Moose Movements and Habitat Use Along the Upper Susitna River

Progress Report
to
Alaska Power Authority
(April 1978 through September 1978)

By
Kenton P. Taylor
and
Warren B. Ballard

Alaska Department of Fish and Game
Division of Game

Ronald Somerville, Director
Donald E. McKnight, Research Chief

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CONTENTS

SUMMARY

Moose (*Alces alces gigas*) radio-collared in the vicinity of the proposed Susitna hydropower project were relocated 151 times from 1 April to 30 September 1978. Most moose observed were in spruce dominated habitats. Seven of the 10 cows that calved in 1978 did so in spruce habitats. Four additional moose were captured and radio-collared in August 1978 to replace those lost during the previous year.

Movement patterns for most moose during this study period were similar to those of previous years. Nine of the original 18 radio-collared moose crossed the Susitna River in the proposed impoundment area at least once. Proportionately more moose (10 of 14) utilized the same summer range in both 1977 and 1978 than utilized the same winter range (6 of 14).

Present information suggests that moose from many portions of the Susitna River drainage utilize habitats adjacent to or within the area which would be flooded by dam construction.

BACKGROUND

The Susitna River basin has long been recognized as an important habitat to a wide variety of wildlife species (ADF&G unpublished data). Increasing interest in hydroelectric power development in the Devils Canyon area stimulated some general ungulate population assessment work in 1974 (USF&WS 1975). Limited funds became available in 1976 to acquire baseline information on moose movements and habitat use within the impact area (Fig. 1). The present study, funded by the Alaska Power Authority (APA), was a continuation of the work reported in Taylor and Ballard (1978) which was initiated in 1976. Briefly, the history of the project was as follows:

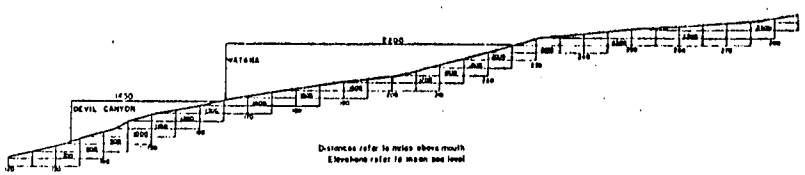
During October 1976 and March 1977, 18 radio collars and 21 visual collars were placed on moose along the Susitna River from the mouth of the Maclaren River downstream to Devil Creek. Radio-tracking flights over a 13 month period yielded 270 observations of the radio-collared moose. Visual-collared moose were located 43 times. Radio-collared moose located between Jay Creek and Devil Mountain maintained small year around home ranges, generally less than 48 km^2 in extent. One moose from Devil Creek was seen near Lone Butte, 84 km east of her tagging location indicating that some east-west movements occur. Movements of eight moose collared east of Jay Creek were substantially longer, and migrations up to 103 km were observed. Radio-collared moose were observed most often in spruce (*Picea glauca* and *Picea mariana*) dominated habitats during all seasons. Seven of the eight cows gave birth in spruce vegetation. The Susitna River bend from Goose Creek to the mouth of the Tyone River was identified as important winter habitat for moose from many areas of the Susitna River drainage. Lower elevations along the Susitna River between Jay Creek and Devils Canyon were important as both wintering and calving areas for resident moose populations. Radio-collared and visual-collared moose crossed the Susitna River a minimum of 26 times. Fifteen of these crossings occurred along that portion of the river which would be inundated following dam construction. Evidence gathered during this phase of the study suggests that moose from many portions of the Susitna River drainage utilize habitats adjacent to or within the area flooded by waters impounded by the proposed Susitna hydroelectric project.

PROCEDURES

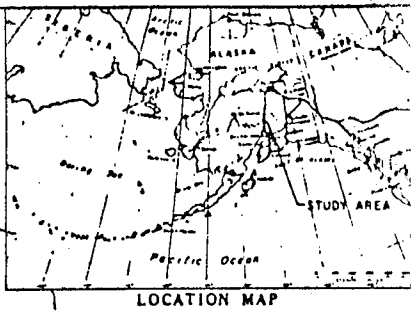
Flights to locate radio-collared moose were made at least monthly in a Piper PA-18 Supercub equipped with two, three or four-element Yagi antennas connected to a four-band, 12-channel portable receiver manufactured by AVM Instrument Company (Champaign, Illinois). Tracking techniques were similiar to those described by Mech (1974). During parturition and several weeks afterwards, flights were intensified to one every 3 to 5 days to assess initial production and survival of calves.

Radio collars were retrieved from animals that died during the course of the study and placed on new study animals. Capture and processing techniques were identical to those described by Taylor and Ballard (1978) except that 29 mg of Anectine (Succinylcholine chloride)

Figure 1. Devils Canyon Proposed Hydroelectric Project Moose Movement Study Area. Devils Canyon Project, March 1978.



UPPER SUSITNA RIVER PROFILE
RIVER MILES 120-290



LOCATION MAP

BASIN BOUNDARY

RECOMMENDED
A DAM AND RESERVOIR AT WATANA DAMSITE WITH TRANSMISSION FACILITIES.

RECOMMENDED
A DAM AND RESERVOIR AT DEVIL CANYON DAMSITE.

DEVIL CANYON DAMSITE

WATANA DAMSITE

MOOSE MOVEMENTS SUSITNA STUDY AREA

SCALE
0 5 10 15 20 Miles

LEGEND
RESERVOIR
ACCESS ROAD
TRANSMISSION ROUTE

SOUTHCENTRAL RAILBELT AREA, ALASKA
INTERIM REPORT NO. 1
UPPER SUSITNA RIVER BASIN
RECOMMENDED IMPROVEMENT

ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA
DECEMBER 1975

FILE NO. 2-SOU-92-04-01 PLATE 1

were used. Colored ear streamers and visual collars were attached to each radio-collared moose to aid in identification from the air. Condition of the teats (lactating or not lactating) was noted. The animals' associations with other moose when collared were recorded. An incisor tooth was taken from each animal, when feasible, for cementum line age determination according to methods of Sergant and Pimlott (1959).

FINDINGS

Results of the initial moose-collaring, data collection and radio monitoring flights conducted between October 1976 and November 1977 were reported by Taylor and Ballard (1978). Three radio-collared moose were lost during spring 1978. The carcass of number 8040 was found 8 July 1978. She was last observed on 14 February, and the cause of mortality is unknown. The collar of moose number 8588 was found on the ground 8 July. She was last observed 12 June 1978 and her fate is unknown. The radio collar of moose number 8038 was found in a pool in Watana Creek, also on 8 July. She was last observed on 11 April 1978, and she is believed to be dead.

Four cow moose were captured and radio-collared between Deadman and Jay Creeks in August 1978 to replace the three lost in spring 1978. Incisor teeth were collected from three, but their ages have not yet been determined. None of the four were lactating at the time of collaring, and none were accompanied by calves, although one was with a yearling bull.

Radio-collared moose along the Susitna River from the Denali Highway bridge downstream to Devil Creek were relocated 151 times between 1 April and 30 September, increasing the total number of moose relocations since the beginning of the study to 430 moose observations.

Movements

Radio-collared moose occupied ranges from 27 to 686 km^2 (Table 1). Observations obtained after March 1978 increased range sizes for 10 of 16 radio-collared moose. Of the six ranges that did not increase with increased observations, five were in the Watana Creek drainages.

Six of 14 radio-collared cows alive from winter 1977 through summer 1978 utilized approximately the same winter range in both years. The average distance between winter ranges utilized by the other 8 moose was 17 km (range 6 km to 50 km). Ten moose of these 114 moose utilized roughly the same summer range in 1977 and 1978. Of the four that did not, the average distance between ranges used was 16 km (range 6 km to 31 km).

Radio-collared moose crossed the Susitna River four times between 1 April and 30 September 1978, bringing the total minimum number of crossings since the beginning of the study to 30. Nine (50 percent) of the original 18 radio-collared moose have crossed the Susitna River at least once.

Table 1. Range size, number of radio-locations and minimum number of river crossings of radio-collared moose along the Susitna River.

Radio Number	Number of Locations	Range Length km.	Range Width km.	Total Area km^2	Minimum Number of river crossings
8583	21	11.3	6.4	26.6	0
8584	21	20.1	7.2	50.7	3
8586	19	17.7	7.2	43.5	1
8589	2	--	--	--	-
8580	3	--	--	--	-
8038	22	14.2	9.3	51.5	0
8573	22	14.5	8.0	43.5	2
8576	21	12.9	10.5	41.0	0
8022	28	24.8	17.2	180.2	2
8588	16	13.5	8.2	39.9	1*
8040	20	17.1	6.4	49.9	0
8578	29	16.8	8.3	41.0	1
8579	20	49.9	20.0	240.4	2
8031	36	19.3	17.7	108.6	0
8035	38	66.8	14.5	405.6	2
8018	30	70.0	25.7	639.7	2
8030	37	55.5	21.2	415.8	3
8575	31	103.8	12.1	685.6	0
8040II	4	--	--	--	-
8588II	4	--	--	--	-
5527	3	--	--	--	-
5540	3	--	--	--	-
	430				19

* Cow observed on island

Movements - Devil Mountain Area

None of the three study animals collared in the Devil Mountain area made any significant movements during this phase of the study. Number 8583 remained on the north side of the river in an area of less than 12 km^2 (Fig. 2). Numbers 8584 and 8586 remained on the south side of the river in overlapping areas of approximately 31 km^2, and 15 km^2 respectively. All three remained at elevations between 500 m and 750 m. Seasonal changes in vegetation and snow depth appeared to have little influence on elevation fluctuations from April through September. All three moose utilized different winter ranges in 1978 than in 1977. Average distance between ranges was approximately 9 km. Numbers 8584 and 8586 wintered on the south side of the Susitna river during 1978. Both had previously wintered on the north side. All three moose inhabited essentially the same summer range in 1978 as they utilized in 1977.

Movements - Watana Creek Area

Five of six cows originally collared in the Watana Creek area were alive at the beginning of this study, but two (Nos. 8038 and 8588) were lost shortly thereafter. Both remained within the ranges they utilized the previous year (Fig. 3). Moose number 8038 confined her movements to a 5 km stretch along the east bank of lower Watana Creek. Moose number 8588 utilized the lower elevations at about 750 m along the north shore of the Susitna River as well as the upland hillsides above 900 m. She was rarely found in the more level terrain in between the two.

Moose numbers 8022 and 8573 also remained within previously established range boundaries (Fig. 4). Moose number 8022 confined her movements to a 23 km^2 area along upper Watana Creek while number 8573 ranged in an area of approximately 15 km^2. Moose number 8576 was the only moose in the Watana Creek area that extended its range during this phase of the study (Fig. 4). Originally occupying an area of 21 km^2, her range increased to 78 km^2 as she moved into higher elevations above the Susitna River during summer 1978.

Movements - Susitna Bend Area

Movements of moose during this phase of the study in the Susitna Bend area were much less extensive than those that had occurred during the preceding 12 months. Although two of the four radio-collared moose in this area calved in spring 1978, no substantial movements prior to calving were observed (Fig. 5). Moose number 8031 remained in an area of 10 km^2, while number 8578 inhabited an area of approximately 31 km^2. Number 8579 increased its range substantially and was found during this study period utilizing an area of approximately 160 km^2 (Fig. 5). Moose number 8030 returned in spring 1978 to calve in the general vicinity of her 1977 calving location and remained within a 41 km^2 area throughout the summer (Fig. 6). Moose number 8578 utilized essentially the same range throughout this study period (Fig. 5), an area of approximately 20 km^2.

Figure 2. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River near Devil Mountain.

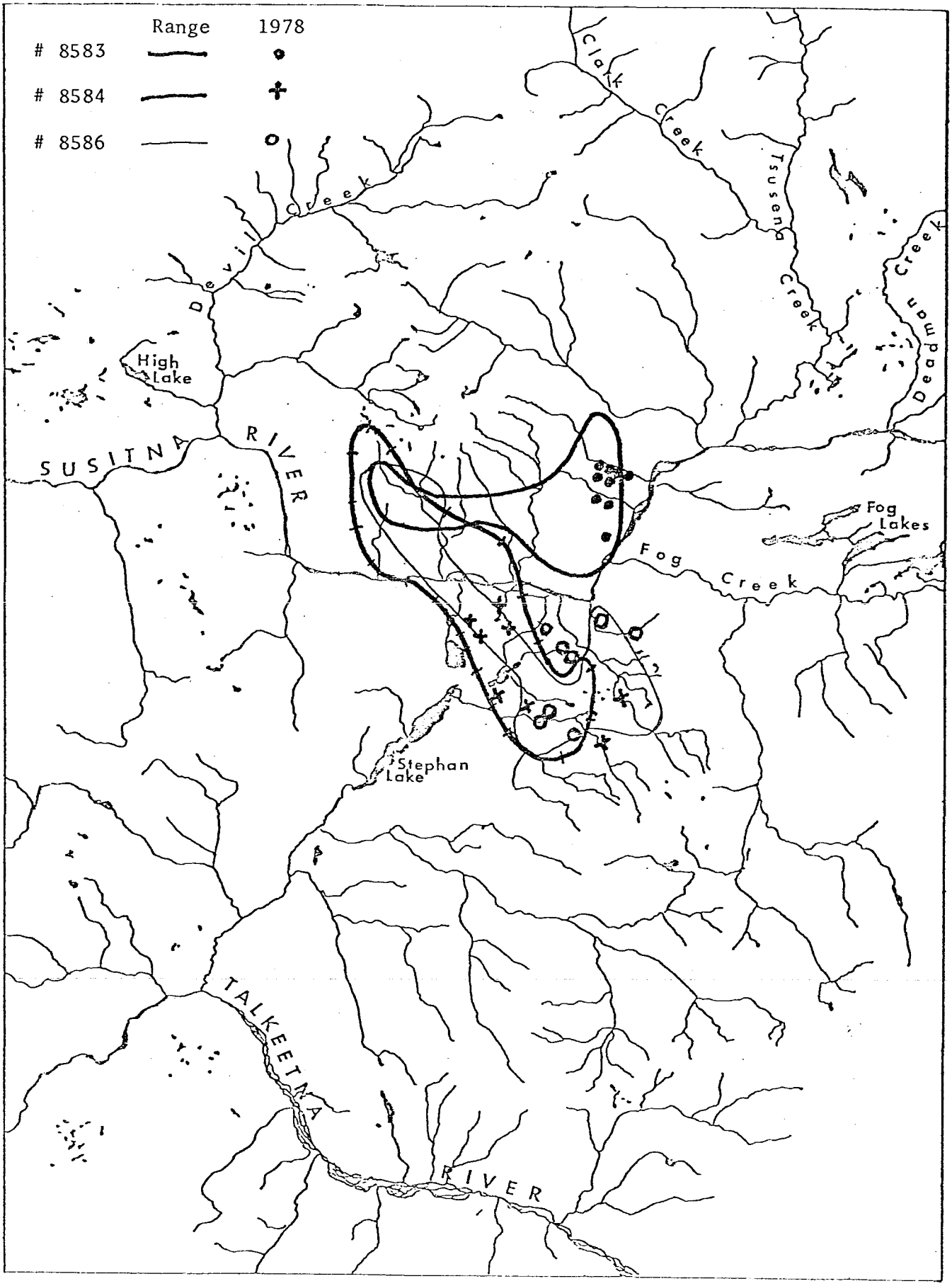


Figure 3. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River near Watana Creek.

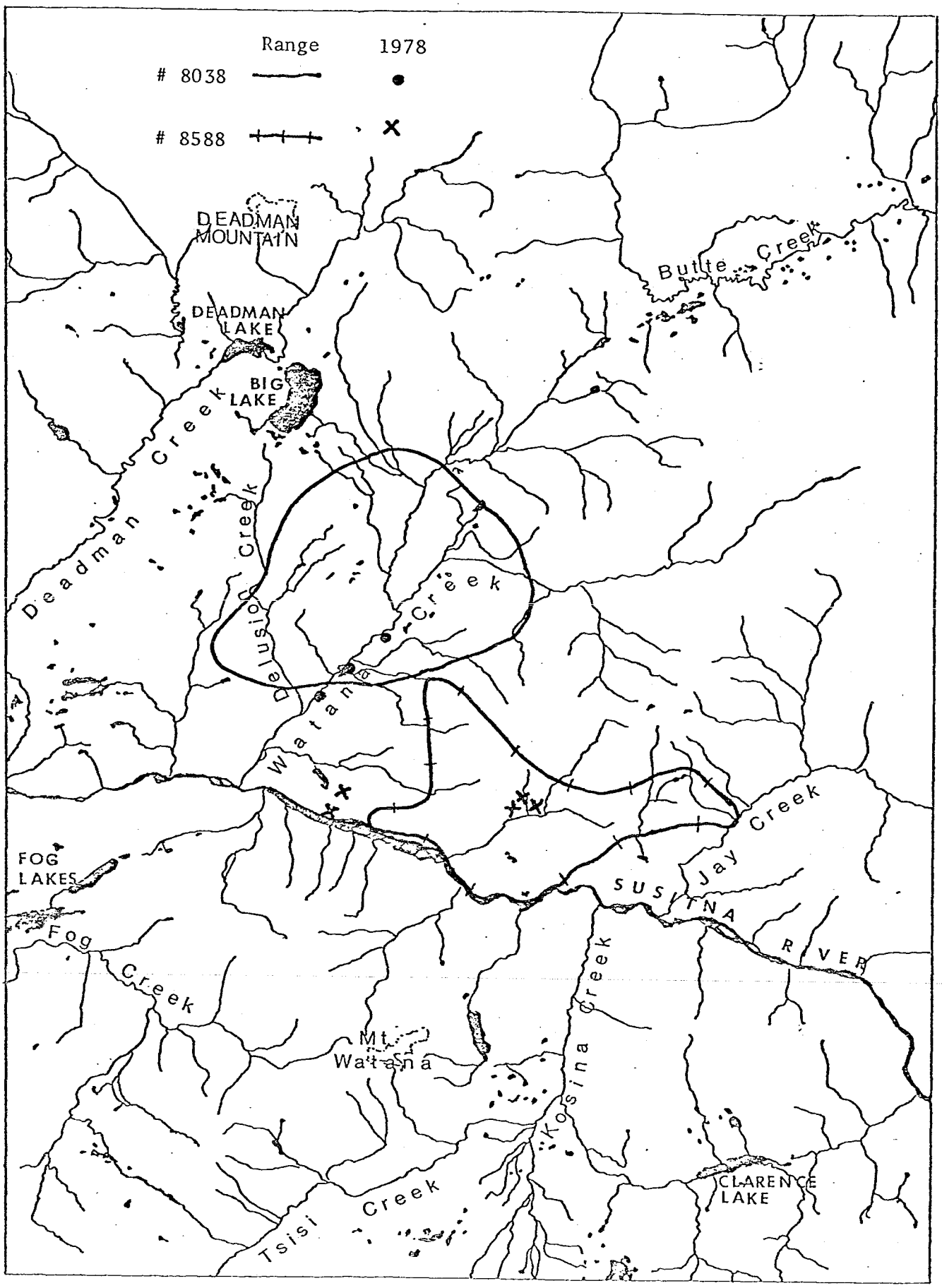


Figure 4. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River near Watana and Jay Creeks.

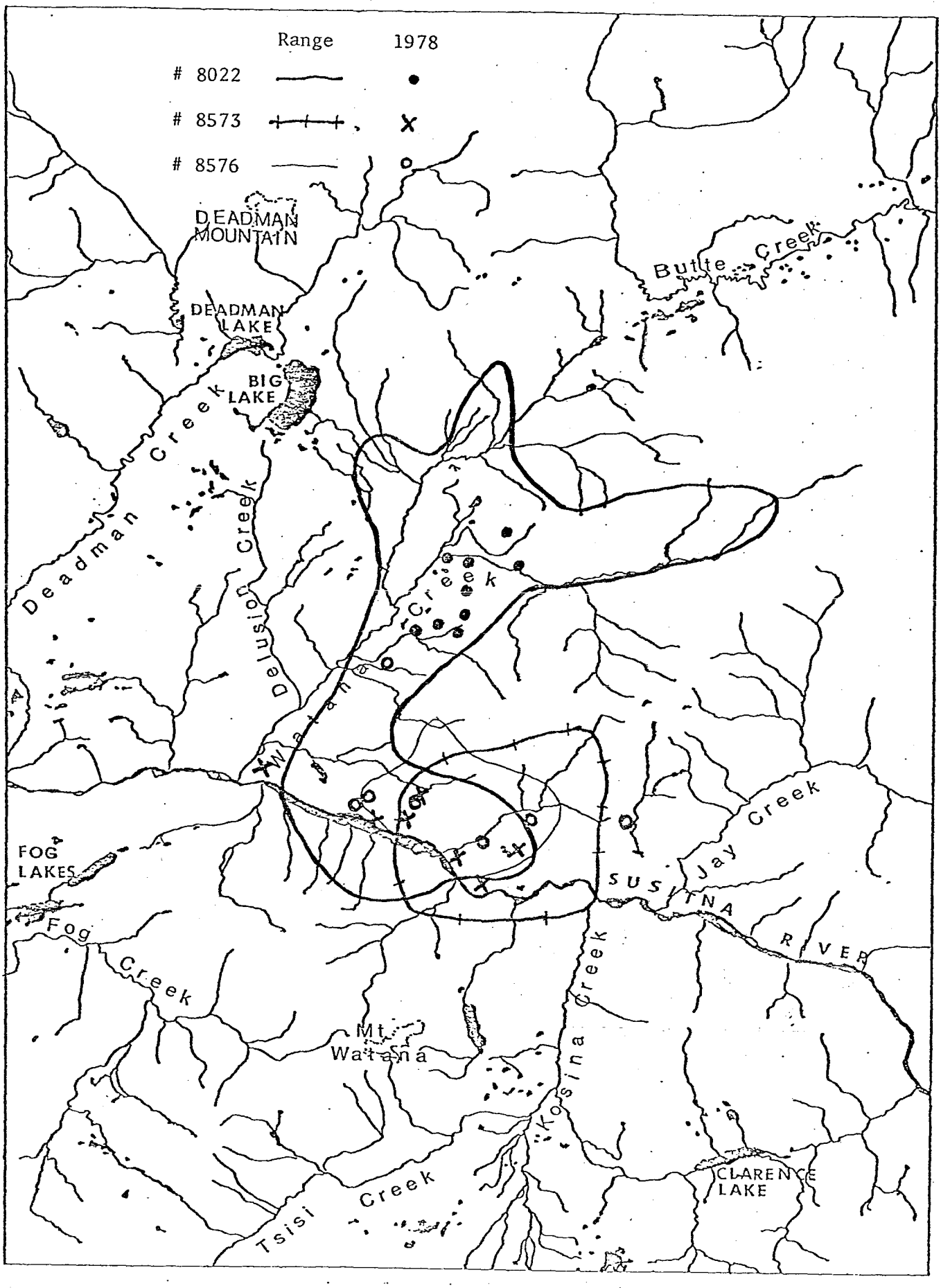


Figure 5. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River near the Mouth of the Tyone River.

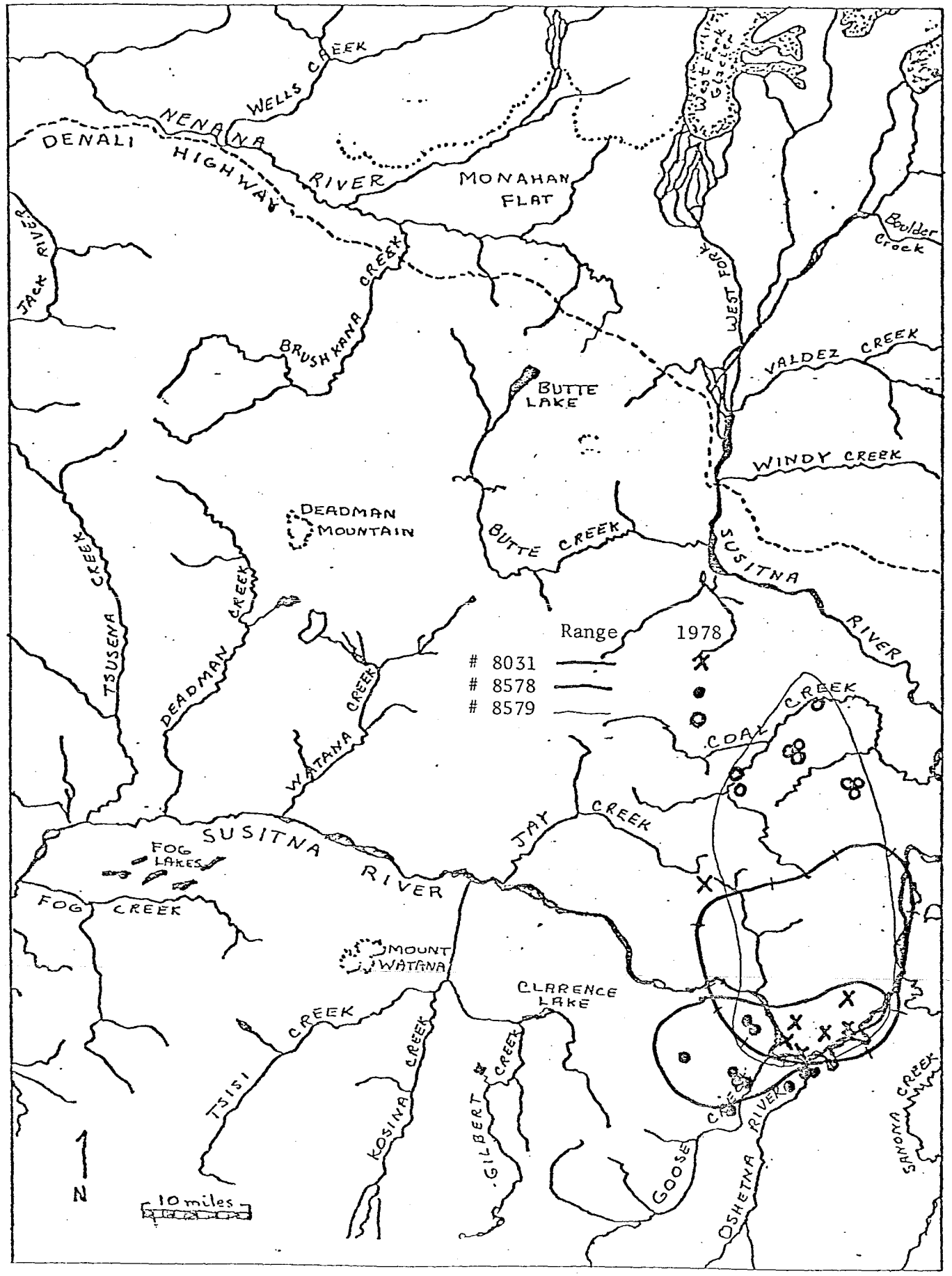
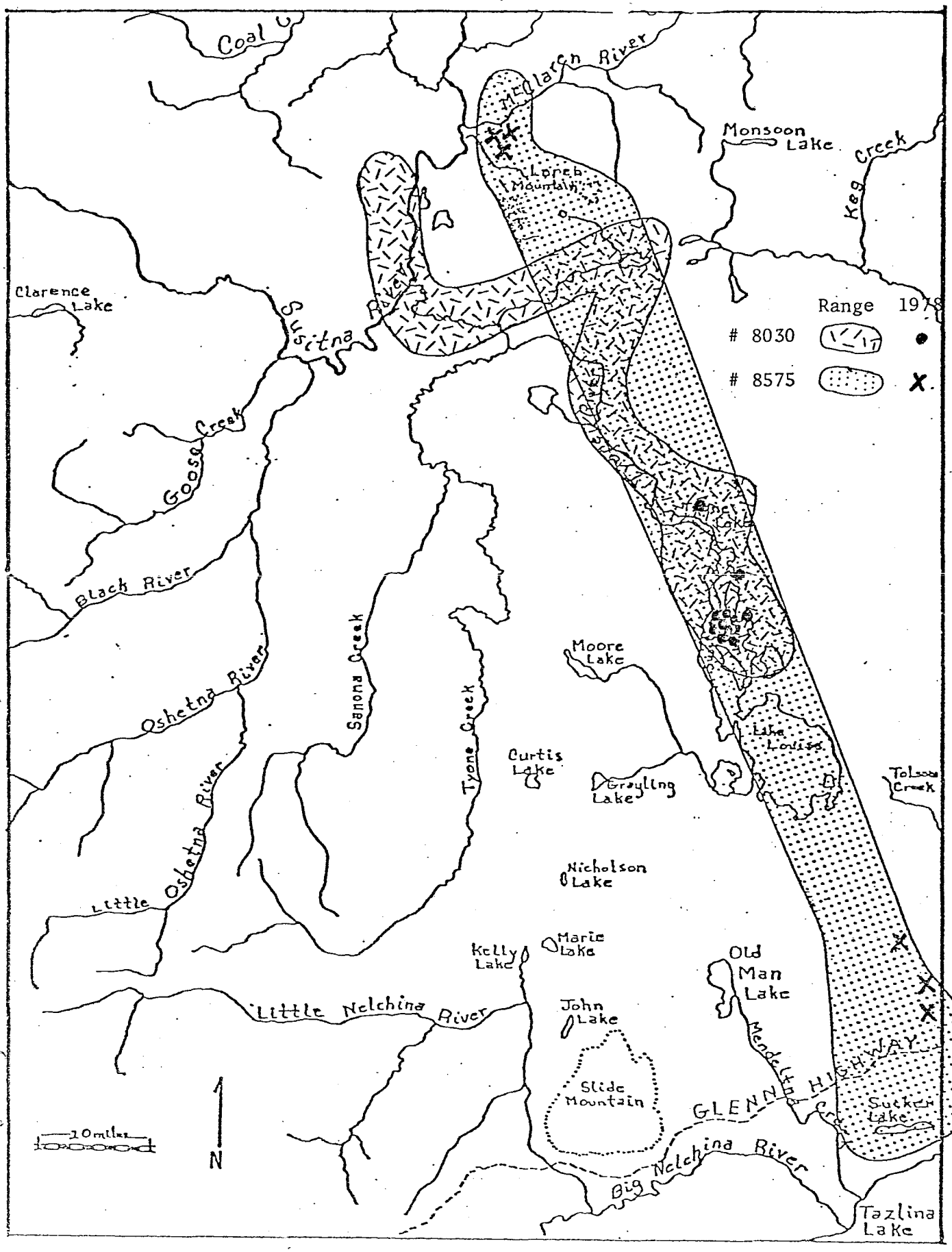


Figure 6. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River near the Mouth of the Maclaren River.



Movements - Maclaren River Area

Both moose collared along the Maclaren River migrated considerable distances between distinct summer and winter ranges. Moose number 8035 wintered in the Susitna Bend area and spent the summer along the Maclaren, roughly 50 km away (Fig. 7). Her movements have followed this pattern during the past 2 years. Number 8575 followed a similar pattern (Fig. 6). During April 1977 she migrated over 100 km from the Maclaren River to south of the Glenn Highway near Tazlina Lodge. She returned to the Maclaren River in October, and in May 1978 was found again 100 km southeast in the same area she occupied the previous year. Movement patterns for both moose were slight on their winter and summer ranges.

Movements - Butte Creek Area

During the 1976-77 portion of this study moose number 8018 migrated from its summer-fall range in the Butte Creek area to winter along the Maclaren River and in the western Alphabet Hills where she calved in May (Fig. 8). She returned July 1977 to Butte Creek and remained there in an area of 30 km^2 through this study period. She calved on 30 May 1978 about 40 km from where she had her calf on 30 May 1977.

Vegetation Use

Habitat types utilized by collared moose were noted during radio-tracking flights and observations were classified into 10 groups (Table 2). Three hundred and fifteen habitat observations of radio-collared moose have been recorded; 220 (70 percent) were in spruce dominated habitats. Radio-collared moose were most often observed in spruce of low to moderate density.

Seven of 10 cows that gave birth in spring 1978 were first seen with their calves in spruce dominated habitats. Two were in marshy areas and one was above timberline in the willow/alder community.

DISCUSSION

Most of the data collected between April and September 1978 support the earlier findings of Taylor and Ballard (1978). General movement patterns during migration periods were very similar to those recorded the previous year. There were some noteworthy exceptions, however.

Two of the three moose in the Devil Mountain area remained on the south side of the Susitna River through this study period and have not been observed on the north side since March 1977 when they were collared. Moose number 8018, collared along Butte Creek, migrated 65 km during winter 1976-77. She did not migrate at all during winter 1977-78 winter, however, and remained in the Butte Creek area.

Movement patterns for most moose along Watana Creek were considerably less extensive during this study period than they had been previously. Number 8022 inhabited a substantially smaller area (approx. 23 km^2) than she had the previous year (180 km^2). This was also true to a lesser extent of moose numbers 8573, 8031 and 8578 in the Susitna Bend area.

Figure 7. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River and Maclaren River.

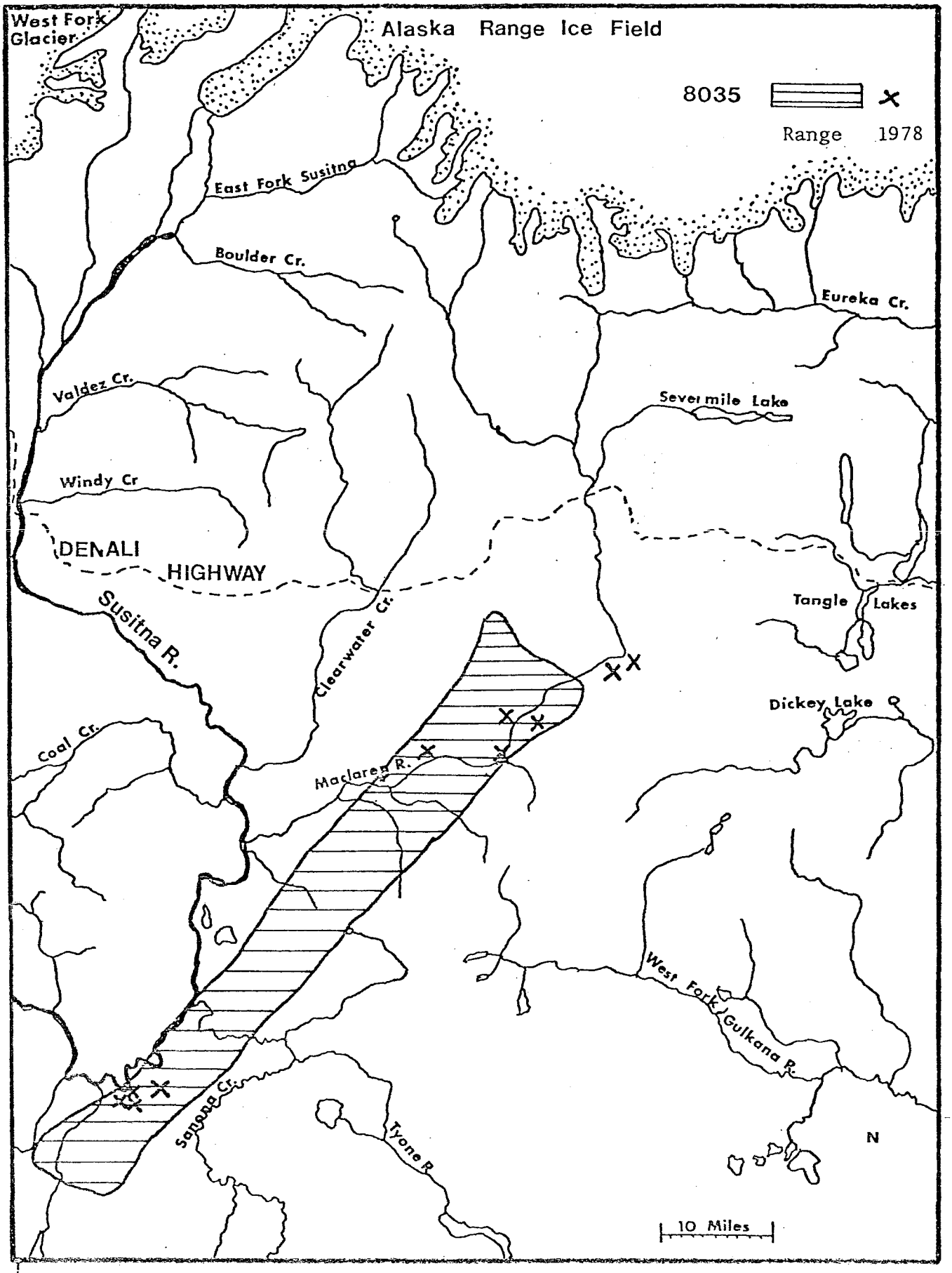


Figure 8. Previous Range and 1978 Locations of Radio-Collared Moose Along the Susitna River near Butte Creek.

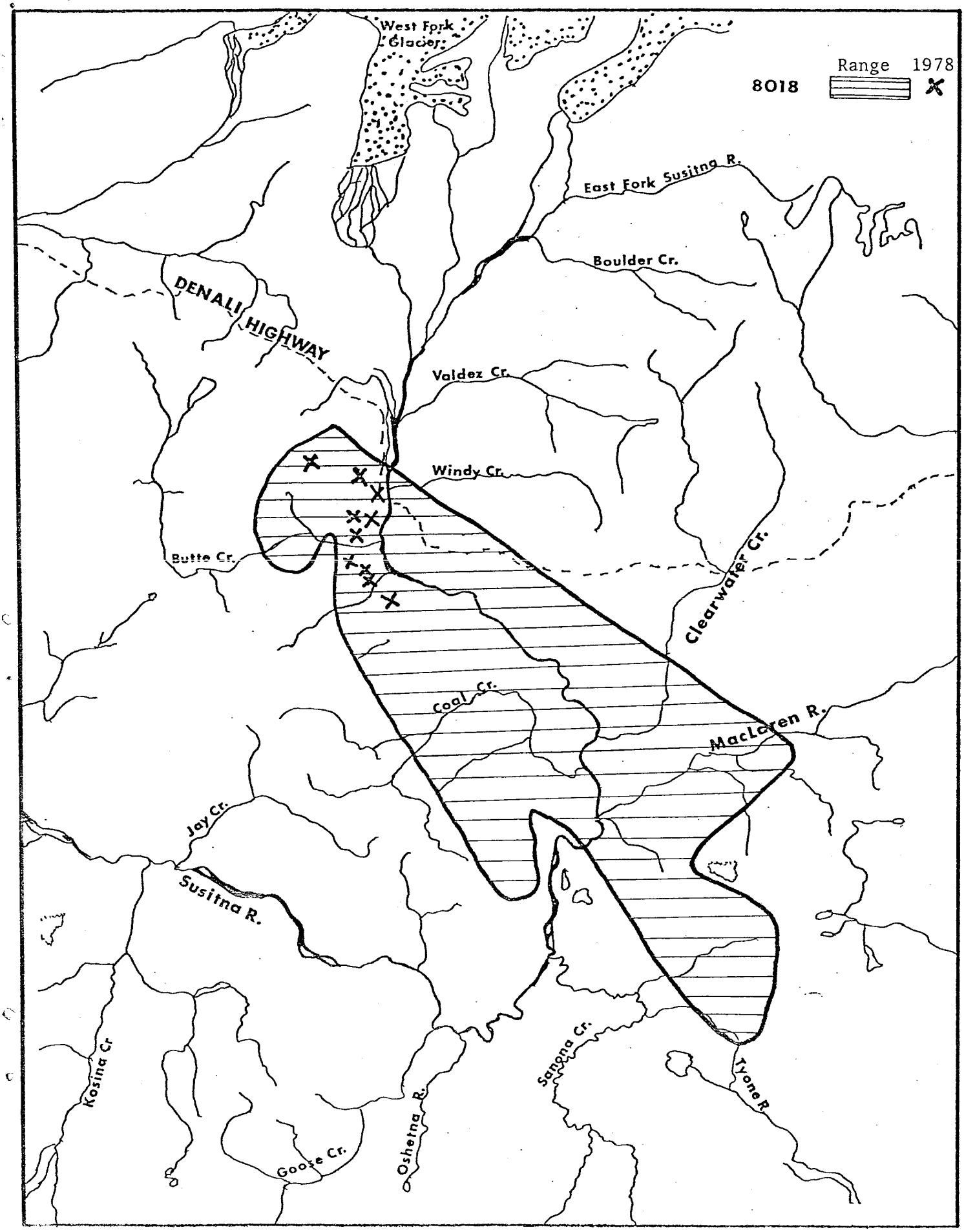


Table 2. Number of observations of radio-collared moose in vegetation types along the Susitna River between October 1976 and December 1977.

Collar Number	Total Sightings	Open Spruce	Medium Spruce	Dense Spurce	Spruce Hardwood**	Alpine Tundra	Alder	Willow	Riparian Willow	Marsh	Open
8583	15	2	4	1	5			2		1	
8584	17	6	7		1		1	2			
8586	13	5	6	1					1		
8589	1			1							
8580	2		1	1							
8038	16	7	7	1	1						
8573	19	5	7	4			1	2			
8576	21	5	10	1	2		1	2			
8022	18	3	2				6	5	2		
8588	13	6	1	2			2	2			
8040	11	2					5	2	2		
8578	21	12	1	2		2		3	1		
8579	21	5	5	3		2		5	1		
8031	23	7	2	9			1	4			
8035	26	5	7	6		1		2	4	1	
8018	23	4	6			1	4	4	4		
8030	23	4	9	8	1						1
8575	22	5	9	6				1	1		
8040II	3	?					1				
8588II	3	2	1								
5527	2		2								
5540	2				2						
	315	87	87	46	12	6	22	36	16	2	1
Percent of Total	100.0	27.6	27.6	14.6	3.8	1.9	7.0	11.4	5.1	.6	.3

* Spruce categories include both white spruce (*Picea glauca*) and black spruce (*Picea mariana*).
** Hardwoods in this category include aspen (*Populus tremuloides*) and birch (*Betula papyrifera*).

Snow depths during winter 1977-78 were similar to those of 1976-77. Below average snow accumulation occurred in most of the study area during both winters. Movements of those moose that migrated in the fall appeared to be triggered by increasing snow depths. Increased use during winter months of the spruce dominated habitats at lower elevations along the Susitna River and Watana Creek indicates these areas would probably be critical to the survival of local moose populations during a severe winter.

PRELIMINARY CONCLUSIONS

This radio-telemetry study was focused almost exclusively on the north side of the Susitna River upstream from the proposed Devils Canyon dam site. Both winters covered by this study were considered mild. Identification of critical wintering areas is most readily accomplished during winters of high to severe snow depths, as moose tend to congregate in greater densities on the most vital ranges as snow depths increase. Collection of moose movement information downstream and on the south side of the Susitna River is essential in order to evaluate the full potential effects of the proposed hydroelectric project. Downstream effects on moose would be expected to be significant, since vegetation composition would be altered substantially as a result of regulated water flow (Army Corps of Engineers, 1978).

Annual moose harvests within the immediate drainages of the upstream portion of the Susitna River have averaged 146 moose since 1974 (ADF&G, unpublished data). Approximately 475-500 sportsmen participate in moose hunts in this area each fall (op. cit.). How significantly dam construction might reduce or increase this level of participation is difficult to guess with the limited data available. Construction of an access road to the Watana site could substantially increase hunter pressure in the area, creating a corresponding increase in total man days spent hunting. The quality of the hunting experience would probably decline, however, as well as the rate of hunter success. Dam construction and maintenance schedules are projected on a basis of a dam life of 100 years. If project impacts reduced local moose populations by 50 percent this would amount to a corresponding loss of harvest of 7,300 moose during the life of the dam. Loss of hunting opportunity downstream and loss of non-hunting wildlife values can not be estimated on the basis of available information.

Construction of the Devils Canyon dam would flood a 45 km long portion of the Susitna River having a surface area of 7,500 acres (USFWS, 1975). The riverbanks along this portion of the river are generally steep and provide marginal habitat for moose. The low density of moose tracks in this area throughout the winter of 1977-78 indicates that little utilization occurs during winters of light or moderate snowfall. Since water levels in the Devils Canyon resevoir are expected to remain fairly constant, low mortality rates associated with ice shelving and steep mud banks would be expected.

Construction of the Watana dam would inundate 43,000 acres along Watana Creek and the Susitna River. Approximately 35,000 of these acres sustain moderate to heavy utilization by moose during an average winter

(USF&WS 1975). Doubtless, extremely heavy utilization occurs during severe winters. Much of this area supports moderate moose densities during the spring and summer seasons as well. The preliminary movement data gathered from radio-collared moose indicate that moose from several populations from surrounding areas of the Susitna Basin migrate across or utilize this portion of the river during some period of the year. The Alaska Department of Fish and Game observed 2,037 moose during their latest fall sex and age composition counts of these areas (ADF&G unpublished data). LeResche and Rausch (1974) concluded that an observer generally sights between 43 and 68 percent of the moose in an area during an aerial census. Using 50 percent for purposes of extrapolation, the resident moose population utilizing this portion of the basin can be estimated to fall between 4,000 and 5,000 moose. Random stratified counts are needed to accurately assess numbers of moose in this area.

Effects of the construction of the Watana dam on these moose populations could be substantial. The resident nonmigratory segment of the population could be eliminated. The immediate loss of a major portion of the winter range along Watana Creek and parts of the Susitna River to flooding would effectively reduce the carrying capacity of the habitat at higher elevations used only during the warm seasons and mild winters. The Watana Resevoir would be 87 km long and may during some seasons prove to be an effective barrier to migrations. The resulting disruption of movements to traditional breeding grounds may adversely affect productivity. Increased mortality of neonates during post-calving movements might also occur. Since water levels are expected to fluctuate as much as 78 m, behind the Watana dam ice shelving could become a significant cause of mortality. Calving is a common occurence in these portions of the study area. The loss of calving habitat notwithstanding, fluctuating water levels would change the presently timbered slopes from the Watana dam site to the Oshetna River to enormous mud banks. Calf mortality resulting from slipping on or getting stuck in this mud could become a common occurence. A subsequent report will provide data on moose movements from 30 September 1978 through March 1979, and will include a more in depth analysis of movements in relation to the dam sites.

ACKNOWLEDGEMENTS

We wish to thank Era helicopters and the Army Corps of Engineers for their cooperation and assistance in radio-collaring moose during August 1978. Thanks also to Doug Geeting and Ken Holland, Holland Air Service, and Ken Bunch, Sportsman Flying Service, for their many safe hours of flying and their willingness to modify their aircraft to accomodate our telemetry equipment.

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