/29	20	4/30	Still Present					50

(over)

(1)	(2)	(3)	(4)	(5)	(6)
III. <u>Doves and Pigeons:</u> Mourning dove White-winged dove					
IV. <u>Predaceous Birds:</u> Golden eagle Duck hawk Horned owl Magpie Raven Crow BALD EAGLE GOSHAWK HAWK OWL GREAT GREY OWL MARSH HAWK HARLAN'S HAWK ROUGH-LEGGED HAWK	Resident Resident Resident Resident Resident Resident Resident Resident 1 2 1	 300 1500 2000 150 300 50 10 20 10 5	1/15 1/15 4/30 4/30 4/30 1/15 1/15 1/15 4/30 4/30 4/30	Still Present Still Present Still Present Still Present Still Present Still Present Still Present Still Present Still Present Still Present Still Present	 100 500 2000 4000 300 350 60 15 40 20 10
Reported by					John B. Hakala

INSTRUCTIONS

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

3-1751

Form NR-1A
(Nov. 1945)

MIGRATORY BIRDS

(other than waterfowl)

Refuge KENAI NATIONAL MOOSE RANGE

Months of MAY

to AUGUST

19 69

(1) Species	(2) First Seen		(3) Peak Numbers		(4) Last Seen		(5) Production			(6) Total
Common Name	Number	Date	Number	Date	Number	Date	Number Colonies	Total # Nests	Total Young	Estimated Number
I. <u>Water and Marsh Birds:</u>										
Common Loon	Were Present		1500	7/20	Still Present				1000	1800
Arctic Loon	2	5/23	200	7/20	Still Present				150	300
Red-throated Loon	2	5/9	50	7/20	Still Present				20	100
Red-necked Grebe	Were Present		1000	7/20	Still Present				600	1200
Horned Grebe	2	5/9	1200	7/20	Still Present				800	1500
Double-crested Cormorant	2	5/5	20	5/10	Still Present				10	40
Sandhill Crane	Were Present		1000	8/25	Still Present			20	25	20,000
II. <u>Shorebirds, Gulls and Terns:</u>										
Semi-palmated Plover	1	5/5	200	6/15	2	8/20				300
American Golden Plover	4	5/8	400	6/15	2	8/25				600
Black-Bellied Plover	1	5/8	200	6/15	1	6/20				300
Common Snipe	Were Present		50,000	8/30	Still Present					100,000
Whimbrel	2	5/8	50	5/25	1	8/25				80
Spotted Sandpiper	6	5/28	1000	7/10	3	8/25				1500
Solitary Sandpiper	2	5/28	200	7/10	1	8/25				300
Greater Yellowlegs	Were Present		300	7/10	2	8/10				400
Lesser Yellowlegs	Were Present		100	7/10	1	8/10				200
Glaucous-winged Gull	Were Present		5000	8/8	Still Present					6000
Herring Gull	Were Present		6000	8/8	Still Present					8000
Mew Gull	Were Present		3000	7/15	Still Present					6000
Bonapartes Gull	Were Present		700	8/8	Still Present					1000
Arctic Tern	1	5/8	1500	7/10	2	8/5				1500

(over)

(1)	(2)	(3)	(4)	(5)	(6)
III. <u>Doves and Pigeons:</u> Mourning dove White-winged dove					
IV. <u>Predaceous Birds:</u> Golden eagle Duck hawk Horned owl Magpie Raven Crow GOSHAWK BALD EAGLE OSPREY HAWK OWL GREAT GRAY OWL SHORT-EARED OWL BOREAL OWL	Resident Resident Resident Resident Resident Resident 1 Resident Resident Resident Resident	15 300 1000 1500 200 200 10 20 10 50 300	8/30 6/15 8/30 8/30 6/15 8/5 7/8 8/30 8/30 8/30 8/30	Still Present Still Present Still Present Still Present Still Present Still Present 2 8/13 Still Present Still Present Still Present Still Present	30 400 1500 2000 300 250 15 30 20 70 400
				1 2	
				John B. Hakala	
				Reported by	

INSTRUCTIONS

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

3-1751

Form NR-1A
(Nov. 1945)

MIGRATORY BIRDS

(other than waterfowl)

Refuge KENAI NATIONAL MOOSE RANGEMonths of SEPTEMBER to DECEMBER 19 69

(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>I. Water and Marsh Birds:</u>											
Common Loon		Were Present		1500	9/1	1	10/20				1800
Arctic Loon		Were Present		200	9/1						250
Red-throated Loon		Were Present		50	9/1						70
Red-necked Grebe		Were Present		1500	9/10		10/2				2000
Double-crested Cormorant		Were Present		30	9/3						50
Sandhill Crane		Were Present		3000	9/16		9/26				50,000
<u>II. Shorebirds, Gulls and Terns:</u>											
Common Snipe		Were Present		20,000	9/1		9/7				25,000
Glaucous-winged Gull		Were Present		1000	9/1		9/4				1000
Herring Gull		Were Present		3000	9/1		9/7				3000
Mew Gull		Were Present		500	9/1		9/6				500
Bonaparte's Gull		Were Present		100	9/1		9/4				100

(over)

(1)	(2)	(3)	(4)	(5)	(6)
III. <u>Doves and Pigeons:</u> Mourning dove White-winged dove					
IV. <u>Predaceous Birds:</u> Golden eagle Duck hawk Horned owl Magpie Raven Crow	Resident	15	9/6	Still Present	30
	Resident	100	9/6	Still Present	200
	Resident	1000	9/6	Still Present	1000
	Resident	1500	9/6	Still Present	1700
GOSHAWK	Resident	150		Still Present	200
BALD EAGLE	Resident	150	9/26	Still Present	200
HAWK OWL	Resident	30	9/6	Still Present	50
GREAT GREY OWL	Resident	10	9/21	Still Present	20
SHORT-EARED OWL	Resident	30	9/21	Still Present	50
BOREAL OWL	Resident	150	9/21	Still Present	200
Reported by..... John B. Hakala					

INSTRUCTIONS

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

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

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

WATERFOWL UTILIZATION OF REFUGE HABITAT

Refuge KENAI NAT'L MOOSE RANGE For 12-month period ending August 31, 1969

Reported by John B. Hakala Title Refuge Manager

(1) Area or Unit Designation	(2) Habitat Type Acreage		(3) Use-days	(4) Breeding Population	(5) Production
	Crops	-0-	Ducks	534,340	Unknown
	Upland	1,472,000	Geese	106,326	Unknown
	Marsh	96,000	Swans	21,455	60
	Water	162,000	Coots	-0-	48
	Total	1,730,000	Total	662,121	Unknown
	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)

3-1750c

Form NR-1C

(Sept. 1960)

WATERFOWL HUNTER KILL SURVEY

Refuge KENAI NATIONAL MOOSE RANGE

Year 1969

(1) Weeks of Hunting	(2) No. Hunters Checked	(3) Hunter Hours	(4) Waterfowl Species and Nos. of Each Bagged	(5) Total Bagged	(6) Crippling Loss	(7) Total Kill	(8) Est. No. of Hunters	(9) Est. Total Kill
			<u>NEGATIVE REPORT</u> /					

(over)

3-1752
Form NR-2
(April 1946)

UPLAND GAME BIRDS

1613

Refuge KENAI NATIONAL MOOSE RANGE Months of JANUARY to APRIL, 19 69

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Spruce Grouse	Spruce Forests (900,000 acres)	150			1:1	300			6,000	
Partridge: Willow	Brushland Marshland, and Timbered lands (450,000 acres)	100			1:1	400			4,500	
Rock	Alpine tundra, meadow, mountain and brushland (350,000 acres)	110			1:1	150			3,200	
White-tailed	Alpine tundra, meadow and mountains (300,000 acres)	230			1:1	50			1,300	

3-1752
Form NR-2
(April 1946)

UPLAND GAME BIRDS

1613

Refuge KENAI NATIONAL MOOSE RANGE

Months of MAY to AUGUST, 1969

(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'v'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Spruce Grouse	Spruce Forests (900,000 acres)	45			1:1	400			20,000	
Ptarmigan: Willow	Brushland and Alpine meadow (100,000 acres)	13			1:1	60			8,000	
Rock	Alpine tundra and mountains (300,000 acres)	54			1:1	40			5,600	
White-tailed	Alpine tundra and mountains (300,000 acres)	125			1:1	20			2,400	

3-1752

Form NR-2

(April 1946)

UPLAND GAME BIRDS

1613

Refuge KENAI NATIONAL MOOSE RANGEMonths of SEPTEMBER to DECEMBER, 19 69

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Spruce Grouse	Spruce Forests (900,000 acres)	45			1:1	600			20,000	
Ptarmigan: Willow	Brushland, Marshland, and Timbered lands (450,000 acres)	56			1:1	500			8,000	
Rock	Alpine tundra, meadow, mountain and brushland (350,000 acres)	63			1:1	100			5,600	
White-tailed	Alpine tundra, meadow and mountains (300,000 acres)	125			1:1	30			2,400	

3-1753
Form NR-3
(June 1945)

BIG GAME

Refuge KENAI NATIONAL MOOSE RANGE Calendar Year 1969

(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, marshland, brushland and alpine meadow (1,200,000 acres)	1300	700				50		200			9,000	8,400	1: 5
Black bear	Timberland, alpine tundra and brushland (1,260,000 acres)	150	20						10			600	570	1: 1
Brown bear	Lowland timber, marshland and brushland (1,000,000 acres)	20	5						2			50	43	1:1
Dall sheep	Alpine tundra and mountains (200,000 acres)	250	25				20		50			1,200	1,150	1:3
Mountain goat	Alpine tundra and mountains (250,000 acres)	50	6*						5			300	290	-
Caribou	Marshland, brushland and alpine meadow	15							2			60	35	1:4
* Estimate --	1969 harvest figures not yet available													

Remarks:

Reported by John E. Kurtz

3-1754
Form NR-4
(June 1945)

SMALL MAMMALS

Refuge KENAI NATIONAL MOOSE RANGE

Year ending April 30, 1969

(1) Species	(2) Density		(3) Removals					(4) Disposition of Furs					(5) Total	
Common Name	Cover Types & Total Acreage of Habitat	Acres Per Animal	Hunting	Fur Harvest	Predator Control *	For Re- stocking	For Re- search	Share Trapping			Total Refuge Furs Shipped	Furs Donated	Furs Destroyed	Popula- tion
								Permit Number	Trappers Share	Refuge share				
Beaver	Marsh-brush 750,000	150	14											5,000
Mink	Marsh-brush 750,000	150	64											5,000
Land Otter	Marsh-brush 750,000	750	10											1,000
Muskrat	Marsh-brush 750,000	30	207											25,000
Coyote	All 1,700,000	680	44											2,500
Marten	Timber	12,000												100
Weasel	Timber	240	81											5,000
Wolverine	All refuge		1											
Wolf	All refuge	115,300												15
Lynx	All refuge	1,440	18											1,200
Snowshoe Hare	All refuge	4												500,000
Fox	All refuge	17,300												100

* List removals by Predator Animal Hunter

* List removals by Predator Animal Hunter

REMARKS:

Reported by John E. Kurtz

DISEASE

Refuge KENAI NATIONAL MOOSE RANGE

Year 1969

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.) _____

NONE REPORTED

Condition of vegetation and invertebrate life _____

Remarks _____

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 _____

NONE REPORTED

Remarks _____

Bureau of Sport Fisheries and Wildlife

PUBLIC RELATIONS
(See Instructions on Reverse Side)

Refuge KENAI NATIONAL MOOSE RANGECalendar Year 1969

1. Visits

a. Hunting 32,534 b. Fishing 50,575 c. Miscellaneous 125,240 d. TOTAL VISITS 208,349

1a. Hunting (on refuge lands)

TYPE	HUNTERS	ACRES	MANAGED BY
Waterfowl	635	75,000	BSF&W
Upland Game	7,964	1,200,000	BSF&W
Big Game	23,915	1,512,000	BSF&W
Other	20	1,200,000	BSF&W

Number of permanent blinds NONEMan-days of bow hunting included above 12

Estimated man-days of hunting on lands adjacent to
refuge 15,000

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

TYPE OF AREA	ACRES	MILES
Ponds or Lakes	153,000	
Streams and Shores		1,000

1c. Miscellaneous Visits

Recreation 42,875 Official 165
Economic Use 1,200 Industrial 81,000

2. Refuge Participation (groups)

TYPE OF ORGANIZATION	NO. OF GROUPS	NUMBER IN GROUPS	NO. OF GROUPS	NUMBER IN GROUPS
Sportsmen Clubs			1	11
Bird and Garden Clubs				
Schools	1	14	5	664
Service Clubs			8	222
Youth Groups			8	189
Professional-Scientific	1	40	7	125
Religious Groups			1	40
State or Federal Govt.			17	81
Other			1	23

3. Other Activities

TYPE	NUMBER	TYPE	NUMBER
Press Releases	24	Radio Presentations	0
Newspapers (P.R.'s sent to)	5	Exhibits	0
TV Presentations	1	Est. Exhibit Viewers	0

3-1757
Form NR-7
(Rev. June 1960)

(1)
NONAGRICULTURAL COLLECTIONS, RECEIPTS, AND PLANTINGS

Refuge KENAI NATIONAL MOOSE RANGE Year 1970

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
Alsike Clover							Russian River Fire	12a	200 Ac.	850	6/69		
Meadow Foxtail							Russian River Fire			1000	6/69		
Red Fescue							Russian River Fire			450	6/69		
Annual Rye Grass			9/69	BLM purchased			Swanson River Fire	12/a	400 Ac.	4600	9/69		

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

Total acreage planted:

Marsh and aquatic _____
Hedgerows, cover patches _____
Food strips, food patches _____
Forest plantings _____

Remarks: 350 lbs. Alsike Clover and 900 lbs. meadow foxtail
planted on Russian River Fire was seed we had on hand. Other
seed was purchased by USFS. BLM purchased 5000 lbs. annual
rye grass for the Swanson River Fire. They left the remaining
1400 lbs. with us.

(Rev. Jan. 1956)

Branch of Wildlife Refuges

Borough

BOROUGH KENAI PENINSULA BOROUGH

State ALASKA

NEGATIVE REPORT

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
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
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42	42	42	42
43	43	43	43
44	44	44	44
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46	46	46	46
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52	52	52	52
53	53	53	53
54	54	54	54
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62	62	62	62
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67	67	67	67
68	68	68	68
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72	72	72	72
73	73	73	73
74	74	74	74
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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				

*See instructions on back.

3-1759
Form NR-9
(April 1946)

COLLECTIONS AND RECEIPTS OF PLANTING STOCK
(Seeds, rootstocks, trees, shrubs)

Refuge KENAI NATIONAL MOOSE RANGE Year 1969

Species	Collections				Receipts		Total Amounts on Hand	Amount Surplus
	Amount	Date or Period of Collection	Method	Unit Cost	Amount	Source		
			/NOTHING TO REPORT/					

Interior Duplicating Section,
Washington 25, D.C. 84267

Refuge KENAI NATIONAL MOOSE RANGE Year 1969

Permittee	Permit No.	Unit or Location	Actual Acreage Utilized	Animal Use Months	Tons of Hay Harvested	Period of Use From - To	Rate	Total Income	Remarks
				<u>NEGATIVE REPORT</u>					

Totals:

Acreage grazed.....

Animal use months.....

Total income Grazing.....

Acreage cut for hay.....

Tons of hay cut.....

Total income Haying.....

TIMBER REMOVAL

Refuge KENAI NATIONAL MOOSE RANGE Year 1970

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
23 Free Use		Funny River	20	50 cords	---	-----	Dead & Down	Spruce
10 Free Use		Funny River	10	10 cords	---	-----	Dead & Down	Spruce
2 Free Use		Funny River	2	2 cords	---	-----	Dead & Down	Spruce
18 Free Use		Funny River	40	63,000 BF	---	-----	Refuge Regs.	Spruce
2 Free Use		Funny River	10	175 trees	---	-----	Cut at ground line	Spruce

Total acreage cut over 82 Total income -----

No. of units removed B. F. 63,000 Method of slash disposal lop & scatter
Cords 62
Ties -----

VALUES OF WILDLIFE AND RELATED RECREATION
ON THE KENAI NATIONAL MOOSE RANGE

A Report Submitted

to

Chief, Division of Wildlife Research
Bureau of Sport Fisheries & Wildlife
Department of the Interior
Washington, D. C.

by

Dr. Harold W. Steinhoff
Research Professor of Wildlife Management
Alaska Cooperative Wildlife Research Unit
University of Alaska, College, Alaska

September 1, 1969



Contents

	<u>Page</u>
Part I Introduction - A Summary of Values	1
Part II A Catalog of Values	3
A. Recreational Values	3
B. Esthetic Values	8
C. Educational Values	9
D. Biological Values	10
E. Social Values	10
F. Commercial Values	12
Part III Assignment of Values to Areas	14
Part IV Estimate of Future Values	16
Part V Appendix - Methods and Basic Data	18

VALUES OF WILDLIFE AND RELATED RECREATION ON THE KENAI NATIONAL MOOSE RANGE

PART I INTRODUCTION - A SUMMARY OF VALUES

How much are you asking for your backyard? What is your annual income in affection from your family? Analogous questions discourage many attempting to evaluate wildlife and related recreation. Yet competitive resources such as oil, timber, and agriculture can be measured in terms of dollar price and profit. Comparisons may be undesirable to some but they are inevitable. This report assumes we can make them legitimately, effectively, and successfully.

By "value" I mean the amount of one thing that can be exchanged for another. Value exists only in the minds of men, so an important question is, "Value to whom?" For this study we mean "value to the people of the United States, as owners of the resource." The whole is the sum of all its parts, so this includes value to individuals and to specified sub-groups, for example commercial fishermen.

Value is much time-related. We specify 1968 values, - those true for all or part of calendar year 1968. Values may be "area-related" or "thing-related". I have used the "area" approach, and attempt to value wildlife and recreation only on the Kenai National Moose Range (hereafter often abbreviated Range, Moose Range, or KNMR) or portions of it. Characteristics of the Range have been well described by Smith (1967).

Illegitimacy of application has been the major criticism of economic and other analyses of wildlife values. Usual uses of such data are either: (1) comparison with value of other resources, or (2) determination of rational investment in the wildlife resource. The principal objective of the following summary table is to present the values of wildlife and related recreation on the Kenai National Moose Range in a way that will show their proper use in such comparisons. The incommensurable values which cannot be expressed in dollars are usually more important than the economic expression. Descriptive expressions of these values are therefore listed first in the summary. All listed values should be considered every time one of the indicated comparisons is made. Fuller meaning of abbreviated expressions may be gained by study of the text in Part II. Methods are fully described and basic data are presented in the Appendix, Part V.

The expressions of value at column headings of the summary table on the next page are defined as:

Real Estate Sales Price - the wildlife value of the entire 1,730,000-acre Range if it were to be sold to a single real estate investor.

Annual Profit - net annual income to owners, the American public, over and above costs of managing and harvesting the wildlife and related recreational resources.

Total Expenditures - total dollar expenditures by visitors seeking wildlife and related recreation, for current expenses, travel, and equipment chargeable directly to their recreational visits to the Range in 1968.

Gross Sales Volume - equivalent to the gross sales of any specified commodity generated by any defined unit, for example the gross sales of all farm goods produced on the Kenai Peninsula. It includes the cost of producing and harvesting the commodity, plus the profit to the producer.

Possible Added Use Fee - toll that could be charged by a sole owner (monopolist) as an additional fee for recreational use of the area.

Personal Income Generated - that portion of expenditures of recreationists which flows into someone's pocket as income (primarily wages and salaries) either directly from the recreationist or by later exchanges of the same money, i.e. the "multiplier" effect.

Income Taxes Paid - federal income tax paid on the Personal Income Generated.

Contribution to GNP - 1968 contribution of expenditures of recreationists on the Moose Range to the Gross National Product.

SUMMARY OF VALUES OF WILDLIFE AND RELATED RECREATION ON THE KENAI NATIONAL MOOSE RANGE IN 1968

Wildlife Values	Real Estate Sales Price	Annual Profit	Total Expenditure	Gross Sales Volume	Possible Added Use Fee	Personal Income Generated	Income Taxes Paid	Contribution to GNP
Recreational	1. Two-thirds of owners think Range should be managed primarily for moose, other wildlife, and recreation. 2. Owners rated quality recreation and wildlife values high, other resource values low. 3. 358,000 recreation days were spent by 23,000 individuals from 6090 families. 4. 31,000 days of use by 200 rare trumpeter swans, and 65 young were produced in 1968. 5. 1,733,000 days of use by ducks and geese yielded \$26,000 for waterfowl exported for harvest off the Range. 6. 53% of owners said they would vote for a larger appropriation for the Range. 7. Wilderness, scenery, and wildlife are the reasons 1/3 of non-residents visited. 8. Policy statements at all levels of U. S. government place wildlife management and ecosystem protection first, wildlife-oriented recreation and research second, other resource uses completely subordinate. 9. Estimates of dollar value, computed by expenditures and consumers surplus methods, only. \$67,400,000 (\$39/acre) \$2,700,000 (\$21/rec.day) \$7,500,000 (\$21/rec.day) \$16,600,000 (\$100/yr./fam.) \$7/rec.day or \$5,700,000 \$1,100,000 \$6,840,000 (By 1980) \$290,000,000 \$11,600,000 \$31,000,000							
Esthetic	1. Owners, users, and managers rated esthetic values highly. 2. Nation was willing to forgo \$173,000 to protect esthetic values endangered by oil operations.							
Educational	1. Executive Order of President of the United States included education as a major objective. 2. Owners recognized education as the second most important value of the Range. 3. \$727,000 has been invested in 52 research projects on the Range in the last 27 years.							
Biological	1. Changes in ecology of the area will change the values, potentially drastically. 2. 42 moose-auto accidents in 1968 cost an estimated \$42,000 loss.							
Social	1. One-third of local families are dependent to some extent on the Range for a livelihood. 2. There are 3.4 wildlife place names per 100 square miles in the area. 3. 75% of Alaskans said the Range was one of the reasons they remained in Alaska.							
Commercial	1. Salmon produced on the Range contributed \$1,122,000, or 25% of the Inlet commercial fishermen's income. 2. 336,000 pounds of game meat was harvested on the Range in 1968, worth \$336,000. 3. The 1968 fur harvest on the Range totalled \$4000. 4. 47% of owners had read of the Range, most in paid magazine sources. 5. \$5,700,000 was spent in Alaska and generates other income.							

TOTAL VALUE The total value in each column is the descriptive values plus the dollar values listed.

PART II A CATALOG OF VALUES

RECREATIONAL VALUES

Economic

Recreation is voluntary activity, beyond that required for physical survival, to re-establish within oneself a sense of well-being (Lerner, 1963). Recreational values of wildlife are those related to sport and hobbies (King, 1947). Economic values are ones which can be expressed in money.

Clawson's Method The bewildering array of methods and variations thereof for assessing recreational values testifies to the difficulty of such assessment. We omit for the moment the question of "intangible" or "incommensurable" values. The crux of the problem is the legitimacy of method of assigning a dollar value to recreation, a resource not directly priced in the market. A modification of Clawson's (1959) method is most applicable to the Kenai National Moose Range. A local user who spends \$100 to hunt moose on the Range receives a "consumer's surplus" of \$900 compared to a non-resident who must spend \$1000. The total consumer's surplus of recreational visitors to the Kenai National Moose Range in 1968 was \$2,697,000.^{1/} In effect this is value placed in the pocket of the recreationist as profit, and is analogous to net income. A sole owner who charged the varying individual consumer's surpluses as entrance fees (a discriminating monopolist) could presumably recover this amount annually. The annual income may be capitalized at 4% to \$67,429,000 (or \$39 per acre) as market value of the Range for recreation. Capitalized value (also termed "real estate sales price") is the amount which a corporation would need to invest, at 4% interest, to gain the annual return of \$2,697,000.

Single Fee Method The sole owner would more likely charge the same entrance fee to all recreationists and he would naturally seek the fee that would yield the maximum net return. The demand curve computed in Clawson's method permits computation of this value also. The optimum single fee would be \$7 per recreation day^{2/}, recreationists would buy 131,737 days at this rate, for an annual income of \$922,000. Capitalized at 4% the market value of the Range for recreation would be \$23,054,000. The Clawson method would place the profit in the recreationists pocket while the Single-Fee method assumes all profit goes to the sole owner.

The optimum annual fee per family unit would be \$100. Some 2550 family units would purchase the use of the Range at this figure and would spend 141,692 RD's there. Annual income would be \$255,000 and capitalized value \$6,375,000.

Obviously few would pay the \$100 fee if initiated next year, to say nothing of the public outcry at the idea. We assume that once the public became emotionally adjusted to paying for recreation they would be willing to pay this much. Obviously also, the nation gains the greatest net return, ten times as much, by letting each participant pocket his consumer's surplus for himself.

Expenditures Method Much condemned as the illegitimate child of the assessment family, critics call unfair the inclusion of food costs in recreational expenditures, because "one must eat anyway." A second complaint is that recreational expenditures do not add "new" money to the economy but simply reallocate what would otherwise be

^{1/} Basic data and computations for this and subsequent figures are presented in the Appendix.

^{2/} A recreation day is a visit by one individual to a recreation area for recreation purposes during any reasonable portion or all of a 24-hour period (Joint Task Force, Ad Hoc Water Resources Council, 1964). Hereafter abbreviated RD.

spent elsewhere, - a sort of robbing Peter to pay Paul, and Peter objects! But other resources all charge the cost of food to the final product. The value of a log as it comes from the forest includes the cost of the logger's lunch, axe, and house trailer, just as the value of a recreational experience when it comes from the forest includes the cost of the moose hunter's lunch, rifle, and camper.

Several economists have pointed out that the second complaint is invalid because every expenditure, of any kind, for anything, is a "reallocation" from something else that might be purchased. So the expenditures method is a legitimate way to assess the recreational value of wildlife. Expenditures have been called "gross economic value" by some, but are more properly termed a "cost of production and harvest."

Recreational expenditures by visitors which may be assigned to the Kenai National Moose Range in 1968 totalled \$7,543,000. This figure may logically be compared with the cost of harvest of any other resource on the Moose Range, such as the cost of harvest of oil in 1968. Such oil expenses include the cost of equipment (depreciation and interest on investment) and labor, but not the cost or value of the resource itself, or of the amount of oil produced. Recreational expenditures cannot be capitalized, properly, because they are not income or profit to the resource owner in the usual sense. In fact they may be thought of as an expense.

The expenditures generated \$5,656,000 in personal income, on which \$1,131,000 were paid in Federal taxes, from an investment of only \$150,000, or 13% of this in management costs in the form of Congressional appropriations to the Range. State income taxes would total another \$100,000 to \$200,000. Contribution to GNP is 1.2 times personal income, or \$6,840,000. These figures are extrapolated from indices developed by Swanson (1969).

Pearse Method Pearse (1968) related consumer's surplus to salary classes rather than distance zones ala Clawson. He assumed the consumer's surplus for each hunter equal to the difference between his fixed expenditures and those of the hunter in his salary class who had the highest fixed expenditures. Two major questions have been raised about this method: one, only discretionary income (that portion not already committed to obligations and necessities of life) should be used; and two, the recreation day is a more logical unit than the trip (which Pearse used). A hunter who spends \$100 for a ten day hunt obviously receives more consumer's surplus than a hunter who spends \$100 on a one day hunt. Pearse also included the "opportunity cost" (wages that might have been earned) of time spent on the hunt, as a part of fixed cost.

A modified Pearse method applied to the Range shows a consumer's surplus of \$87,859,000 for 1968. Use of the recreation day rather than the visit resulted in the high figure. If we assume that everyone receives as much value as does the most affluent and lavish spender, this is an indication of maximum profit the recreationists received on the Kenai National Moose Range in 1968. The capitalized value is \$2,200,000,000!

Combination Method The recreationist is both producer and consumer of the recreational experience. His costs are his expenditures and the opportunity cost of time he invests. His profit is the consumer's surplus. The total is comparable to the sales price of other products. The recreational experience is analogous to the log, fresh salmon, barrel of crude oil, or sack of potatoes on the homesteader's truck. The gross sales volume of recreation on the Moose Range in 1968 was \$16,560,000.

Expenses + Profit = Sales Price or

(Recreational Expenditures + Opportunity Cost of Time) + Consumer's Surplus = RSP
Sum of RSP's (Recreation Sales Price) = Gross Sales Volume

Expenditures	\$ 7,543,000
Opportunity Cost	6,320,000
Consumer's Surplus	2,697,000
Gross Sales Volume	\$16,560,000

Opinions Actions, especially the crossing of palms with silver, speak louder than words. Nevertheless, opinions are indications of value too. About 50% of 1968 visitors to the Range said the experience was of priceless value in addition to what they had to spend. And 95% said that it was worth at least a moderate additional amount. Residents and non-residents were much alike in response to this question.

Almost 50% of a sample of 126 U. S. citizens, owners of the Range, who did not use the Range in 1968 said they would travel more than 1500 miles to visit it. Fifty-three percent said they would vote for a greater appropriation for the Range, 40% indicated the same as the current appropriation, and 7% said they would vote for less or none. These proportions were consistent among salary classes as shown by a non-significant chi-square. A vote by the owners of a public resource is one important way to express value, and a vote involving appropriations is a very tangible evidence of it. This may be an example of "option demand", - willingness to pay for the option to use the resource later (Krutilla, 1967).

Values shown by these opinions are difficult to assign to a type of wildlife value, but the "recreational" category is the most logical one.

Exports In addition to recreational experiences consumed on the premises, some are exported for consumption elsewhere. Migratory birds, which transport themselves, and pictures and writings transported by artists and authors are examples.

Some 1,733,000 waterfowl days were spent on the Range in 1968 by ducks and geese which were available for hunting off the Range during the year. If we assume 334 days (i.e. 11 months) as the average life of a duck, a 50% allowable annual harvest, and a value of \$10 per duck or goose harvested, this totals a value of \$26,000 produced on the Range in 1968 in the form of waterfowl exported for potential harvest. In addition to this, 31,000 days of use by 200 trumpeter swans were provided and 65 young swans were produced. Maintenance of a rare and until recently endangered species is a priceless value. Add to this the recreational pleasure and esthetic value brought by the thousands of song birds, cranes, loons, and eagles produced and supported on the Range but moving elsewhere for harvest by binocular and at bird feeding stations.

Moose produced on the Range move outside to be hunted, but imports from the Chugach National Forest to the east, which are killed on the Range, probably balance the exports.

Pictures of the area and stories about it are exported for vicarious recreation by people who never will visit the Range themselves. At least one motion picture photographer completed a feature film on the Moose Range in 1968. He pictured wildlife and recreation on the Swan Lake Canoe Route. Pictures of salmon appeared in the National Geographic Magazine and several wildlife and scenic pictures published in the Alaska Sportsman were from the Moose Range. Though of small intrinsic value, such pictures impart considerable value to the Range through vicarious enjoyment of those who view them. This is evident in the high percentage (47%) of owners who had read of the Kenai National Moose Range. Of these 66% had read of wildlife observation, 64% of hunting, and 55% of fishing and wilderness adventure on the Range. The public is not directly aware of this value, because only two to six percent of users and owners alike considered commercial photographs, as well as other commercial wildlife values, an important value of the Range. Of the two groups, owners valued it highest.

Fines Though not intended by either donor or recipient as an economic expression, fines for violation of sport fishing or hunting regulations are a source of income to the state and express the cost of a "recreational" experience to the violator. In 1968, 53 convicted transgressors on the Moose Range paid \$1475 in fines, an average of \$28 each. The market value of a recreation day is \$46, so the miscreant made \$18. A rational basis for setting fines might be at least the value of the stolen commodity, - the RD involved.

Incommensurable Values

Devine (1966) has distinguished between incommensurable, i.e. cannot be expressed in the common unit such as dollars, and intangible, i.e. incapable of quantitative measurement. Non-economic recreation benefits are here regarded as incommensurable rather than intangible because they are measured in some way by opinions of users, owners, and managers. Users are represented by visitors to the Range in 1968, owners by a small national sample of persons who did not visit the Range, and managers by federal officers at all levels responsible for the Range.

Over 23,000 individuals, in 6090 families, used the Range for wildlife and recreation in 1968. They spent 358,319 recreation days there. This figure corresponds well with the Moose Range staff report of 588,133 12-hour visitor use days. These figures alone represent a considerable, concrete expression of value.

Resource Values "Quality Recreation" uses edged out "Wildlife" uses as most important on the Kenai National Moose Range in the minds of the public at large and (perhaps strangely) the managers. Only the resident users rated wildlife uses as highest. "General Recreation" was third, "Other Renewable Resources" fourth, and "Non-Renewable Resources" (oil and mining), and "Business and Commercial" uses last. Many of the last two were rated "Not to be permitted". This seems a clear mandate from the owners and major users of the Range to value quality recreation (cross-country skiing, photography, wildlife observation, hiking, sightseeing, sail boating, canoeing, and wilderness) above all other uses, with wildlife a close second choice.

Table 1. Ranking of resource uses to be permitted on the Kenai Moose Range.

Resource Use Group	Users			
	Residents	Non-Res.	Owners	Managers
Quality Recreation	1.5 ^{1/}	1.4	1.6	1.3
Wildlife	1.3	1.4	1.8	1.4
General Recreation	1.8	1.8	2.0	2.2
Other Renewable Resources	3.2	3.2	3.2	3.6
Non-Renewable Resources (Oil & Mining)	3.4	3.5	3.4	3.6
Business and Commercial	3.4	3.3	3.5	3.8

^{1/} Mean score. 1-Highest use; 2-Intermediate use; 3-Lowest use; 4-Not to be permitted.

Wildlife Values Recreational use of wildlife is the Number One wildlife value of the Kenai National Moose Range with the closely related esthetic value of wildlife close behind in the minds of users, owners, and managers (Table 1). Educational value is third, social value fourth, and commercial value last. This is an expected result, here tabulated in tangible terms.

Table 2. Ranking of wildlife values of the Kenai National Moose Range.

Wildlife Value	Users		Owners	Community		
	Residents	Non-Res.		Leaders	Managers	Consensus
Recreational	1	1	1	1	2	1
Esthetic	2	2	3	2	1	2
Educational	3	3	2	3	3	3
Social	4	4	4	4	4	4
Commercial	5	5	5	5	5	5

Managers are more concerned with the value of the beauty of the area than its recreational use. To owners, education is more important than beauty.

Management Values Non-market resources are usually publicly-owned or publicly-controlled, and as such their allocation depends not only on the expressed or implicit will of the people, but on their chosen leaders and experts (i.e. managers), who the public trusts to make wise decisions on allocation. Thus opinions of managers are important in determining the value of the KNMR. Policies of managers of the area indicate values they hold, - a combination of personal values and those they think the area has for the people as a whole. The President of the United States is the top manager and has already expressed his evaluation on December 16, 1941, in Executive Order 8979 of Franklin D. Roosevelt, "for the purpose of protecting the natural breeding and feeding range of the giant Kenai moose...a unique wildlife feature....for the study in its natural environment of the practical management of a big game species..." This position has never been amended by a succeeding President.

In 1962 Congress expressed its intent that the National Wildlife Refuges be used for outdoor recreation (Refuge Recreation Act, Public Law 87-714), provided that the primary purpose of the refuges was not compromised. Subsequently in 1964 the "Recreational Policy on National Wildlife Refuges" of the U. S. Bureau of Sport Fisheries and Wildlife stated that public recreation is a secondary use (to wildlife) of national wildlife refuges and ranges, and that "These uses will be authorized where there is a significant local or national recreational need which can be met without conflict or interference with primary objectives..." Wilderness is appropriate in portions of larger areas compatible with the primary function.

The Advisory Board on Wildlife Management (the "Leopold Committee") of the Department of the Interior reiterated in their 1968 report the primary objective of protection and management of waterfowl and rare, unique, or endangered species. They raised preservation and restoration of natural ecosystems to equal status as a primary objective. Important secondary objectives were wildlife viewing, hunting, fishing, and research. Only recreation oriented toward wildlife and fish was considered appropriate.

Director Gottschalk, Bureau of Sport Fisheries and Wildlife, recently said that "The Bureau will continue to work to safeguard the ecological, recreational, cultural, scientific, and economic values of game and non-game migratory birds and their habitats."

Dr. J. P. Linduska, Associate Director of the Bureau, emphasized quality recreation as an outstanding secondary purpose of refuge areas, in two phases. The first phase is wildlife-oriented recreation which has highest priority, but a permissible second phase on some refuges is "the accommodation of compatible but nonwildlife-oriented activities for which adequate funds are available" (Linduska, 1968).

Refuge Manager John Hakala and his staff in 1968 prepared a master plan for the Range which stresses a policy of quality recreation and includes a zoning of high-intensity recreation use, wilderness, areas of minimum intrusion for wildlife viewing, wild-area on canoe routes, and areas secluded for moose calving and wintering, and browse production.

Values described in the last few paragraphs are most important because they guide decisions of men who most directly affect the area.

Management Recommendations of Owners Opinions of owners confirm present policies of managers of the area. Almost two-thirds think the Range should be managed primarily for moose, wildlife, and recreation. Thirteen percent think more recreational development is needed, and 12% would dedicate it all to wilderness. Only a few owners recommend holding it unused for future generations, giving it to native peoples, or trying to receive the greatest dollar return. None thought the Range should be sold to private owners.

8

Reasons for Visit Recreational value is indicated by reasons users give for visits to the area. Non-residents stress wildness, scenery, and wildlife first, reputation next, and facilities third. (Table 3) Residents emphasize accessibility first, facilities next, and wilderness, scenery, and wildlife third. Both place other resources in last place. Residents and non-residents alike spent 60% of their recreational visits on the KNMR in 1968. Consistent with the resident's love of accessibility is indication by 76% of them that the Kenai National Moose Range is one of the factors which influence them to stay in Alaska.

Table 3. Reasons for visit to the Kenai National Moose Range.

Residents		Non-Residents	
Accessibility	25%	Wildness, Scenery, & Wildlife	33%
Facilities	23	Reputation	26
Wildness, Scenery, & Wildlife	23	Facilities	20
Reputation	16	Accessibility	15
Other Resources	13	Other Resources	6

ESTHETIC VALUES

Our materialistic society surprisingly seems overwhelmingly to vote for esthetic values. Such values of wildlife are wildlife objects and associated environment possessing beauty, affording inspiration, and contributing to the arts (King, 1947). The average visitor scarcely distinguishes between the re-creation of mind, spirit, and body from the beauty of wildlife and environment which stimulates pleasure and satisfies artistic hunger. Thus part of the "Recreational" value, both economic and incommensurable, should be assigned here.

Rankings by Visitors

High ranking of esthetic values in relation to recreational ones is indicated in: (1) Tables 1 and 2; (2) ratings by managers who are most professionally aware of values; and (3) Table 3, where non-residents indicate esthetics as a major reason for their visit to the Range. A sizable portion of the \$16 million dollar market value of recreation on the Range would be assignable to esthetic value, if we knew how to do so. Much of the additional worth of the experience claimed by 95% of the visitors is attributable to the esthetic aspect.

Diseconomic Values

Costs or losses to one resource because of another resource are known as "external diseconomies." The extra cost of oil exploration, development, and production on the Kenai National Moose Range in order to maintain esthetic values is an example. Extra costs accrue because of narrow seismic trails, less heavy equipment, seismic operation only with snow cover and on frozen ground, careful containment and disposal of wastes during drilling, and restoration of areas by levelling, reseeding grass, and replanting trees after exploration, development, and pipeline construction. Although some of these measures are aimed at direct protection of wildlife (including commercial fisheries) and its habitat, most are aimed at preserving the esthetic beauty and the natural environment. Oil companies estimate that extra costs total 10% to 50% of their expense for exploration and development. The total extra cost for all oil operations on the Range in 1968 is estimated at \$173,200. In earlier years the cost was greater because exploration and development activity was more intense, sometimes twice as great, or about \$350,000.

Viewed nationally, this amount is profit which the public was willing to forgo, and this is an expression of value of wildlife and related recreation on the Range. It should be added to the primary market value of wildlife, given earlier, because it is considered a part of the expense of production of the wildlife experience, and is

thus not already included in the costs (expenditures and opportunity cost) listed previously. To the oil company it is a loss (or added expense), to the public it is a cost of the wildlife experience.

The diseconomy oil imposes on wildlife and recreation includes loss of 20 square miles of habitat and recreational area due to oil roads, pipelines, air strips, and oil well sites (Hakala, personal communication). This totals 0.7% of the Range, a loss of \$470,000 in value.

EDUCATIONAL VALUES

President Franklin D. Roosevelt declared in his Executive Order that "study in its natural environment of the practical management of a big game species that has considerable local economic value" was a major purpose of establishment of the Kenai National Moose Range. Thus the singular voice of the people spoke forcefully from the first, of the educational value of the area. Educational values are those which add to man's knowledge, either collectively through research, or individually through personal learning. In this day, when the light of appreciation of environments is just dawning, a still-wild and natural area such as the Kenai National Moose Range is invaluable for the study of natural environments.

Research

Approximately \$727,000 has been invested in 52 separate identified research projects on the Range. Moose were a primary interest in 28 studies, and 21 of these were concerned with moose range. Other research featured trumpeter swan, Dall sheep, goat, beaver, general and plant ecology, fisheries, fungi, spruce grouse, erosion control, ice fields, and lake morphometry. Nineteen studies are continuing. At least nine known technical publications have resulted, in addition to annual and final reports of most projects.

The type specimen of the Alaska moose was taken in 1897 near Tustumena Lake. The group of Stone caribou in the Chicago Natural History Museum were taken in the general area around 1900. Several wolf specimens came from the Kenai. The howl of descendant of their survivors is once again heard on the Range, - a naturally restored value. George Shiras III collected and photographed in the Skilak Lake area in 1911, and wrote a book as a result. C. Hart Merriam had bear specimens from the Kenai for his taxonomic studies. Two Dall sheep from the KNMR grace the Copenhagen Museum of Zoology since 1963. In more recent years the Arctic Health Research Laboratory has small mammal collections from the Moose Range. All these examples indicate educational value.

Personal Learning

Seventeen groups totalling 578 people visited the Range, at least partly for educational reasons in 1968. Students in wildlife biology at the University of Alaska made their annual one-week field trip to the Range. The Alaska Conservation Society and the Sierra Club conducted group recreation-education hikes in the area. Writings about the area in books and magazines provides a combination of education and recreation. Almost 50% of owners had read of the Range, mostly wildlife accounts (40%), general recreation (23%), and quality recreation (21%). Owners ranked education as the second greatest value of the Range, ahead of esthetic, social, and commercial values (Table 1). Community leaders of Kenai and Soldotna rated educational value in third place, but only 3 out of 11 spontaneously mentioned education as one of the values the Moose Range contributes to the community.

All groups came back strongly to recognize education in the form of "wildlife observation" and "wildlife research" as a top use of the Range in comparison to other resources (Table 4).

Table 4. Rating of educational factors as "highest uses" of the Range

Use	Users			
	Residents	Non-Res.	Owners	Managers
Wildlife Observation	75 ^{1/2}	71	72	100
Wildlife Research	67	54	76	88

^{1/} Percent rating the use as a "highest use" of the Range.

BIOLOGICAL VALUES

Do you want to "blow your mind" ala the hippie? Then worry about biological wildlife values. King (1947) defined these as the worth of services rendered by wild animals. In the broad sense "wildlife" includes all wild animals, - beetles, nematode earthworms, and mosquitoes, as well as moose, salmon, and ptarmigan. So we are really talking about ecology, - energy cycles, coactions, and population dynamics. All the ecology of a moose is integrated in one fact, - the presence of the moose. Similarly, the economics of the ecology of the Range is integrated in one value, - the value of the wildlife experience. The worth of a nematode which produces organic material for moose food shows up in the expenditure of the moose hunter. So we have already tallied most of the biological values at their end point of consumption. Detailing the processes that contribute to these values is far beyond the scope of this report.

Two special ideas are worth mentioning. One, the ultimately expressed values of dollars in the pocket or gleams in the eye are affected just as much or more by change in biological complexes as they are by immediate manipulation of moose herds and picnics. A change in biological values inherent in the moose-wolf relationship will change the wildlife value of the area subtly but profoundly. Thus any economic system devised, computerized, and de-humanized must take into account the operative biologic systems. We must use bioeconomic systems!

Second, for the first time, negative economic values (i.e. losses) rear their ugly head. Moose-auto encounters and mosquito bites are an economic or esthetic loss in most cases. Officially recorded moose-auto accidents in 1968 totalled 42 and cost an estimated \$42,000 dollars. Losses due to bears were perhaps balanced by increased value of recreational experience and education associated with the loss.

SOCIAL VALUES

Social values of wildlife are both intangible and incommensurable. King (1947) defines them as "values accruing to the community as a result of the presence of wild animals." These values are demonstrated by what people do, say, and commemorate.

What People Do

Buckley (1957) said that "well over half of the wage-earners in Alaska are dependent to a greater or lesser extent upon wildlife for their livelihood." The 1960 population close to the Moose Range was one-third the 1968 population. If we assume all increase was related to oil, and that all the pre-oil population was dependent to some degree on wildlife and related recreation, then one-third of the 1968 population of 7500 close to the Moose Range are dependent directly on wildlife and related recreation. These dependencies come from commercial fishing, providing goods and services for hunters, fishermen, and other recreationists, and from food provided by game meat. Many families purchase practically no domestic meat, year-around.

Fifty percent of nearby families use the Range for recreation. Family participation is shown by the average of 7/party for swimming, 6 for picnicking, 5 for camping, 4 for fishing, 3 for general hunting (including moose), and 2 for sheep and goat hunting. People within 300 miles of the Range use it at a rate of 2.73 recreation days per person, - obviously a major investment of time.

What They Say

Wildlife and recreation rival the weather as a topic of social conversation on the Kenai Peninsula. I have no measure of this, but frequency of wildlife topics in conversation is high. Approximately 13% of the column inches of news in the Cheechako News is conservation-related, and about 5% relates quite directly to the Kenai National Moose Range.

What They Commemorate

Names of local features such as lakes and streams indicate things held dear in the minds of namers. Wildlife place names occur at the rate of 3.4 per 100 square miles on the Moose Range, with each feature name counted only once. I know not how this index compares with other areas, but suspect one name per 100 square miles would be high for remote areas of the nation.

Other Ratings

Users, owners, and managers rated "social" in fourth place among wildlife values of the Range. Since they rated it higher than "commercial", presumably social values would have a higher dollar value than commercial ones, if they could be so expressed and measured. The 75% of Alaskans who said the Range was one of the reasons they remained in Alaska expressed a social value.

What Community Leaders Say

Only a few of the 11 community leaders interviewed recognized social values of the Range. Mostly they thought of the recreation it provides the citizens of the community and the income the communities derive from recreation on the Range.

Socio-Economic Characteristics of Users

Socio-economic characteristics of users indicate segments of society which value the wildlife and recreation of the Range highly enough to use it, and those who receive the major benefit. Whether or not these are the kind of people we want to encourage and reward in our society is a matter of personal philosophy and value judgments. They are presented here for your own interpretation. Data for "All" in Tables 5, 6, and 7 are from the U.S. Census Bureau.

Table 5. Comparison of occupations of users of the Range and the entire United States

Occupation	Residents		Non-Residents	
	Users	All(1968)	Users	All(1967)
Skilled Workman	27%	16%	35%	29%
Professional	27	10	23	12
Business, Sales, Administrative	20	29	16	31
Armed Service	19	35	1	2
Retired	2	4	31	20
Other (Laborer, Housewife, Student)	5	5	5	6

Users include a higher proportion of skilled workmen and professional, and a lower proportion of businessmen, salesmen, administrators, and armed servicemen than all the population. Non-resident retired users are in higher proportion than retired members in the population.

Table 6. Comparison of family income of users of the Range and all comparable citizens.

Salary	Residents		Non-Res.	
	Users	All	Users	All
Under \$2000	1%	4%	1%	12%
\$2000 - 3999	2	11	3	14
\$4000 - 5999	4	15	12	14
\$6000 - 7999	5	17	11	16
\$8000 - 9999	8	15	16	14
\$10,000 - 14,999	32	17	30	19
\$15,000 and over	46	20	27	10

Users are definitely in the higher income brackets. User-All patterns are similar for residents and non-residents. Alaska user family incomes are phenomenally high.

Table 7 Comparison of age of users of the Range and all comparable citizens.

Head of Household Age Group	Residents		Non-Residents	
	Users	All (1960)	Users	All (1967)
25 and under	7%	28%	4%	6%
26 - 35	35	27	13	17
36 - 45	31	21	18	20
46 - 55	21	13	23	20
56 - 65	5	7	30	17
66 and over	1	4	11	20

Alaskan users are early middle age and non-residents are late middle age compared to all citizens. Alaskans as a whole are much younger than non-residents.

COMMERCIAL VALUES

Contribution to Commercial Salmon Catch Salmon produced on the Range contributed \$1,122,000, or 25% of the commercial salmon income to the commercial fishermen of Cook Inlet in 1968, a "pink salmon year". The Range contributes 31% of the Cook Inlet commercial salmon fisherman's income, omitting pink salmon. Some years the proportion may be as high as 40% (Bureau of Sport Fisheries and Wildlife, 1963). Its retail value after processing at the cannery was \$3 million. No indices exist to allocate the portion of this value actually produced on the Range. On livestock ranges of the western United States the value of a calf is 10 to 20% of the value of the marketed steer. If this analogy is valid, the value to the Gross National Product in 1968 of commercial salmon produced on the Kenai National Moose Range was \$150,000.

Meat An estimated 336,000 pounds of meat were harvested on the Range in 1968, about 75% moose (250,000 pounds) and most of the rest salmon at Russian River (76,000 pounds). At one dollar per pound, a conservative figure, the value in 1968 was \$336,000. Nineteen percent of resident visitors said wildlife meat made a major contribution to their food supply year around and only two percent said they did not consume game meat.

How is the value of game meat to be regarded in an economic analysis? Is it extra income to be added to values of expenditures? Or an expected return on the recreational investment, to be deducted if one is computing the value of the recreational experience itself? To the extent that the meat was not a conscious goal of the recreation experience, it is a bonus, without cost. Thus its value is a commercial one, additional to the value of the recreational experience. If the meat was part of the purpose for the visit, its value should be deducted from the value of the recreational experience and tallied as a commercial value of wildlife. Probably a fair proportion of meat harvested on the Range in 1968 falls in this category, especially of the moose meat, but the amount is unknown.

Hides and Furs Very few moose hides are salvaged or tanned, though some potential value exists in use of this resource. Fur trapping is primarily recreational, and its value has been included with recreational expenditures. Market value of furs harvested in 1968 totals \$4014. The average annual income for 1963-1967 was \$4669, at 1968 prices. Allocation of this value should follow principles discussed in the previous section.

The Businessman? We deal with primary values to the nation at the point of consumption, in this analysis. Secondary benefits of those who sell wildlife goods and services, - the multiplier effect, is not measured. However, the businessman's benefit is roughly equal to the expenditures of \$7.5 million annually. Of this, \$2.4 million are current expenses which go largely to the local economy, \$1.3 million are transportation expense in Alaska, \$0.4 million is transportation elsewhere, \$2 million for equipment in Alaska, and \$1.4 million for equipment elsewhere. This totals \$5.7 million spent in Alaska and \$1.8 million spent elsewhere in 1968 by visitors to the Kenai National Moose Range.

PART III ASSIGNMENT OF VALUES TO AREAS

Resource decision of the future often will be made on smaller areas, rarely on the whole Range at once. At first I wanted to allocate all values to defined smaller areas of the Moose Range. Insufficient information exists to do this. The closest I can come is a percentage allocation to areas defined in Figure 1 and listed in Table 8

Table 8. Allocation of values of wildlife and related recreation to areas of the Range

<u>Area^{1/}</u>	<u>Percent of Value Allocated</u>
1. Chickaloon Flats	1.3
2. Northern Lakes	3.7
3. Swanson River-Swan Lake Canoe Systems	16.7
4. Kenai-Russian Rivers Campground	30.7
5. Skilak Loop	27.3
6. Area Between Skilak and Tustumena Lakes	5.0
7. Tustumena Lake	6.3
8. Area South of Tustumena Lake	3.7
9. Mountain Area on the East Side	5.3
	<u>100.0</u>

^{1/} Defined in Figure 1.

A similar allocation could be made to recreational uses of the Range from primary and secondary uses indicated by 1968 visitors.

Table 9. Allocation of values to recreational uses of the Moose Range.

<u>Group of Uses</u>	<u>Percent of 1968 Uses</u>
Fishing	22
Hunting	18
Camping and Picnicking	15
Relaxation and Driving	14
Wildlife Observation, Photography	12
Berrying	4
Hiking, Horse Use	4
Water Sports	4
Canoeing	3
Winter Sports	2

This distribution does not correspond closely to that reported by the Range staff for 1968, which showed 92% of the "visitor use days" in the first three categories. Sixty-seven percent of the use was allocated to camping and picnicking alone. The discrepancies are due partly to differences in method and partly to differences in interpretation. In this report camping is categorized as a use only if it was an end in itself, not merely for convenience or inexpensive living while pursuing another use such as salmon fishing. This study, Range reports, nor any other studies have effectively considered allocation of use and purpose among the family members of a visiting unit. The father may come primarily to fish, the mother to relax, one child to camp, and another to swim. A similar more precise allocation could be made of the multiple objectives and uses by each individual in the family.

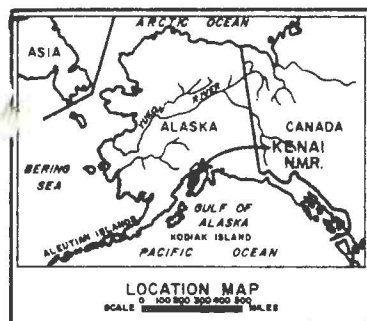
KENAI NATIONAL MOOSE RANGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

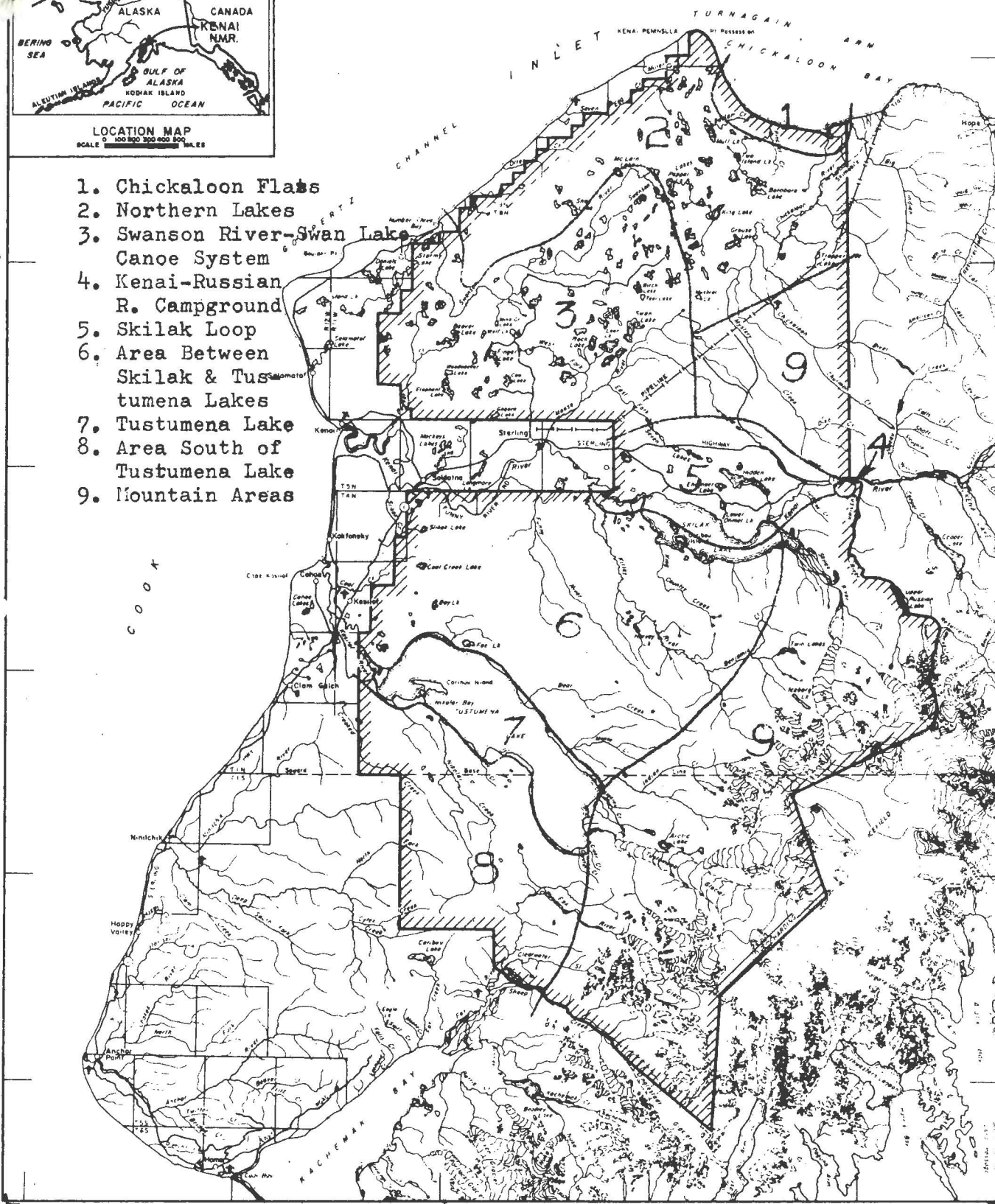
ALASKA

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

15



1. Chickaloon Flats
2. Northern Lakes
3. Swanson River-Swan Lake Canoe System
4. Kenai-Russian R. Campground
5. Skilak Loop
6. Area Between Skilak & Tustumena Lakes
7. Tustumena Lake
8. Area South of Tustumena Lake
9. Mountain Areas



COMPILED IN THE DIVISION OF ENGINEERING
FROM SURVEYS BY U.S.G.S & B.S.F. & W.

Fig. 1. Recreational areas of the KENAI NATIONAL MOOSE RANGE
SEWARD MERIDIAN



TOWNSHIP
DIAGRAM



MEAN
DECLINATION

PORTLAND, OREGON

Scale 0 5 10 15 20 25 MILES

IR ALASKA 362 408

PART IV ESTIMATE OF FUTURE VALUES

Economic values of wildlife are related to commodity price and salary, so I assume any future user of the preceeding sections will adjust values to the consumer price index. The 1968 mean index was 121, based on a 1957-59 index of 100.

By 1980 I estimate use of the Range will increase 184% over 1968, to 1,019,000 recreation days. Expenditures and consumer's surplus will increase 311% to \$31 million and \$11.6 million respectively. Capitalized market value of the Range for recreation, at 4%, will be \$290 million. Increase in dollar value compared to recreation days is greater because of assumed continued inflation and a greater proportion of non-resident who spend five times as much per recreation day.

These figures are based on federal and state agency estimates of increases in population and tourist travel by 1980, and on expected construction of the Turnagain Arm Causeway. They are believed conservative. The wildlife and related recreational resources of the Kenai National Moose Range are rare commodities. Many of them are unique. They are in short supply, and more cannot be produced at will on the assembly line. To paraphrase Cooley (1967), the acreage of the Moose Range in 1492 had almost no value to the white man because it was unknown. Today the 1,730,000 acres have great value. In 1980 they will have proportionally much greater value because of 2.84 times the demand with the same number of acres.

What was the value to the natives of the area in 1492, and what would it have been worth to them today, if the white man had never come? Data from Hickok (1968) indicate about 2000 Kenaitze Indians (a sub-grouping of Tanaina Indians in villages of the western Kenai Peninsula) lived adjacent to the Kenai National Moose Range in 1805. Most lived in 10 villages along Cook Inlet from Nikishka on the north to Anchor Point at the south. One village, Skilak, existed on the south shore of Skilak Lake, the only village on the area presently Moose Range. If we assume that their population was stable at carrying capacity, and that they received only commercial wildlife benefits of salmon (\$150,000), moose meat (\$407,000), and furs (\$4014) from the Range equal to the 1968 harvest, the 1492 A.D. value would have been \$490,000, adjusted to the 1968 consumer price index. With an assumed continued hunting and fishing subsistence culture, in the absence of the white man the Kenaitze population, natural resource harvest from the Moose Range, and 1968 dollar value to the Kenaitze would be the same as in 1492, \$490,000, which capitalized at 4% would mean a real estate sales value of \$12,250,000.

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PART V APPENDIX - METHODS AND BASIC DATA

The study was financed by the U. S. Bureau of Sport Fisheries and Wildlife through a contract with the University of Alaska administered by the Alaska Cooperative Wildlife Research Unit. Colorado State University furnished sabbatical half-salary to Dr. Harold W. Steinhoff, the principal investigator. The Society of Sigma Xi provided a grant-in-aid to assist in transportation expense to Alaska.

The project was conducted in residence on the 1,730,000-acre Kenai National Moose Range between June 20, 1968 and September 1, 1969. Special assistance of the Range staff, John Hakala, Robert Richey, Robert Seemel, John Kurtz, Mrs. Harvey Stroud, and Betty Raymond, and of Dr. David Klein and Secretary Norma Wrightsman of the Alaska Unit, is here acknowledged. Marian Steinhoff assisted with recording of field data, mailing questionnaires, and many hours of statistical coding. Many others contributed ideas and information, not least of which were 1569 respondents to questionnaires. John Noland, Systems Analyst, spent much personal time and interest in programming and processing of data. Computer tapes which contain basic data, and programming information are retained in the files of Harold Steinhoff and are available for use by others.

METHODS OF STUDY

Questionnaire I - Values and Attitudes of Users

Estimate of Number of Non-Duplicated Recreation Units The family was chosen as the sampling unit and was designated a recreational unit (RU). The target population was every RU which used the Kenai National Moose Range in 1968. I attempted to obtain a 100% sample from July 3 on. RU's (as recognized by one vehicle per RU) and license numbers were recorded daily in campgrounds and roadsides of the 60-mile "Skilak Loop" from July 3 to September 8, and weekly until October 10, 1968. Similar counts were made weekly on the Swanson River-Swan Lake Road, and periodically at Tustumena Campground. Repeat license numbers were eliminated.

Canoeists were listed from registers on the canoe routes, and duplicates eliminated.

Fly-in fishermen numbers were estimated and some names obtained from six air charter services in Anchorage. Kenai air charter services stated they did not fly anyone to the Range. Names of individuals who filed flight plans on the Moose Range in 1968 were obtained from the Federal Aviation Agency office in Kenai.

A complete computer listing of 1968 moose and sheep hunters in Unit 15 was obtained through the Alaska Department of Fish and Game from the University of Alaska computer center. Persons were selected from this list who hunted in one of the sub-units of the Moose Range. Other listings of users in 1968 included brown bear harvesters, trappers, and Sierra Club visitors.

The aggregate of these sources constituted the known RU visiting the Kenai Moose Range in 1968. Duplicates were eliminated. Total numbers were estimated as follows:

Table 1A. Estimate of number of non-duplicated recreation units on the KNMR in 1968.

Summer Campers and Fishermen	Alaska	Other States
Actually identified in 60 days, 7-3 through 9-8-68	2025	697
This would make a New RU/Day rate of	33.75	11.62
Assumed error of those missed, 10%	3.38	1.16
Assumed actual New RU/Day rate	37.13	12.78
Assume 50% of this rate in June and 34% in May, (Alaska only), corresponding to monthly use estimates in the KNMR office	June 18.9 May 12.6	6.5
Estimated actual New RU, 7-3 through 9-8-68 (68 days X rate)	2525	869
6-7 through 7-2-68	491	169
5-1 through 6-6-68	466	
Moose and Sheep Hunters (100% of non-duplicated)	909	33
Canoeists (assumed 50% registered, so this is 2X the count)	266	92
Fly-in Fishermen (estimated from interviews with guides)	200	50
Misc. (Non-dup. trappers, skiers, ice fishermen, etc.)	20	
TOTAL RECREATION UNITS USING KNMR IN 1968	4877	1213

Questionnaire I and Responses Each identified RU was sent Questionnaire I. Names and addresses of vehicle license holders were obtained from vehicle license bureaus of states concerned. Questionnaire was addressed to the male who appeared to be the head of the family. Those to summer users were sent on February 3, 1969 and a follow up postcard sent to non-respondents on March 7. Questionnaires were sent to moose hunters and sheep hunters on March 26, 1969 and follow-up postcards on April 25. Returns were coded on optical mark scan sheets until May 19 when they were delivered to the Anchorage Borough School District computer center for processing. Alaskan returns were 47%, non-residents 40%. The 44% average response is good, considering the complexity of the questionnaire. It actually represents a 28% sample of all RU's on the Range in 1968. Buckley's (1955, 1957) earlier Alaska study achieved a 52% return, but this represented a sample of only 2.5% of his target population. Pearse (1966) attained a 3.4% sample, and Brown et al. (1964) a 0.45% sample of their target populations. Response was proportionally distributed through user groups as shown in Table 2A.

Table 2A. Distribution of Questionnaire I among user groups of the Moose Range.

User Group	Questionnaires		Percent
	Sent	Returned	Returned
Summer Campers & Fishermen	2707	1177	43
Moose Hunters	860	402	47
Canoeists	179	87	49
Sheep Hunters	82	35	43
Airplane Owners	35	9	26
Sierra Club	22	16	73
Trappers	14	5	36
Brown Bear Hunters	9	4	44
Total	3908	1735	44

Note: These are classified by source of name and address, unduplicated. Since summer campers and fishermen were identified first, they include many moose hunters, canoeists, and sheep hunters who are therefore omitted from the moose canoe, and sheep totals.

A further important question is whether essential characteristics of non-respondents differ from respondents in a way that would affect their expenditures, recreational uses, and other values they express on the questionnaire. Occupation wa



ALASKA COOPERATIVE WILDLIFE RESEARCH UNIT

UNIVERSITY OF ALASKA
ALASKA DEPARTMENT OF FISH AND GAME
UNITED STATES FISH AND WILDLIFE SERVICE
WILDLIFE MANAGEMENT INSTITUTE
UNIVERSITY OF ALASKA, COLLEGE, ALASKA

January 31, 1969

Dear Outdoorsman:

Only you can answer questions which will help us measure the value of wildlife and related recreation on the Kenai National Moose Range, and to make it the place you want it to be.

The enclosed questionnaire will only take you a few minutes to complete, but it contains questions vital to the future use of the Range for wildlife and recreation.

Your reply will be combined with replies of others selected, to show economic and esthetic values of wildlife on the Range. All answers will be held completely confidential. Only group facts will be published.

The questions have been carefully designed to save your time in answering. They have been kept to the minimum number necessary for the study. Every one of your answers are important.

Please return the questionnaire in the enclosed stamped envelope.

Sincerely yours,

Harold W. Steinhoff

Harold W. Steinhoff, Ph.D.
Research Professor of
Wildlife Management

WILDLIFE VALUES STUDY
Kenai National Moose Range

Cooperating: University of Alaska
Colorado State University
Bureau of Sport Fisheries and Wildlife

A. What primary and secondary uses did you and your family make of the Kenai National Moose Range in 1968? A "primary use" is one which was the major reason for your visit. A "secondary use" is a planned or unplanned use which was not a major reason for your visit. Indicate your answer by placing a "1" opposite each primary use and a "2" opposite each secondary use in the following list. A primary use on one visit may be a secondary use on another, so you could logically list both a "1" and a "2" for the same use.

- | | |
|--------------------|-----------------------------|
| — 1. Berry picking | Hunting |
| Boating | — 16. Goat |
| — 2. Power Boat | — 17. Grouse |
| — 3. Sail Boat | — 18. Moose |
| — 4. White-water | — 19. Ptarmigan |
| — 5. Camping | — 20. Sheep |
| — 6. Canoeing | — 21. Photography |
| Fishing | — 22. Picknicking (day use) |
| — 7. Ice Fishing | — 23. Relaxation |
| — 8. Salmon | — 24. Scenic Drive |
| — 9. Trout | |
| — 10. Hiking | Skiing |
| Horseback | — 25. Cross-country |
| — 11. Pack Trip | — 26. Downhill |
| — 12. Riding | — 27. Snowmobiling |
| | — 28. Swimming |
| Hunting | — 29. Water Skiing |
| — 13. Black Bear | — 30. Wildlife observation |
| — 14. Brown Bear | |
| — 15. Coyote | |

B. Which of the following areas of the Kenai National Moose Range did you or your family use in 1968? "Use" may include scenic viewing, or enjoyment of unseen wildlife or wilderness. (Check all applicable areas:)

- 1. Chickaloon Flats Waterfowl Area
- 2. Northern Lowland Lake Area
- 3. Swanson River & Swan Lake Canoe Routes
- 4. Russian River Campground Area
- 5. Skilak Loop Road and 1947 Burn Area
- 6. Plateau Area between Skilak & Tustumena Lakes
- 7. Tustumena Lake
- 8. Area South of Tustumena Lake (Caribou Hills)
- 9. Mountain Regions on East Side of Range

C. Approximately how many recreational visits did you and/or your family make to the Kenai National Moose Range from January through December, 1968? (Check one.)

- 1 — 2 — 3 — 4 — 5 — 6-10 — 11-20 —
21-50 — Over 50 —

D. Could you please describe one of your 1968 visits to the Kenai National Moose Range by answering the next ten questions. Please have one specific visit in mind.

1. In which month did you make this visit?
2. What area of the Range did you visit, primarily? (From list in Question B.)
3. How many were in your family party on this visit?
4. What was the primary purpose of your visit? (List number from proper use in Question A.)
5. What other areas did you "use" in the sense of Question B? (List numbers from Q. B.)
6. What time did you arrive at the Moose Range (Check one.) Before 2 p.m. — After 2 p.m. —
7. How many days did you stay, to the nearest half day? Answer:
8. What time did you leave the Moose Range? (Check one.) Before 2 p.m. — After 2 p.m. —
9. If this visit was part of a longer vacation trip, what other major areas did you visit on the same trip (Check all applicable places).

— 1. No other area	— 6. Fairbanks Area
— 2. Anchorage	— 7. Kenai-Soldotna Area
— 3. Banff-Jasper	— 8. Mt. McKinley Park
— 4. Homer Area	— 9. Seward Area
— 5. Inside Passage	— 10. Other

10. Please estimate expenditures of you and your family for the entire trip (from the time you left home until you returned home) associated with the visit described above. For each of the following group of items indicate the letter of the proper expenditure category, a through j, below.

- Food (groceries, restaurants, snacks)
- Lodging (motel, trailer park, campground fees)
- Fuel (for boats, stoves)
- Guide fees
- Special transportation (air, boat, etc.)

- | | | |
|------------------|------------------|------------------|
| a. None | e. \$50.00-99.99 | h. \$500-999 |
| b. \$0.01-9.99 | f. \$100-199 | i. \$1000-1999 |
| c. \$10.00-19.99 | g. \$200-499 | j. \$2000 & over |
| d. \$20.00-49.99 | | |

- E. How many recreational visits did you and/or your family make to all outdoor areas outside of town during 1968? Count each separate stay in a recreational area as one visit, whether for one hour or for two weeks or more. Be sure to count spring, summer, fall, and winter visits. There were 14 weekends between June 1 and September 1. Important answer! (Check one.)

1-----2-----3-----4-----5-----6-10-----11-20-----
21-50-----Over 50-----

The following questions are designed to assess your general expenditures which relate to your visits to the Kenai National Moose Range in 1968.

- F. How far is it (to the nearest 100 miles) by the shortest highway route from your home to the Kenai National Moose Range? Answer: ----- miles.

Following are some representative approximate distances:

Anchorage	100	Los Angeles	3800
Buffalo	4800	Miami	5500
Chicago	4200	New Orleans	4800
Dallas	4300	New York City	5100
Denver	3500	Raleigh	5100
Fairbanks	500	St. Louis	4300
Great Falls	2600	Seattle	2600
Juneau	1000		

- G. By what means did you travel from your home to the Kenai National Moose Range? Place a "1" by the method you traveled farthest, a "2" by the next farthest, etc. Please mark all applicable methods.

-----1. Aircraft -----4. Bus
-----2. Auto or Pickup -----5. Train
-----3. Boat or ferry -----6. Other

- H. Please estimate the original cost of the following items which you used in any way on the Kenai National Moose Range in 1968. Write in the number of the cost category.

1. None -----Tent
2. \$1-50 -----Camper (& Pickup if used with cpr.)
3. \$51-100 -----Trailer, Furnishings, Accessories,
4. \$101-200 -----Boat, Motor, Trailer, Canoe, Raft, etc.
5. \$201-500 -----Fishing Gear (rods, reels, lures, nets)
6. \$501-1000 -----Hunting Gear (guns, cases, and ammunition, knives, packs)
7. \$1001-2000 -----
8. \$2000-4000 -----Special Clothing (boots, parkas, etc.)
9. \$4000-7000 -----Sleeping Bags and Mattresses
10. \$7001-10000 -----Cooking Gear (stove, dishes, pails, gas & water cans, etc.)
-----Licenses (hunting, fishing, boat, Golden Eagle, etc.)
-----Camera Gear (still, movie, lenses, meters, cases, projectors)
-----Snowmobile, Skis, etc., Snowshoes

- I. Please estimate how long you have owned each of the following items, which you used on the Kenai National Moose Range in 1968. Write in the number of the age category.

Age
1. Less than 1 year -----Tent
2. Over 1, less than 3 years -----Camper
3. Over 3, less than 5 years -----Pickup
4. Over 5, less than 10 years -----Trailer
5. Over 10, less than 20 years -----Boat
-----Best fishing rod
-----Most-used gun
-----Sleeping bag (average)
-----Camp stove
-----Still camera
-----Movie camera

- J. How much do you believe recreational experiences on the Kenai National Moose Range in 1968 are worth to you and your family, beyond what you have had to spend?

-----None -----Moderate amount -----Priceless
-----Little -----Great amount

- K. How much do fish and game contribute to the total food eaten by your family? (Check one)

-----1. Major food source throughout the year
-----2. Major food source, periodically in the year
-----3. Minor food source, throughout the year
-----4. Minor food source, periodically in the year
-----5. Not consumed

- L. Which of the following additional values does the Kenai National Moose Range have for you or your family? (Check all applicable values.)

-----1. Commercial (sale of hides, sales of pictures, fishery)
-----2. Educational (gain of personal or public knowledge, research)
-----3. Esthetic (inspiration unmeasurable in terms of money, including scenic, wilderness)
-----4. Recreational (additional, beyond what you have spent)
-----5. Social (general contribution to character or community, state, and nation)

- M. If you live in Alaska, is the availability of the Kenai National Moose Range one of the factors which influences you to stay in Alaska?

----- Yes ----- No

N. Which of the following features prompted you to visit the Moose Range rather than similar areas elsewhere? (Check all applicable features.)

- 1. Chance to see wildlife
- 2. Ease of access, because close to home
- 3. Ease of access, because open public land
- 4. Ease of access, because of roads and trails
- 5. Facilities (campgrounds, canoe routes, etc.)
- 6. Familiar with area because of other use, e.g. hunting
- 7. Nearness to wilderness
- 8. Presence of berries
- 9. Relatively wild appearance
- 10. Reputation of Kenai Peninsula in general
- 11. Reputation, for fishing
- 12. Reputation, for hunting
- 13. Friend recommended it
- 14. Scenery
- 15. Water, for boating, swimming
- 16. Other (specify)

The following question is designed to determine what uses you, as part owner of the publicly-owned Kenai National Moose Range, would like to see there.

O. Classify each of the following uses of the Kenai National Moose Range, in your judgement, as "1" (highest use), "2" (intermediate use), "3" (lowest use), or "4" (not to be permitted). Write the appropriate number 1, 2, 3, or 4, opposite each listed use.

- 1. Berry picking
- 2. Business and industrial establishments
- 3. Camping (overnight use)
- 4. Commercial fishing in lakes and streams
- 5. Commercial vacation resorts and lodges
- 6. Cross-country skiing
- 7. Downhill skiing, developed, with lifts
- 8. Grazing livestock
- 9. Homesteading, residential homesites
- 10. Horse packing and riding
- 11. Hunting, big game
- 12. Hunting, small game and waterfowl
- 13. Logging
- 14. Mining
- 15. Oil exploration and wells
- 16. Photography, wildlife observation, hiking, sightseeing, picnicking
- 17. Production of young salmon, by nature
- 18. Recreational cabin sites
- 19. Sail boating, canoeing
- 20. Snowmobiling
- 21. Sport fishing
- 22. Swimming
- 23. Water skiing, motor boating
- 24. Wilderness (large roadless area)
- 25. Wildlife research

Your answers to the following questions will add greatly to the value of the study. All answers will be held completely anonymous and confidential. However, answers to these questions are optional.

P. In what age group do you, the head of the household, fall?

- 25 or under — 26-35 — 36-45
- 46-55 — 56-65 — 66 or over

Q. In which of the following categories is your present major occupation, as head of the house?

- 1. Armed Services
- 2. Businessman
- 3. Retired
- 4. Salesman, Clerk, Attendant, etc.
- 5. Professional (including teacher, resource mgr.)
- 6. Skilled Workman
- 7. Administrator
- 8. Other (specify)

R. In which of the following categories does the total annual income of your family fall? This includes wages and salaries, business profits, net farm income, pensions, rents, and any other income received by members of this family living at home.

Please write the number of the income category here: _____

- | | | |
|---------------------|---------------------|---------------------|
| 1. Less than \$2000 | 6. \$10,000-11,999 | 11. \$20,000-24,999 |
| 2. \$2000-3999 | 7. \$12,000-13,999 | 12. \$25,000-29,999 |
| 3. \$4000-5999 | 8. \$14,000-15,999 | 13. \$30,000-39,999 |
| 4. \$6000-7999 | 9. \$16,000-17,999 | 14. \$40,000-49,999 |
| 5. \$8000-9999 | 10. \$18,000-19,999 | 15. Over \$50,000 |

S. If you have any additional comments on wildlife and related recreational values of the Kenai National Moose Range, any special explanation of your answer to any of the above questions, or any other comments on this WILDLIFE VALUES STUDY, please make them here:

Please return the questionnaire even if you did not complete answers to all questions.

the single most significant characteristic available for comparison. Respondents' occupations were determined from the completed questionnaires. Non-respondents' occupations were determined from the Anchorage City Directory and from the Homer Electric Company and City of Kenai utilities clerk who had personal knowledge of occupations on the western Kenai Peninsula. The two populations are shown surprisingly comparable in Table 3A, except that respondents are higher in proportion of professionals and lower in proportion of "Other" (laborers, housewives, students, fishermen). Differences in these two categories are the only ones significantly different by chi-square at the 0.05 level. This could slightly bias responses toward higher income and expenditures and a more idealistic value system. However, mean expenditures per recreation day for these two groups were near the mode, so I considered weighting unnecessary in computing total expenditures.

Table 3A. Occupations of respondents and non-respondents to Questionnaire I.

Occupation of Head of House	Mean Expenditures per Rec. Day	Respondents		Non-Respondents	
		Number	Percent	Number	Percent
Skilled Workman	\$27.64	30	8	42	9
Professional	23.13	83	22	58	12
Salesman, Clerk, Service etc.	19.01	53	14	63	13
Businessman	24.58	43	11	49	10
Administrator	21.53	40	10	35	7
Armed Services	9.46	30	8	42	9
Other (Laborer, Fisherman)	20.31	25	7	120	24
Retired	73.12	14	4	14	3
Total	25.41	382		489	

Lastly, representativeness of reply from census regions of the U.S. is indicated in Table 4A, as well as a comparison of area of origin of 1968 KNMR visitors with those in a 1967 Alaska tourism study. Replies are slightly biased in favor of nearby regions, especially the West North Central (the Prairie States). Non-resident visitors to the KNMR are quite similar in area of origin to those who visit the rest of Alaska, with a slight differential preference of East North Central (i.e. Lake States) and Mountain (i.e. Rocky Mountain) regions for the Kenai area.

Table 4A. Response to Questionnaire I, by census regions of the United States, and a comparison of area of origin of Range and Alaskan non-resident visitors.

Census Region of Residence	Questionnaire I		Non-Resident Area of Origin	
	Total sent	Rate of Return	Range Users, 1968	Alaska Tourism, Statewide, 1967
Alaska	3120	47%		
Pacific	232	46	31%	30%
East North Central	193	48	26	20
Mountain	100	31	14	10
West North Central	61	61	8	12
West South Central	54	31	7	4
South Atlantic	43	30	5	4
Middle Atlantic	41	46	4	10
New England	17	47	2	2
East South Central	16	25	2	2

Analysis of Data Data coded on optical mark scan sheets were programmed by John Noland, Systems Analyst, Anchorage Borough School District, for translation by IBM 1231 reader to magnetic tape and for computations on the IBM 1401 computer. Expenditures per recreation day (E_{RD}) were computed by the following formulae:

$$E_{RD} = C(\text{current expense}) + T(\text{travel expense}) + E(\text{equipment expense})$$

$$C = S/(N+1) \div (P \times L) = S/PL(N+1)$$

$$T = (0.2W)/(N+1) \div (PL)$$

$$E = [2(D_1 + I_1)/V] \div (PL), \text{ where } D_1 = H_1 F_1 \text{ and } I_1 = 0.05(D_1)(A_{\max i} - A_i)$$

where A - present age of an item of equipment
 D - depreciation
 F - factor, the reciprocal of the maximum age of usability of equipment
 H - original cost of an item of equipment
 I - interest
 i - categories of equipment
 L - length of stay on a visit, in days
 M - maximum age of usability of an item of equipment
 N - number of specified major areas visited on a given trip
 P - party size, in number of persons
 S - sum of current expenditures on a given trip
 V - number of recreational visits to all outdoor areas in 1968
 W - distance from home to the KNMR by the shortest highway route

Tabulations from the computer output were manipulated to provide data for Table 5A.

Table 5A. Basic data for computation of Clawson's consumer's surplus method.

Distance Zone (Miles)	Question. Responses	Adjusted Total No. Rec.Units	Mean, KNMR			Rec.Days/ Yr./RU	Total KNMR Rec Days/Yr.
			No./ Party	Days/ Visit	Visits/ Year		
0-300	1165	4758	3.8	1.5	11.7	66.69	317,311
300-750	22	90	3.7	5.0	1.6	29.60	2,664
750-2200	7	29	3.6	3.1	1.6	17.86	518
2200-3000	34	178	3.0	5.0	1.8	27.00	4,806
3000-4000	100	525	2.8	6.2	1.8	31.25	16,406
4000-5000	78	410	3.5	5.6	1.8	35.28	14,465
5000-6000	19	100	2.9	5.7	1.3	21.49	2,149
							358,319

Table 5A. (Continued)

Distance Zone (Miles)	1968 Pop. (100,000)	RD/Yr./100,000	Mean Expend. per RD	Total Expend. (Mean x RD)
0-300	1.16	273,544	\$14.17	\$4,496,297
300-750	0.89	3,000	27.51	73,287
750-2200	0.42	1,233	71.00	36,778
2200-3000	66.27	72.5	76.63	368,284
3000-4000	358.95	45.7	80.89	1,327,081
4000-5000	919.16	15.74	72.66	1,051,027
5000-6000	368.56	3.37	88.30	189,757
				\$7,542,511

Table 5A. (Continued)

Distance Zone (Miles)	RU/100,000	Annual Expend./RU	Mean Family Income	Expend./RD/ \$1000 Income	Mean Mileage Travelled
0-300	4102	\$ 945	\$15,472	\$0.92	110
300-750	101	814	13,667	2.01	500
750-2200	69.0	1268	18,857	3.76	1064
2200-3000	2.68	2069	8,833	8.68	2790
3000-4000	1.46	2528	13,113	6.17	3650
4000-5000	0.446	2563	12,855	5.65	4470
5000-6000	0.156	1898	13,206	6.68	5320
Mean Alaska			\$15,460		
Mean Non-Resident			12,417		
Mean, All			14,983		

The logarithm of RD/Yr./100,000, Y, plotted against mean expenditure per RD, X, yielded a straight line (Figure 1A) so the linear regression $\hat{X} = 6.294 - 0.0618Y$ was computed, with a standard error of estimate of 0.900. Both X and Y values were weighted by the number of questionnaire responses in each distance zone. Correlation was high, $r = -0.854$ and $r^2 = 0.73$, so 73% of the variation in expenditures was accounted for by variation in RD/Yr./100,000 population.

A demand curve was constructed from this formula, following the method of Clawson (1959). Consumer's surpluses recoverable by a discriminating monopolist and a non-discriminating (i.e. single-fee) one were computed from the demand curve. A similar computation was made to determine amount recoverable from a single additional annual fee. Recreation units were used rather than recreation days, and annual expenditure per recreation unit was used rather than expenditure per visitor day. The formula for the demand schedule was $\hat{X} = 36.83 - 10.79Y$.

Consumer's surplus by the modified Pearse method was computed by manipulation of data in Table 6A. Opportunity cost of time was not included because on an "expenditure per recreation day" basis, the opportunity cost is equal for all in an income group.

Table 6A. Basic data and computations for the modified Pearse method.

Income Group	No. Obs.	Mean RD/Yr.	Sample Tot RD	Adjusted Tot. RD	Highest Exp	Mean Exp	Av CS ^{1/} per RD	Total CS Col. 5 X 8
1	8	113.5	908	2,040	58	14	44	\$ 89,800
2	34	140.0	4,760	10,690	151	26	125	1,335,000
3	74	126.6	9,370	21,200	418	37	381	8,080,000
4	85	145.3	12,376	27,800	315	28	287	8,000,000
5	131	108.8	14,221	32,000	311	33	278	8,900,000
6	158	107.3	17,000	38,200	518	32	486	18,570,000
7	178	139.0	24,790	55,650	224	20	204	11,360,000
8	182	135.0	24,580	55,150	305	19	286	15,780,000
9	113	161.0	18,200	40,950	122	16	106	4,335,000
10	113	123.8	13,990	31,410	144	19	125	3,930,000
11	67	107.3	7,200	16,180	362	28	334	5,415,000
12	62	101.3	6,291	14,110	134	22	112	1,580,000
13	26	167.3	4,351	9,775	46	14	32	312,200
14	9	92.8	835	1,877	87	35	52	97,600
15	6	157.0	943	2,120	66	31	35	74,200
			159,815	359,152				\$87,858,800
			x 2.242					
		Total RD	358,319					

1/ Consumer's Surplus

Questionnaire II - Values and Attitudes of Owners

Owners of the Kenai National Moose Range include all citizens of the United States of America. Users overtly express value by their presence. Owners may value the area because they hope to visit it some day, or obtain vicarious pleasure therefrom, or have a personal value system that applies to anything they own, including public property. Owners are 9000 times as numerous as users, so even a small individual value held by an owner could aggregate a total greater than users.

The target population of owners was all families in the United States who had not visited the Range in 1968, but who had a basic economic and social similarity to user families. The sampling unit was the family and the target sample size was a number from each state equal to its number of representatives in the U. S. Congress, but with a minimum of ten from each state.

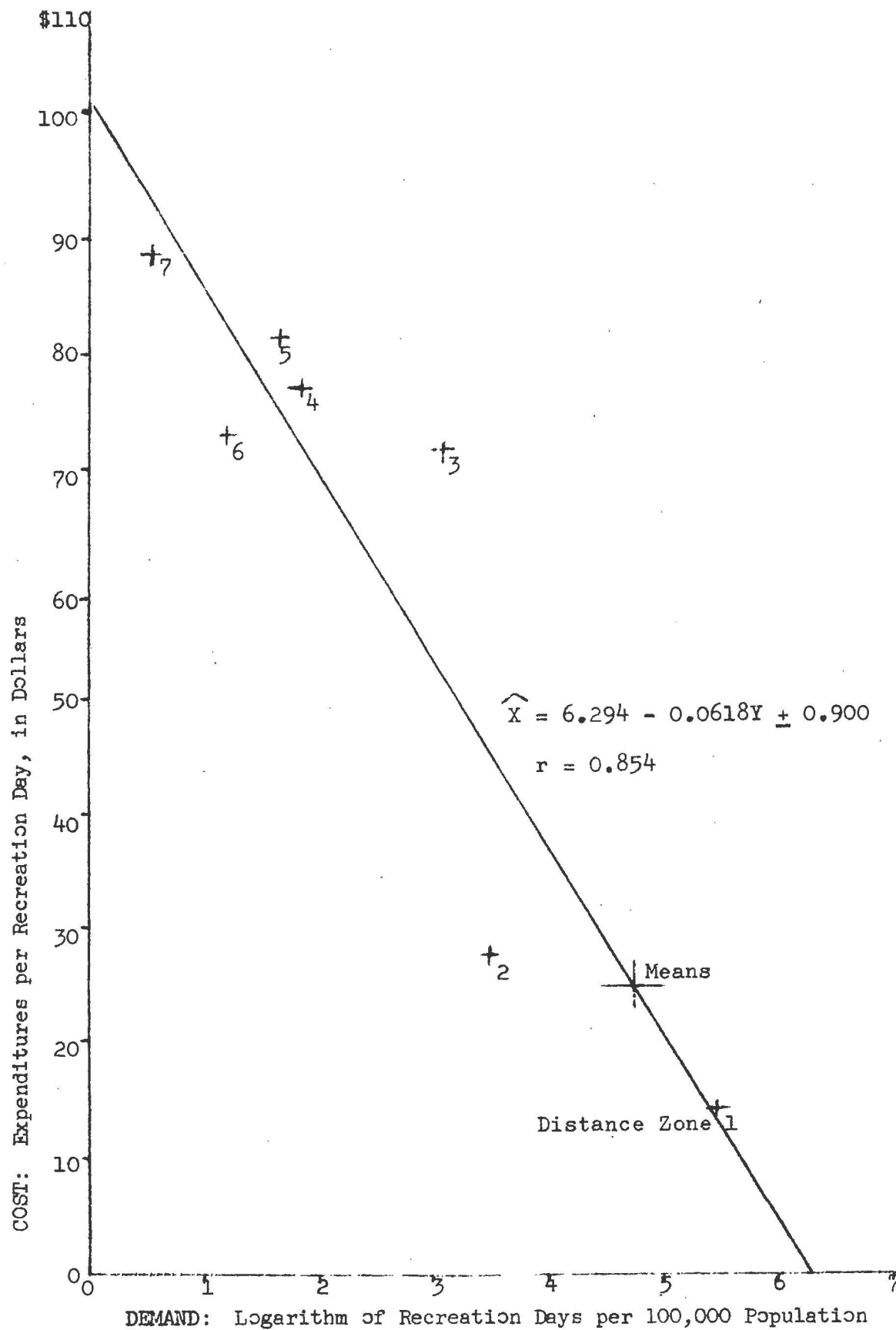


Figure 1A. Relationship of cost and demand on the Kenai National Moose Range, 1958.

WILDLIFE VALUES STUDY
Kenai National Moose Range

Cooperating: University of Alaska
Colorado State University
Bureau of Sport Fisheries and Wildlife

A. Have you heard of the Kenai Peninsula?YesNo

B. Have you visited the Kenai Peninsula?YesNo

C. Have you heard of the Kenai
National Moose Range?YesNo

D. Have you visited the Kenai
National Moose Range?YesNo

The Kenai National Moose Range is a 1,730,000-acre area of public land set aside by the federal government for perpetuation of the unusually large Kenai moose, and for related fish, wildlife, and scenic beauty. The eastern third is mountainous, the tundra home of the ptarmigan (an alpine grouse) and Dall sheep. It contains huge glaciers and ice fields. The western two-thirds is rolling spruce-birch forest with many lakes and several great rivers. Alaska salmon run up these rivers to their spawning grounds on the Range. The lowland is the major home of moose, salmon, trout, waterfowl (including the rare Trumpeter Swan), and spruce grouse.

Hunting, fishing, logging, and grazing are permitted when compatible with wildlife management. No private homes or businesses are permitted on federal property within the Range. Oil has been discovered, and carefully controlled seismograph lines and access roads have been permitted, mostly in the northern part.

One major paved highway traverses the Range and another has been proposed across Turnagain Arm, a bay separating the Kenai Peninsula from Anchorage. The proposed route would make the Range only 40 miles from Anchorage, the major population center of Alaska, and easily accessible to 100,000 people, year around.

As part owner of this public land, your desires for its management and the values it holds for you are important. The following questions are designed to determine your evaluation of the Kenai National Moose Range.

E. How far would you drive to visit the Kenai National Moose Range, at least once? (Mark the greatest distance you would go.)

....None10 miles502505001500More

F. Please classify each of the following uses of the Kenai National Moose Range, in your judgement, as "1" (highest use), "2" (intermediate use), "3" (lowest use), or "4" (not to be permitted). Write the appropriate number, 1, 2, 3, or 4, opposite each listed use.

- 1. Berry picking
- 2. Business and industrial establishments
- 3. Camping (overnight use)
- 4. Commercial fishing in lakes and streams
- 5. Commercial vacation resorts and lodges
- 6. Cross-country skiing
- 7. Downhill skiing, developed, with lifts
- 8. Grazing livestock
- 9. Homesteading, residential homesites
-10. Horse packing and riding
-11. Hunting, big game
-12. Hunting, small game and waterfowl
-13. Logging
-14. Mining
-15. Oil exploration and wells
-16. Photography, wildlife observation, hiking, sightseeing, picnicking
-17. Production of young salmon, by nature
-18. Recreational cabin sites
-19. Sail boating, canoeing
-20. Snowmobiling
-21. Sport fishing
-22. Swimming
-23. Water skiing, motor boating
-24. Wilderness (large roadless area)
-25. Wildlife research

G. Which of the following values does the Kenai National Moose Range have for you, personally, whether you ever expect to visit it or not? (Check all applicable.)

- 1. Commercial (sale of fur, hides, pictures, fish)
- 2. Educational (gain of knowledge, research)
- 3. Esthetic (inspiration unmeasurable in money; beauty)
- 4. Recreational (enjoyment, reading about it)
- 5. Social (general contribution to the character of the community, state, and nation)
- 6. None

H. Rank each of the following values of the Kenai National Moose Range for the nation as a whole, in your judgement, as "1" (highest), "2" (intermediate), "3" (lowest), or "4" (none). (Rank each value as 1, 2, 3, or 4.)

- 1. Commercial (same criteria as Question G, above)
- 2. Educational
- 3. Esthetic
- 4. Recreational
- 5. Social

- I. Have you read one or more stories or articles or seen motion pictures or television features that involved the Kenai National Moose Range?YesNo
- J. If "yes," what sort of account was it? (Check all applicable.)
- | | |
|-----------------------------|--------------------------------|
| 1. Biological research |10. Historical |
| 2. Bird observation |11. Homesteading |
| 3. Camping |12. Hunting |
| 4. Dangerous wildlife |13. Mountain climbing |
| 5. Dog-sled travel |14. Natives (Eskimos, etc) |
| 6. Farming |15. Oil |
| 7. Fishing |16. River travel |
| 8. Gold mining |17. Wilderness adventure |
| 9. Other (specify) |18. Wildlife observation |
- K. Answer this question only if your answer to previous question "I", at the top of the page, was "No". Have you read stories or seen motion pictures or television programs about a real or fictitious area of Alaska which you visualize as similar to the Kenai National Moose Range?YesNo
- L. If your answer to Question K is "Yes", what sort of accounts were they? (Check all applicable.)
- | | |
|-----------------------------|---------------------------------|
| 1. Biological research |10. Historical |
| 2. Bird observation |11. Homesteading |
| 3. Camping |12. Hunting |
| 4. Dangerous wildlife |13. Mountain climbing |
| 5. Dog-sled travel |14. Natives (Indians, etc.) |
| 6. Farming |15. Oil |
| 7. Fishing |16. River travel |
| 8. Gold mining |17. Wilderness adventure |
| 9. Other (specify) |18. Wildlife observation |
- M. The Kenai National Moose Range now receives about \$150,000 per year for management of the area. If you could vote directly on its appropriation, how much of your tax dollar would you send to the Range?
....NoneLessSame as nowMoreMuch more
- N. Which of the following best represents your idea of what we should do with the Kenai National Moose Range? (Check one.)
- | |
|---|
| 1. Dedicate it all to wilderness |
| 2. Encourage use which will yield the highest dollar return to the present generation |
| 3. Give it to the native peoples of Alaska (Eskimos and Indians) as settlement for their land claims |
| 4. Hold it unused for future generations |
| 5. Increase development of recreational facilities |
| 6. Manage primarily for moose, wildlife, recreation |
| 7. Try eventually to place it all in private ownership |
- O. In which of the following activities have you or your family participated at least once within the past year? (Check all applicable.)
- | | | |
|----------------|-------------------|-----------------------|
|1. Boating |4. Hunting |6. Scenic driving |
|2. Camping |5. Picnicking |7. Wildlife ob- |
|3. Fishing | |servation |
- Your answers to the following questions will add greatly to the value of the study. All answers will be held competely anonymous and confidential. However, answers to these questions are optional.
- P. In which age group do you, the head of the household, fall?
- | | | |
|-----------------|-----------|----------------|
|25 or under |36-45 |56-65 |
|26-35 |46-55 |66 or over |
- Q. In which of the following categories is your present major occupation, as head of the house? (Check one.)
- | |
|---|
| 1. Armed Services |
| 2. Businessman |
| 3. Retired |
| 4. Salesman, Clerk, Attendant, etc. |
| 5. Professional (including teacher, resource mgr.) |
| 6. Skilled Workman |
| 7. Administrator |
| 8. Other (specify) |
- R. In which following category does the total annual income of your family fall? This includes wages and salaries, business profits, net farm income, pensions, rents, and any other income received by members of this family living at home.
- | | | |
|---------------------|-----------------------|-----------------------|
|1. Under \$2000 |6. \$10000-11999 |11. \$20000-24999 |
|2. \$2000-3999 |7. \$12000-13999 |12. \$25000-29999 |
|3. \$4000-5999 |8. \$14000-15999 |13. \$30000-39999 |
|4. \$6000-7999 |9. \$16000-17999 |14. \$40000-49999 |
|5. \$8000-9999 |10. \$18000-19999 |15. Over \$50000 |
- S. If you have any additional comments on wildlife and related recreational values of the Kenai National Moose Range, any special explanation of your answer to any of the above questions, or any other comments on this WILDLIFE VALUES STUDY, please make them here:
- Please return this questionnaire even if you did not complete answers to all questions.

The second previous vehicle license number from each user vehicle license number was chosen for the sample. If more were needed from a state than this provided, the fifth, ninth, fourteenth, etc. previous vehicle license number was chosen.

Questionnaire II was sent to 537 owners on February 3, 1969, and follow-up post-cards were sent to non-respondents March 7. At termination of coding on May 19, 158 returns, or 29% had been received. The low return may be explained by the complexity of the questionnaire and naturally lower interest of remote owners of the Range. Returns were fairly well distributed from all regions of the United States except the east south central, as shown in Table 7A.

Table 7A. Distribution and return of Questionnaire II, by census regions of the U. S

Census Region	Questionnaires		Percent
	Sent	Returned	Returned
Alaska	27	9	33
Pacific	65	18	28
Mountain States	64	26	41
West North Central	54	22	41
West South Central	45	13	29
East North Central	83	22	26
East South Central	40	4	10
New England	42	11	26
Mid-Atlantic	40	10	25
South Atlantic	77	25	32
Total	537	158	29

Occupations of respondents, from questionnaire responses, corresponded surprisingly well to occupations of all United States heads of families, from 1967 U. S. Census Bureau data (Table 8A). Differences may be a result of the paired-license sampling scheme.

Table 8A. Occupations of respondents and non-respondents to Questionnaire II.

Occupation	Questionnaire II	Heads of Families
	Respondents	All U.S., 1967
Skilled Workmen	30%	29%
Business, Sales, and Managerial	30	31
Professional	16	12
Retired	11	20
Other (Laborers, Students, Housewives)	10	6
Armed Services	3	2

A high proportion of owner families had themselves engaged during the year in outdoor recreation activities such as boating (52%), camping (58%), hunting (58%), wildlife observation (68%), picnicking (71%), fishing (73%), and scenic driving (83%). The 1965 national survey of hunting and fishing expenditures showed that one out of three fished and one out of five hunted but did not show what proportion of families fished or hunted

Data were coded and analyzed the same as Questionnaire I.

Questionnaire to Managers

Managers of the Range from the assistant refuge managers in the line through supervisor, region, bureau, and service, to the Secretary of the Interior were sent a special questionnaire consisting of Questions F, G, and H from Questionnaire II. The incumbent and immediate past holder of each position were included in the 25 questionnaires sent. Seventeen, or 64%, were returned and tabulated.

Interviews with Community Leaders

Eleven community leaders were interviewed, including the mayor, city manager, and president of the chamber of commerce of Kenai and Soldotna, the chairman and development planner of the Kenai Peninsula Borough, the superintendent of Borough schools, the superintendent of production of the Union Oil Company in Kenai, and the president of the local chapter of the Alaska Conservation Club. They were asked three specific questions which were given to them in writing. 1. What values do you think the Kenai National Moose Range contributes to this community? 2. How would you rank the following wildlife values of the Kenai National Moose Range in relation to this community, commercial, educational, esthetic, recreational, and social? 3. What is the Range's greatest potential future contribution of values to this community? Answers were tabulated but considerable judgment was required to interpret their statements.

Method of Computing Opportunity Cost^{1/}

Total Opportunity Cost = Days Invested in KNMR in 1968 X Opportunity Cost per Day

$O_{TC} = (\text{Days Spent on KNMR} + \text{Days Travel Enroute}) \times (\text{Income} \div 240 \text{ work days per year})$

$O_{TC} = [V \times D + (M \div 500A)] \times (I \div 240)$

where V - mean number of visits per year

D - mean number of days per visit

M - mean round trip mileage from residence to KNMR

A - mean number of other major areas visited

I - mean family income per year

500 - assumed average mileage per day

240 - assumed number of working days per year

The above was computed for each distance category, and totalled to give \$6,320,248.

Method of Computing Diseconomy to Oil Operations

The following information was gained from conversations with Mr. Dean Laudeman, Manager of Exploration South, Union Oil Company, and Mr. Quinn Williams, Western Geophysical, and from a letter to Mr. Duncan A. Harkin, University of Wisconsin, from Patrick M. Hoffman, Geophysicist, Union Oil Company. All figures are extra costs of oil operations on the KNMR in 1968.

Delays of seismic crew because of thaws, five crews @ \$26,200	\$131,000
Cleanup after seismic operations, four @ \$3,500, one @ \$20,000	34,000
Extra cost of site preparation & cleanup after drilling, two wells	5,200
Estimated extra cost of production operations, pipeline, etc.	3,000
	<u>\$173,200</u>

Method of Computing Research Investment

The research investment was computed by estimating 348 man-months of research effort in the 52 projects. Assuming an average cost of \$1500 per month for salary and expenses, this totals \$522,000. Additionally, \$168,000 has been invested in moose pen fences and \$37,000 extra for moose pen studies. The total is \$727,000.

Method of Computing Moose-Auto Collision Loss

Claims Adjuster Robert Love, of Kenai, estimates that auto repairs due to moose accidents average \$750 to \$1000 each. I used the median, \$875. Mr. Love also estimated average medical costs of \$50 per passenger, a total of \$125 per accident. These

^{1/} Methods described in the next few sections are not intended to be exhaustive because the methods are not the purpose of this report. Enough detail is given to show the general method but not the steps in reasoning, derivation of formulas, or detailed computations.

figures total \$1000 mean cost per moose accident, and are considered conservative. Also, many more moose accidents occurred than the official figure, 42, used here. However, unreported accidents were probably less serious, with less damage.

Method of Computing Newspaper Coverage

The Cheechako News averaged 380 column-inches of news per paper in 1968. Conservation-related articles, including pollution, averaged 50 column-inches per paper, or 13%. Moose Range-related articles, including commercial fisheries, averaged 20 column inches per paper, or 5% in 1968.

Method of Computing Value of Commercial Salmon Catch

Table 9A. Basic data for computation of value of 1968 salmon catch in Cook Inlet produced on the Kenai National Moose Range.

	(Red) Sockeye	(King) Chinook	(Silver) Coho	(Humpy) Pink	(Dog) Chum	Tot
Identified catch, Range-produced						
Kasilof River	193,200	40%				
Kenai River ($\frac{1}{2}$ total)	100,000	40%				
Russian River ($\frac{1}{2}$ total)	60,521					
	353,721					
Percent produced on Range	47%	80%	25%	5%	0	
Total catch produced on Range	564,068	3680	118,834	143,182	0	
Wholesale price per fish	\$1.59	\$5.13	\$1.10	\$0.53	\$0.75	
Total income, Range to comm.fish	\$898,868	\$18,878	\$130,717	\$75,886	0	\$1,122,
Cases produced on KNMR	43,390	681	9,903	6,508	0	
Retail value, case of 48 cans	\$52	\$58	\$42	\$40		
Retail value of salmon from KNMR	\$2,296,290	\$39,498	\$415,926	\$260,320	0	\$3,012,

Method of Computing Meat Value

Pounds of game meat produced on the KNMR in 1968:

12,727 salmon at Russian River X 6 pounds each	=	76,362
500 moose (63.5% of the 787 killed in Unit 15, X 500 pounds each	=	250,000
assuming same proportion as 1967)	(from Spencer & Chatelain, 1953)	
34 sheep X 150 pounds each	=	5,100
Estimated additional fish	=	5,000
		336,462

Method of Computing Value of Hides and Furs

Following basic data are from Herbert Clark, who trapped most of the furs report on the KNMR in 1968.

Table 10A. Value of furs trapped on the KNMR.

Species	Average Price 1968	Average Annual KNMR Catch, 1963-1967		1968 KNMR Catch	
		Number	Total Value	Number	Total Value
Beaver	\$ 28.00	58	\$1624.00	14	\$ 372.00
Coyote	5.00	19	95.00	44	220.00
Lynx	67.50	19	1282.50	18	1215.00
Mink	22.50	41	922.50	64	1440.00
Muskrat	0.90	0	0	207	186.30
Otter	40.00	11	440.00	10	400.00
Weasel	1.00	5	5.00	81	81.00
Wolverine	100.00	3	300.00	1	100.00
			\$4669.00		\$4014.30

Method of Predicting Future Values

Estimates of 1980 visits and values of the Range were made under the following assumptions. Sources of estimates are indicated in parenthesis.

1. Alaska population will increase 99% to 450,000 and visits will increase proportionally. (Smith, 1965)
2. Kenai-Cook Inlet population will increase 115% to 25,000 and visits will increase proportionally. (Alaska State Housing Authority, 1968)
3. Alaskan's leisure time will increase 10% additionally because of more short holidays (such as the Monday holiday law just enacted) and longer vacations.
4. An increase of non-resident recreational visitors (tourists) to Alaska of 225% to 650,000, with proportional increase visiting the Range. (University of Alaska, 1965). Jet travel to Kenai and jumbo jet service to Anchorage may swell this figure. Some 94% of 1968 visitors to the Range travelled by auto as a primary means, 8% used aircraft and 5% used boat as a secondary means.
5. Completion of the Turnagain Arm Causeway and related recreational facilities along its route at the north end of the Range will increase visits by 25% in addition to the above.
6. Increase of recreational facilities at least at the present rate, and sufficient to meet the demand.
7. Inflation will continue at a "normal" 2% per year, or 27% by 1980.

PRESENTATION OF BASIC AND ACCESSORY DATA

Data not presented previously in this report are tabulated here for the record and as a source of reference, without interpretation. Questionnaire answers were provided by 1192 residents and 234 non-residents for I, and by 126 owners for II.

Table 11A. Most frequently listed objectives of visits to the Range in 1968.

Primary Objective				Secondary Objective			
Residents		Non-Residents		Residents		Non-Residents	
Salmon	56 ^{1/}	Camping	68	Photography	33	Photography	35
Trout	52	Salmon,	56	Wildlife Obs.	26	Relaxation	21
Camping	51	Scenic Drive	44	Scenic Drive	25	Scenic Drive	20
Moose	50	Photography	40	Berrying	24	Wildlife Obs.	18
Relaxation	31	Wildlife Obs.	35	Relaxation	22	Trout	17
Scenic Drive	28	Trout	31	Picnicking	18		
Wildlife Obs.	19	Relaxation	27				
Picnicking	19						

^{1/} Percentage of respondents listing the use as a major objective sometime during the year. All over 17% are listed, a natural break in the data.

Table 12A. Primary objective of single visits to the Range, and related mean stays.

Primary Objective of Single Visit		Mean Stay for Each Primary Objective	
Residents	Non-Residents	Residents	Non-Residents
Salmon 26%	Salmon 37%	Sheep 4.9d.	Hiking 13.8days
Moose 22	Camping 19	Relaxation 4.1	Sheep 10.8
Trout 13	Scenic Drive 15	Camping 3.6	Canoe 9.0
Camping 12	Relaxation 6	Ice Fishing 3.6	Moose 8.4
Canoeing 7	Canoeing 5	Canoeing 3.5	Wildlife Obs. 8.1
Relaxation 5	Wildlife Obs. 5	Salmon 3.4	Trout 7.3
Scenic Drive 3	Moose 4	Grouse 3.4	Salmon 5.5
Berrying 2	Trout 3	Hiking 3.1	Relaxation 5.3
Sheep 2	Photography 3	Wildlife Obs. 3.1	Photography 4.9
Picnicking 2	Sheep 2	Trout 2.9	Camping 4.1
Power Boat 2	(20 Others)(less)	Moose 2.8	Goat 4.0
Grouse 1		Berrying 2.5	Scenic Drive 3.7
Wildlife Obs. 1		Goat 2.5	Berrying 3.0
Ice Fishing 1		Power Boat 2.3	
Hiking 1		Snowmobile 2.3	
Photography 1		Photography 2.2	
Black Bear 0		Black Bear 2.1	
(13 Others)(less)		Sailing 2.0	
		Swimming 2.0	

Table 13A. Number of other major areas visited on the same trip as a visit to the Kenai National Moose Range. 1/

Number of Other Areas Visited	Alaska Residents	Non-Residents
0	65%	3%
1	14	6
2	9	7
3	7	11
4	3	14
5	1	17
6	1	17
7	0	14
8	0	9
9	0	3
Mean Number Visited	0.76	5.57

1/ Areas are Anchorage, Banff-Jasper, Homer, Inside Passage, Fairbanks, Kenai-Soldot Mt. McKinley National Park, Seward, and Other.

Table 14A. Frequency distribution of number of visits to the Range in 1968.

No. Visits to KNMR	Resident RU		Non-Resident RU	
	Number	Percent	Number	Percent
1	84	7	155	66
2	90	8	49	21
3	88	7	10	4
4	99	8	5	2
5	99	8	7	3
6-10	353	30	7	3
11-20	245	21	1	0
21-50	113	9	0	0
Over 50	21	2	0	0
Total	1192	100	234	100
Mean	11.0		1.8	

Table 15A. Times of arrival at and departure from the Range.

Time of Day	Resident Percent		Non-Resident Percent	
	Arriving	Leaving	Arriving	Leaving
Before 2 pm	68	20	52	55
After 2 pm	32	80	48	45

Table 16A. Frequency distribution of length of stay per visit to the Range in 1968.

Length of Stay	Resident	Non-Resident
$\frac{1}{2}$ day	4%	2%
1	17	6
$1\frac{1}{2}$	4	2
2	22	15
$2\frac{1}{2}$	6	4
3	20	18
$3\frac{1}{2}$ -7	21	31
$7\frac{1}{2}$ -14	5	17
Over 14	1	6
Mean Stay	3.2 days	5.7 days

Table 17A. Additional worth to visitors of recreational experience on the Range, above what they had to pay.

Additional Worth	Resident	Non-Resident
None	2%	3%
Little	2	2
Moderate	18	19
Great	31	28
Priceless	47	48

Table 18A. Contribution of game meat to total food eaten by users of the Range in 1968. Contribution of fish and game to total yearly food of the family

	Resident	Non-Resident
Major source, all year	19%	3%
Major source, periodically	15	7
Minor source, all year	29	36
Minor source, periodically	35	51
Not consumed	2	4

Table 19A. Relation of expenditures and distance travelled to family income.

Family Income	Mean Expend. per RD		Mean Distance Travelled, One Way	
	Resident	Non-Resident	Resident	Non-Resident
Under \$2000	\$ 4	\$ 43	120 mi.	4670 mi.
\$2000-3999	20	56	110	3680
\$4000-5999	12	85	120	3550
\$6000-7999	14	63	120	4120
\$8000-9999	12	91	120	3680
\$10000-11999	17	97	150	3960
\$12000-13999	13	78	110	4020
\$14000-15999	12	65	120	4280
\$16000-17999	13	63	110	4350
\$18000-19999	16	46	120	3930
\$20000-24999	20	106	130	3360
\$25000-29999	16	71	110	3220
\$30000-39999	12	28	130	4500
\$40000-49999	29	79	120	3800
\$50000 & over	27	42	130	4350

Table 20A. Basic data for allocation of value to various areas of the Range.

Area ^{2/}	Use by 1968 RU		Indicated E ^{1/}		Primary+Secondary ^{1/}		Total Perc	
	No.	Percent	Total	Percent	No.	Percent	Sum	Me
Chickaloon	117	3	\$ 101	0	19	1	4	1
Northern Lakes	186	5	758	2	51	4	11	3
Swanson River	588	16	5345	15	264	19	50	16
Russian River	923	25	15830	45	314	22	92	30
Skilak Loop	940	25	8828	25	463	32	82	27
Between the Lakes	255	7	792	2	89	6	15	5
Tustumena Lake	295	8	1253	4	97	7	19	6
South of Tustumena	175	5	1216	3	46	3	11	3
Mountain Areas	221	6	1262	4	79	6	16	5

^{1/} Primary plus secondary single-visit use in 1968.

^{2/} Areas are defined in Figure 1.

Table 21A. Rankings of best and highest use of the Range.

Use	Highest or Intermediate Use				Lowest Use or Not to Be Permitted			
	Users				Users			
	Res.	Non-Res.	Owner	Mgr.	Res.	Non-Res.	Owner	Mgr.
Wildlife ^{2/}	821	63	70	91	5	7	15	7
Quality Recreation	73	59	70	93	9	4	13	7
General Recreation	64	50	57	64	18	15	24	36
Other Renewable Resources	18	15	20	12	62	48	61	88
Business and Commercial	13	12	13	0	68	52	70	97
Non-Renewable Resources	13	7	10	3	68	55	70	97

^{1/} Mean percent rating the indicated uses in this category.

^{2/} Wildlife - hunting, wildlife observation, fishing, production of young salmon by nature, wildlife research

Quality Recreation - cross-country skiing, photography, hiking, sailboating, canoeing, wilderness

General Recreation - berrying, camping, downhill skiing, horse packing & riding, sightseeing, picnicking, snowmobiling, swimming, water skiing, motor boating

Other Renewable Resources - commercial fishing, grazing, homesteading, logging, recreational cabins

Business & Commercial - business & industrial establishments, commercial vacation resorts & lodges

Non-Renewable Resources - mining, oil exploration & wells

Table 22A. Remarks written on Questionnaire I by 35% of the 1516 respondents.

I. Comments on the Area

1. Beautiful, enjoyable, great, nice - 71
2. Plan to return - 21
3. Saw little wildlife, moose - 9
4. No place like it - 6
5. Too many people - 2

II. Comments on Management of the Area (either criticisms or recommendations)

A. Facilities

1. Need more or improve

- | | | |
|------------------------|----------------------|-----------------------|
| a. Roads - 27 | g. Toilets - 3 | m. Snowmob.trails - 2 |
| b. Camping spaces - 21 | h. Bridges - 3 | n. View sites - 2 |
| c. Campgrounds - 17 | i. Canoe trails - 3 | o. Boat rentals - 2 |
| d. Hiking trails - 8 | j. Boat landings - 3 | p. Target range - 1 |
| e. Concessionaires - 7 | k. Water - 3 | q. Canoe signs - 1 |
| f. Parking - 5 | l. Roadside pkg. - 3 | r. Navig.aids - 1 |

Table 22A. (Continued)

II. Comments on Management of the Area (Continued)

A. Facilities (Continued)

- | | |
|----------------------------------|-----------------------|
| 2. Do not permit any more | 3. I especially liked |
| a. Commercialization - 34 | a. Facilities - 7 |
| b. Roads - 18 | b. Canoe trails - 5 |
| c. Beyond minimum facilities - 2 | c. Campgrounds - 3 |
| d. Fancy restrooms - 1 | |

B. Maintenance

- | | | |
|--------------------------|-----------------------|------------------|
| 1. Clean up (or "messy") | 2. Provide | 3. Maintain |
| a. Camping areas - 4 | a. Wood - 4 | a. Cleanliness - |
| b. Toilets - 4 | b. Plow roads | b. Roads - 2 |
| c. Trash - 4 | in winter - 1 | |
| d. Canoe trails - 3 | c. Spray for bugs - 1 | |

C. Resource

1. Keep it wild - 124 ("Don't try to improve on it or it will be ruined.")
("Chugach multiple use, not KNMR.")
2. Preserve habitat & species, sheep & moose - 19
3. Restrict
 - a. Oil (Tustumena) - 27
 - b. Hunting - 26
 - c. All other resources - 11
 - d. Fishing - 9
 - e. Pollution - 7
 - f. Minerals - 3
 - g. Heavy industry - 3
4. Liberalize or permit
 - a. Multiple use - 12
 - b. Fishing - 10
 - c. Hunting - 9
 - d. Oil - 3
 - e. Rec. cabin sites - 3
5. Keep or manage
 - a. Primarily recreation - 16
 - b. Open to public - 9
 - c. Stock fish - 9
 - d. Introduce elk, caribou, muskox - 5
 - e. Conservation for conservation's sake - 3
 - f. Improve lake fishing - 3
 - g. Natural propagation - 2

D. Regulations

1. Less off-road motors, airplanes, motorboats, snowmobiles - 56
2. Enforce golden eagle, trash, G & F, wasted fish, moose poaching - 21
3. Eliminate snagging - 7
4. More motors permitted - 6

E. Information - Need more - 14

F. Personnel - Were helpful - 5

G. Be consistent, bulldozers & moose pens - 1

H. Miscellaneous

1. Good for children - 10
2. Prices too high - 3
3. Use area for practice landings, as many do - 1

III. Comments on Questionnaire

1. Good questionnaire & idea - 11
2. Larger envelopes - 8
3. Don't feel qualified - 7
4. Poor questions - 4
5. Need map - 4
6. Keep polls out of the game management business - 1

Table 23 A. Air charter services contacted for fly-in data.

Alaska Air Guides. Anchorage. William Cunningham.
 Alaska Big Game Hunts. Anchorage. Marshall Farmer.
 Alaska Bush Carriers. Anchorage. Lloyd Hall.
 Andy's Flying Service. Kenai. Harold R. Andersen.
 Jim's Flying Service. Anchorage. Jim Murphy.
 Kenai Aviation. Kenai. Robert T. Bielefeld.
 Lofstedt's Kenai Air Service. Kenai. Bud Lofstedt.
 McNutt's Flying Service. Sterling. Ray McNutt.
 Pedersen's Moose River Resort. Sterling. Walter Pedersen.
 Rust's Flying Service. Anchorage. Henry B. Rust.
 Soldotna Air Service. Soldotna. Troy Hodges.

Table 24A. Responses of Kenai-Soldotna community leaders to interviews concerning the Kenai National Moose Range.

(All indicate number of answers out of 11.)

1. What values do you think the KNMR contributes to the community?
 Recreational - 11; Financial - 7; Commercial - 4; Educational - 3;
 Quality of Living - 3.
3. What is the Range's greatest potential future contribution to this community?
 Wilderness: Great - 1; Moderate - 2
 Exploitation (management & development) of wildlife: More - 3.
 Exploitation & development of recreation: More - 6; Same - 1.
 Relation of other resources to wildlife: Others secondary - 4; Equal - 4.
 Other resources should be:

	<u>Not Permitted</u>	<u>Further Restricted</u>	<u>Permitted</u>	<u>Encouraged</u>
Oil		5	2	1
Mining	1		2	
Grazing	3		2	1
Timber		3	3	

Table 25A. Research projects conducted on the Kenai National Moose Range.

Date of

Origin No. Title of Project - Investigator(s). Additional Dates Active
 1930's 1. Moose and Range Investigations - L. J. Palmer.

- 1949 2. Moose-Bear Relationships - Ed Chatelain, PR.
 3. Ecology of Burn Areas - Dr. Lutz, Yale U. & USFS. 1950.
 4. Dall sheep - R. Scott, PR. 1950, 1951.
 5. Moose Autopsies - Dr. Brannelly, Bert Babino. 1951.
- 1950 6. Effects of Fire on Revegetation of Moose Forage - John Hakala, FWS. Every
 7. Moose Forage Utilization Study - Staff, FWS.
 8. Winter Water Analysis of Lakes - Elkins, FWS.
 9. Tustumena Lake Studies - T. Karlstrom, Geol. Surv. 1951.
 10. History of Fire on the Kenai, Interviews with Older Residents - Staff, FW
 11. Cover Map - Staff, FWS.
 12. Parasite Studies - Bert Babino, Parasitologist, US Public Health Service.
- 1951 13. Wood-destroying Fungus Study - D. Baxter, U. of Mich.
 14. Plant Ecology Survey - W. Benninghoff, Geol. Surv.
- 1952 15. Natural Forest Areas - J. Scott, BLM.
 16. Range Surveys - A. Starker Leopold & F. Fraser Darling, Cons. Found.
 17. Goat Study - D. Klein, ACWRU.
 18. Permanent Forage Plots - Staff, FWS. To present.
 19. Slikok Experimental Burn of Spruce - Staff, FWS.

Table 25A. (Continued)

- 1954 20. Value of Herbicides in Eradicating Spruce & Tall Decid. Trees - R. Hinman,
21. Coyote-Sheep Predation Study - D. B. Harris, FWS.
22. Experimental Commercial Fisheries - Staff, FWS, and Bur. Comm. Fish.
- 1955 23. Chemical Control of Spruce - Lensink, PR.
24. Mechanical Control of Spruce with the D4 Cat - Staff, FWS. 1956.
25. Experimental Cuttings - Staff, FWS. 1956
26. Control Burn, July - Staff, FWS & BLM.
- 1957 27. Nesting Studies of Trumpeter Swans - Staff, FWS. Through 1967.
- 1960 28. Experimental Moose Ragging Program - Staff, FWS.
29. Experimental Forage Plots, Girdling & Brush Saw - Staff, FWS.
30. Jean Lake Experimental Soil & Moisture Erosion Control - Staff, FWS. To p
31. Experimental Commercial Fisheries, Tustumena & Skilak Lakes - Engel, ADFG.
- 1961 32. Chemical Vegetation Control Plots - Hakala, FWS.
33. Beaver-Salmon Study - Jerry Hout, ACWRU.
34. Harding Ice Field - U.S. Army Engineers. 1962.
- 1962 35. Browse Clipping Study - Staff, FWS.
36. Experimental Fertilizer Plots for Moose Browse - Staff, FWS.
37. Experimental Erosion Control of Cutbanks - Staff, FWS.
38. Experimental Planting of Birch and Willow - Staff, FWS.
- 1963 39. Spruce Grouse Study - Larry Ellison, ADFG.
- 1964 40. Moose Censusing by Square Mile Quadrats - Evans & Troyer, FWS. 1965.
41. Dall Sheep Studies, Surprise Mountain - Staff, FWS. 1965, 1966, 1967.
- 1965 42. Dall Sheep Range Study - Staff, FWS.
43. Vegetation Re-burn Study - Staff, FWS.
44. Test of "Closest Plant" Browse Evaluation Method - Staff, FWS.
45. Movements & Behaviour of Alaskan Spruce Grouse - L. N. Ellison, ADFG.
- 1966 46. Dall Sheep Lambing Study - Marsh Pitzman, ACWRU & Staff, FWS. 1967.
47. Pre-flight Studies of Trumpeter Swan Broods - Troyer, FWS. 1967.
- 1967 48. Cooperative Moose Pen Study, Effect on Range - Staff, FWS & ADFG. Cont
49. Cooperative Moose Pen Study, Effect on Moose - Staff, FWS & ADFG. Cont
- 1968 50. Moose Movement Study - Staff, FWS & ADFG.
51. Wildlife Values Study - H. Steinhoff, ACWRU & FWS.
- Unknown 52. Gulls on Skilak Lake - Arctic Health Research.

Distribution of Report:

Secretary of the Interior
Bureau of Sport Fisheries and Wildlife
Division of Wildlife Research, Washington (3)
Division of Wildlife Refuges, Washington
Regional Office, Portland
Associate Supervisor's Office, Anchorage
Kenai National Moose Range Office, Kenai (3)
University of Alaska
Alaska Cooperative Wildlife Research Unit (3)
Department of Wildlife Management
Colorado State University
State Board of Agriculture
Dean, College of Forestry and Natural Resources
Head, Department of Fishery and Wildlife Biology
The Society of the Sigma Xi



4D-16. A view from the historic Moosehorn Trail in the proposed Andrew Simons Wilderness Area. Photo by Seemel.



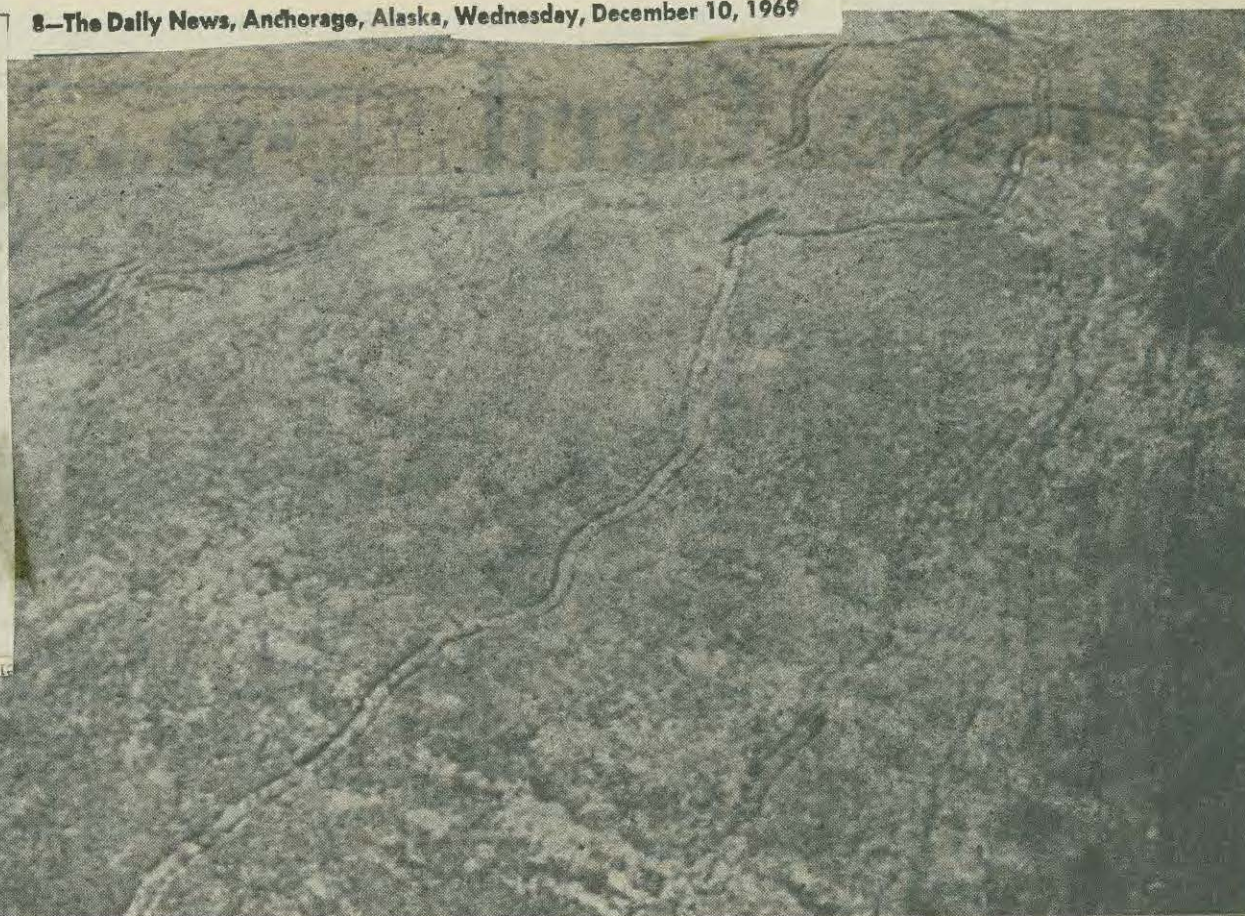
66-48. When the hair on the top of her neck and shoulders stands up have plans made to leave the area when her ears go back. Photo by Seemel.

Off-road vehicles are prohibited in the Kenai range, since they tear up the tundra and undergrowth and upset the ecology of the area. Since tundra cover is so fragile, vehicular tracks leave ruts that scar the area for years, eroding into ugly gullies.

The Department of the Interior is stepping up its enforcement procedures, with violators liable for fines and confiscation of equipment. Planes and helicopters will be used on extended patrols of prohibited areas, Hakala said.

Three men were found guilty in the U.S. Commissioner's Court on charges of willful and unlawful use of a vehicle in the Kenai range in an area prohibited to vehicular travel. Ralph A. Ovalle, Arthur L. Spooner, and Gerald A. Kitchen were each fined \$500 with \$250 suspended.

The three were on a hunting trip



These tracks will scar the Kenai Range for years.

Snow-Sparse Kenai Range Is Vulnerable to Off-Road Vehicle

John Hakala, refuge director for the Kenai Moose Range, continued to warn today that there is too little snow on the range to permit snowmobile traffic. To protect the underlying tundra, a layer of at least six inches to a foot of snow is needed, Dave Spencer, U.S. Fish and Wildlife district supervisor, told The Daily News.

into the Tustumena Lake area last September, using an amphi-cat vehicle to haul out a moose which they had killed approximately one mile back from the lake. The tracks made by this vehicle on the virgin tundra will be visible for many years.

When there is enough snow on the

range to allow recreational travel of snowmobiles, Hakala said he will issue a field announcement from Kenai.

If an antlerless moose season is declared later this year, certain sections

of the range may be opened to snowmobile traffic. These areas would include portions of game management units 15A and 15B, but conditions will again depend on snow cover.



2-5. This fellow and two of his companions were found trespassing with this vehicle on the Moose Range. They were apprehended with the use of a Super Cub plane, a helicopter, and a pickup truck. They were each fined \$500 in federal court. Mark one point for our team. Photo by Seemal.



Containing oil spilled from a pipeline break on the bank of the river. Logs on land and across the water prevented pollution from spreading down stream. Workers were coupling on a high pressure line and the oil was being pumped to the sea.

Workers on the bank of the river. The logs were placed in the river to contain the oil. The logs were placed in the river to contain the oil.

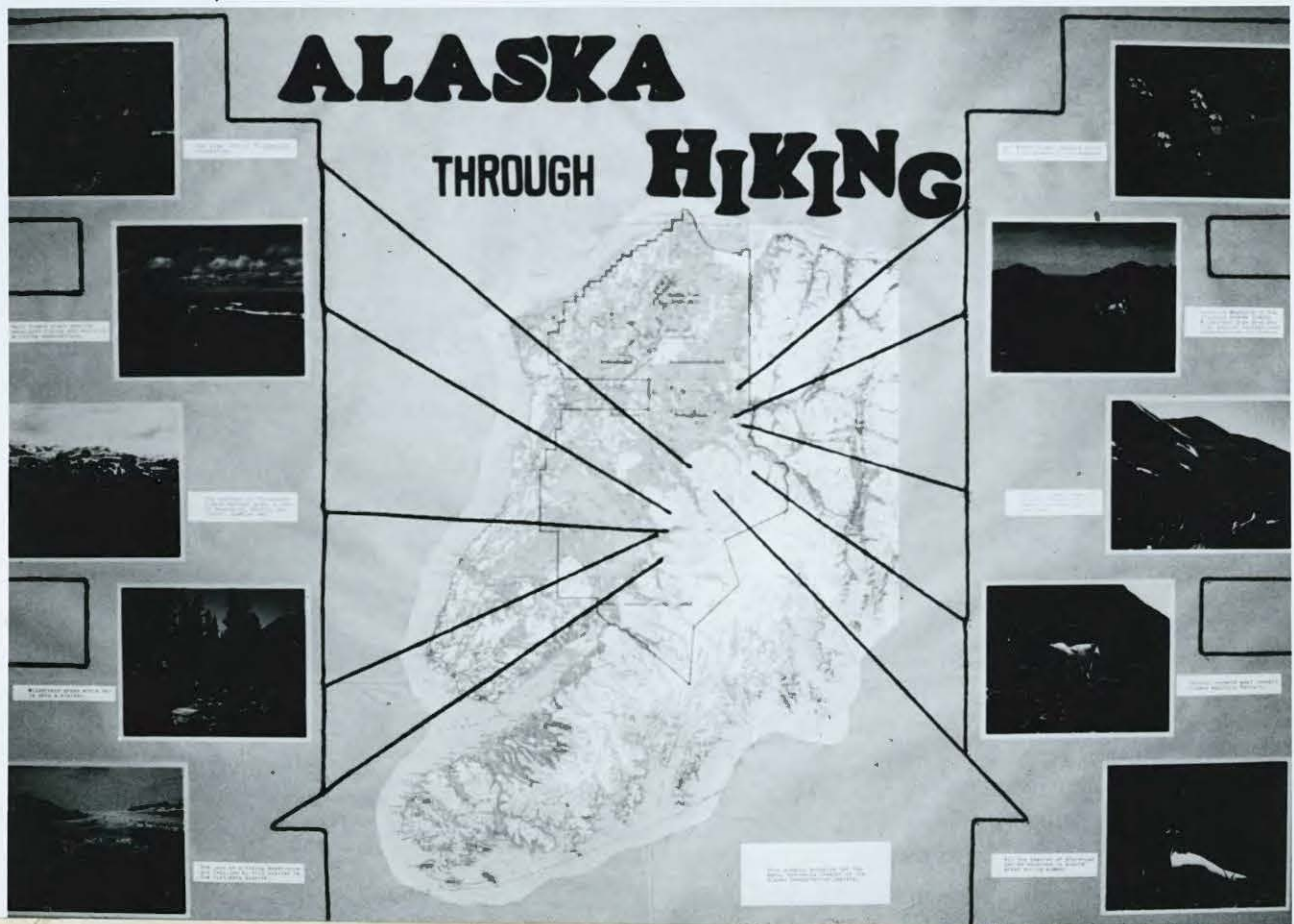




2A-47t Seismic recorder on line just beyond a shot hole. Photo by Richey.

2G-10. Homer Electric Association 115 KV transmission line construction by Snelson, Inc. Photo by Kurtz.





3D-3t. A picture display prepared by the Kenai Chapter of the Alaska Conservation Society and set up at the Kenai Airport. Photo's were furnished by the Refuge. Photo by Richey.



4A-15t. Hidden Lake continued to be one of the most popular campgrounds on the Moose Range. Photo by Kurtz.

4A-19t. Up to two feet of water flowed through Kenai-Russian River Campground during the fall flood. It is hard to believe that this was one of the dryest years on record, yet the Kenai River flooded twice during 1969. Photo by Kurtz.





5A-19t. A pair of trumpeter swans defending their nest site on Brood Lake.
Photo by Troyer.

3F-7t. Bob Wood classifying sheep during the June composition survey. Indian
Creek and Indian Glacier in the background. Photo by Bill Cheney.





3C-6t. Burned area near the origin of the 2570 acre Russian River Fire. Lower Russian Lake and Surprise Mountain in the background. Photo by Richey.



3C-135. A scene along Swanson River during the Swanson River Fire. Photo by Larry Engel, Alaska Department of Fish and Game.



3C-130. Looking north from the Moose Range Headquarters in Kenai on August 13 shortly before the fire reached the city limits near Beaver Creek. That's S M O K E -- not clouds. Photo by Seemel.

2A-46t. Smoke from the Swanson River Fire along the west side of the oilfield. The compressor plant is in the foreground. This entire area burned later without damage to the facilities. Photo by Richey.



3C-129. Secretary of Interior Walter Hickel at Kenai Airport after inspecting Swanson River Fire. From left to right Kenai Mayor Eugene Morin on Hickel's right, Secretary Hickel, "what's his name", KSRM news man Fran Moore, and Kenai Borough Chairman George Navarre with back to camera. Photo by Seemel.





3C-131. The orange liquid is "Phoschek", a fire retardant dropped on hot spots by aircraft. This area is along the Swanson River Road near Mosquito Lake. Nearly 1,000,000 gallons were dropped on this fire. Photo by Seemel.



3C-137. "Cat" line cut in the dry tundra to control the Swanson River Fire.
Photo by Richey.

3C-125. Portion of "back-up line" constructed east of the Swanson River Fire
between Mosquito and Silver Lakes.





30-132. Bridge constructed by fire-fighters on Swanson River. The Bureau of Land Management cleaned all the debris from the river during mop-up of the fire. Photo by Larry Engel, Alaska Department of Fish and Game.



3C-130. Severely burned areas like this will be seeded to annual rye grass to reduce erosion and siltation of the Swanson River. Photo by Larry Engel, Alaska Department of Fish and Game.



7-6. Alaska Department of Fish and Game Fishery Biologist Dave Watsjold surveying fish die-off in Swanson River during Swanson River Fire. (Silver Salmon). Photo by Larry Engel, Alaska Department of Fish and Game.



3C-126. A small herd of bulldozers after a night of carousing north of Sunken Island Lake Road, Swanson River Fire. Photo by Seemel.

3C-128. The same scene as above after rehabilitation. Photo by Seemel.





30-127. After the Swanson River Fire was brought under control the Bureau of Land Management rehabilitated the east line of the burn-up operation program. A total of 114 miles of line were walked in the Mason Range. Photo by G. M. M.



30-7t. On the bank of the Swanson River the point of origin of the 86,000 acre fire. As the coals were kicked off the bank into the river another caught in the grass to the right of the stove ring, blazed up and ran back a few feet to the spruce timber. After five major runs it was brought under control during a period of calm winds 23 days later. Photo by Seemel.



6D-26. This herd of twelve caribou was photographed north of the Kenai Airport after the Swanson River Fire. Photo by Seemel.