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MOOSE HABITAT IN AREAS OF ONGOING AND PROPOSED AGRICULTURAL DEVELOPMENTS

AND

MOOSE POPULATIONS IN AREAS OF ONGOING AND PROPOSED AGRICULTURAL DEVELOPMENTS

By
Diane J. Preston

Final Report
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FINAL REPORT (RESEARCH)

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Project No.: W-21-2 W-22-1 Project Title: Big Game Investigations

Job No.: 1.34R Job Title: Moose Habitat in Areas of Ongoing and Proposed Agricultural Developments

Job No.: 1.35R Job Title: Moose Populations in Areas of Ongoing and Proposed Agricultural Developments

Period Covered: July 1, 1980 through June 30, 1982

SUMMARY

A 816-km^2 area of Interior Alaska was mapped into habitat types using aerial photos, ground surveys, and aerial surveys. The study area included long-established agricultural areas, recently developed agricultural projects, and undeveloped agricultural projects. Cleared and cultivated agricultural land composes the largest percentage of the study area (35%), and this percentage will increase to 46% by 1985 if clearing of new agricultural areas progresses as scheduled.

Habitat selection by moose (*Alces alces*) was determined during aerial surveys of 468 km^2 in early winter (Nov-Dec) 1981, and 241 km^2 in late winter (Mar-Apr) 1982. Moose avoided ($P < 0.05$) coniferous forest and cleared and cultivated agricultural land throughout the winter and selected ($P < 0.05$) deciduous/mixed forest and shrubland in early winter and shrubland in late winter. Current agricultural land does not contribute substantially to moose winter range because berms and windrows provide little habitat, and berms are temporary.

The increased access and visibility resulting from large agricultural projects will increase the vulnerability of moose to hunting. In addition, barbed wire fences present a hazard to moose.

Key words: agriculture, habitat use, Interior Alaska, moose, mortality.

CONTENTS

BACKGROUND

Agriculture is developing rapidly in Alaska. Large-scale agricultural projects are underway or in the planning stages near Delta Junction and Nenana, Alaska. Smaller agricultural parcels are often available in widely dispersed land disposals. This development plus the prospect of extensive livestock grazing represent a significant departure from the historic small-scale agriculture in Alaska. Preston (1982) reviewed the history of agriculture in Alaska.

Leopold and Darling (1953) and Spencer and Chatelain (1953) stated that abandonment of farms resulted in increased browse and habitat diversity, which benefited moose. In Scandinavia, Ahlen (1975) found that abandoned agricultural areas produced the best cervid winter browse. In these cases, the failure of agriculture rather than ongoing agriculture provided benefits to moose.

A few studies have shown ongoing agriculture to be detrimental to moose. In Alberta, moose avoided extensive agricultural clearings (Rolley and Keith 1980). Moose in that area were generally farther from human disturbance and used cleared land less than would be expected in random distribution (Mytton and Keith 1981). Berg and Phillips (1974) concluded that moose avoided cultivated areas in all seasons in northwestern Minnesota. They felt that the moose population would decline as agricultural development progresses in Minnesota. Agricultural interests in Alaska have claimed that the increases in moose populations in the Matanuska Valley were a result of farming which began in the 1930's and 1940's (Klebesadel and Restad 1981). However, they also point out that the recent trend toward larger fields tends to be detrimental to wildlife.

Grazing of livestock may also affect moose habitat and habitat use. Ritchie (1978) found moose used clearcut, timbered, and lightly grazed areas in Idaho significantly more than heavily grazed pastures. Ahlen (1975) found a reduction of winter browse for cervids in all grazed areas.

In addition to loss or alteration of habitat, other effects of agricultural development can impact moose populations. Increased access may increase hunting and poaching; fencing can create barriers to movement or increase mortality due to entanglement. Association with livestock may result in disease transmission from or to moose, and depredation on crops may result in moose/landowner conflicts. Moose in northwestern Minnesota have damaged flax, wheat, orchards, and vegetable crops (P. Karns, pers. commun.). Moose eat barley, primarily in unfenced fields, in central Sweden (K. Danell, pers. commun.) and damage cereal crops in Finland (E. Pulliainen, pers. commun.)

Management of moose populations in agricultural areas in Interior Alaska will depend on understanding the effects of agricultural development and production on moose habitat and use. However, the effect of large-scale agricultural development on moose habitat and populations in Alaska has previously not been studied. This study assesses some effects of agriculture on moose and moose habitat.

OBJECTIVES

To determine amount and type of moose habitat removed by Delta II East Agricultural Project.

To determine if moose habitat is created by windrows, clearing edges, and abandonment of farms in the Delta area.

To determine moose habitat selection and changes in number of moose using large-scale agricultural developments.

To determine effects of agricultural development on moose mortality factors.

STUDY AREA

The 816-km^2 Interior Alaska study area is bordered by the Tanana River on the east and north, the Delta River on the west, and the Alcan Highway on the southwest (Fig. 1). The study area includes the Delta Barley Project (DBP), the Delta II East Agricultural Project (DEAP), the Fourmile Hill and Buffalo small tract agricultural disposals, and an area to the east and north of Delta Junction with a long history of small-scale farming. The topography of the area is relatively flat except for small hills in the northwestern and southeastern portions. Elevation ranges from 300 to 400 m. Vegetation in the area is diverse. The study area lies within Game Management Unit 20D.

METHODS

Habitat Mapping

Level 3 of the vegetation classification system of Viereck and Dyrness (1980) was used, with some modifications to map the habitat (Table 1). The aquatic habitat type included Clearwater Lake and smaller lakes and ponds but not rivers or creeks. The residential/industrial category included only areas with concentrated human activity; areas with few or widely separated residences were classified according to the habitat type. Current agricultural land was defined as land in production or cleared during 1981-82 except for the DBP. All cleared land in the DBP was considered agricultural land, even if it had been cleared before 1981 but not put in production in 1981-82. In the DEAP, the habitat map represents vegetation prior to clearing.

Mapping was done on a mylar over 1:63,360 topographic maps with the aid of 1:60,000 aerial photographs taken in August 1980 and July 1978. Maps were refined and updated in summer 1982 by aerial surveys, ground reconnaissance, and vegetation maps from the State of Alaska, Division of Forestry. A planimeter was used to determine areas of each habitat type. Fences were noted during ground reconnaissance. However, fences are underestimated because many areas were mapped from aerial surveys or aerial photographs, which did not reveal fences.

Habitat Selection by Moose

Aerial surveys were flown to determine habitat selection by moose. During early winter (Nov-Dec) 1981, 468 km^2 were surveyed. In late winter (Mar-Apr) 1982, 241 km^2 were surveyed. The areas included the long-established agricultural areas, the DBP, portions of the DEAP agricultural sale, and areas adjacent to the DEAP. The boundaries of the DEAP tracts had not been finalized as of November 1981, so sample units did not correspond directly to disposal areas. Search intensity varied according to habitat type and ranged from 0.8 min/km^2 in cleared fields to 2.2 min/km^2 in heavily timbered areas. Location of each moose or group of moose was marked on 1:63,360 topographical maps and the habitat type for each location was recorded. Results were analyzed using the technique of Neu et al. (1974) to determine habitat selection or avoidance.

Mortality

Moose mortality was compiled from 1980, 1981, and 1982 harvest data, as well as from reports from residents in the area.

RESULTS AND DISCUSSION

Habitat Types

Habitat in the study area was classified into 13 habitat types (Figs. 2a, 2b, 2c, and 2d). Current agricultural land occupies the largest percentage (35%), with open and closed coniferous forest the most common undisturbed habitat (32%) (Table 2). The habitat types which produce the best moose habitat (tall and low shrub) composed only 11% of the area.

Open and closed coniferous forest accounted for 72% of the area in the DEAP disposal, Buffalo Agriculture, and the undeveloped portion of the Fourmile Hill disposal (Table 2). Shrub categories accounted for only 2% of this area. Following required clearing in the new agricultural areas, cleared and cultivated agricultural land will occupy approximately 46% of the total study area.

Good moose habitat does develop in agricultural fields left uncultivated for approximately 5 years. However, only 8.7 km^2 (1% of the area) of agricultural land uncultivated in 1981 or 1982 was identified as idle agricultural land. This land was in tall and low shrub. With the current emphasis on agricultural production in the area and required clearing and production on new agricultural land, little acreage will remain fallow long enough to produce moose browse.

The area of windrows and berms provides very little moose habitat in the DBP. Approximately 1-3% of current agricultural land in the DBP is in windrows and berms. Most windrows are narrow, providing little cover or browse. Clearing of windrows and the burning of berms and windrows continues on some tracts. On other tracts, no windrows or berms remain. Herbicide drift will probably reduce browse species in berms and windrows adjacent to cultivated land. Messick et al. (1974) found pesticides drifted as much as 540 m under ideal weather conditions and normal rates of application.

Habitat Selection by Moose

Distribution of observed moose among habitat types is shown in Table 3. Several of these habitat categories were combined to increase sample sizes for the assessment of habitat selection by moose (Tables 4, 5).

Moose were not distributed independently of habitat (chi-square, $P < 0.01$) during early and late winter. Moose avoided coniferous and agricultural land in both early and late winter, while selecting deciduous/mixed forest and shrubland in early winter and shrubland in late winter (Tables 4, 5).

Moose were occasionally observed in berms and windrows. The 9 moose seen in agricultural areas were in windrows or berms or within 100 m of a field edge. On 1 October 1982, 22 moose were seen in small berms close to greenbelts in the DBP (C. Champaine, pers. commun.) At that time, no moose were seen in fields or fallow ground. The use of berms may be associated with moose migrating through the area or attempting to use a portion of their predevelopment home range.

Mortality

Barbed wire fencing presents a hazard to moose. Two moose are known to have died in barbed wire fences near Delta Junction from 1980-82. In addition, 1 moose calf was removed alive from a barbed wire fence in the Shaw Creek area in 1981. A moose was also found dead in the Gerstle River Test Site barbed wire fence in 1976. A variety of fencing is being used in the Delta area, but only barbed wire has been found to entangle moose.

A total of 106 km of fencing was observed in the study area, and certainly other fencing exists. Three and 4 strand barbed wire is most common, and slat and barbed wire combinations, electric fencing, high-tensile fencing, hog wire, and hog wire plus barbed wire were also noted. In some areas, 6-7 km of barbed wire fence run continuously, and in other areas, fencing occurs on both sides of section lines forming significant barriers. As the amount of fencing, particularly barbed wire fencing, increases, we can expect more moose mortalities and a greater restriction of moose movements.

The portion of the study area west of Sawmill Creek is closed to moose hunting; the remainder is in the Game Management Unit 20D West permit hunt area. The portion of the DBP east of Sawmill Creek encompasses only approximately 5% of the permit area. However, 3 of 18, 4 of 44, and 9 of 40 moose were harvested in this area in 1980, 1981, and 1982, respectively, representing 16% of the harvest. Prior to 1980, our harvest locations were less precise, but in general few moose were taken in that area. Access and visibility in the area have been drastically increased following clearing. There are approximately 35 km of new roads in the DBP and the edges of many tracts are passable. With the clearing of DEAP and additional new roads, moose will be increasingly vulnerable to hunting pressure.

There have been no known moose mortalities related to depredation of cereal crops in the Delta area. However, 1 moose was shot in 1982 in the long established agricultural area after raiding a vegetable garden and frightening a child.

RECOMMENDATIONS

1. Corridors of forest vegetation should be left between large tracts in future agricultural projects to provide cover for moose movements. The corridors should be at least 100 m wide.

2. The Department of Fish and Game should compile fencing recommendations for farmers to minimize the hazards of barbed wire fencing to moose.

3. The increased access and visibility of moose in agricultural areas will increase the vulnerability of moose to hunting. The Game Management Unit 20D West permit hunt may need to be restricted in the agricultural areas to prevent overharvest of moose.

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PREPARED BY:

Diane J. Preston
Game Biologist II

APPROVED BY:

Robert A. Hinman/JB
Acting Director, Division of Game

Steven R. Peterson/JB
Research Chief, Division of Game

SUBMITTED BY:

Wayne L. Regelin
Regional Research Coordinator

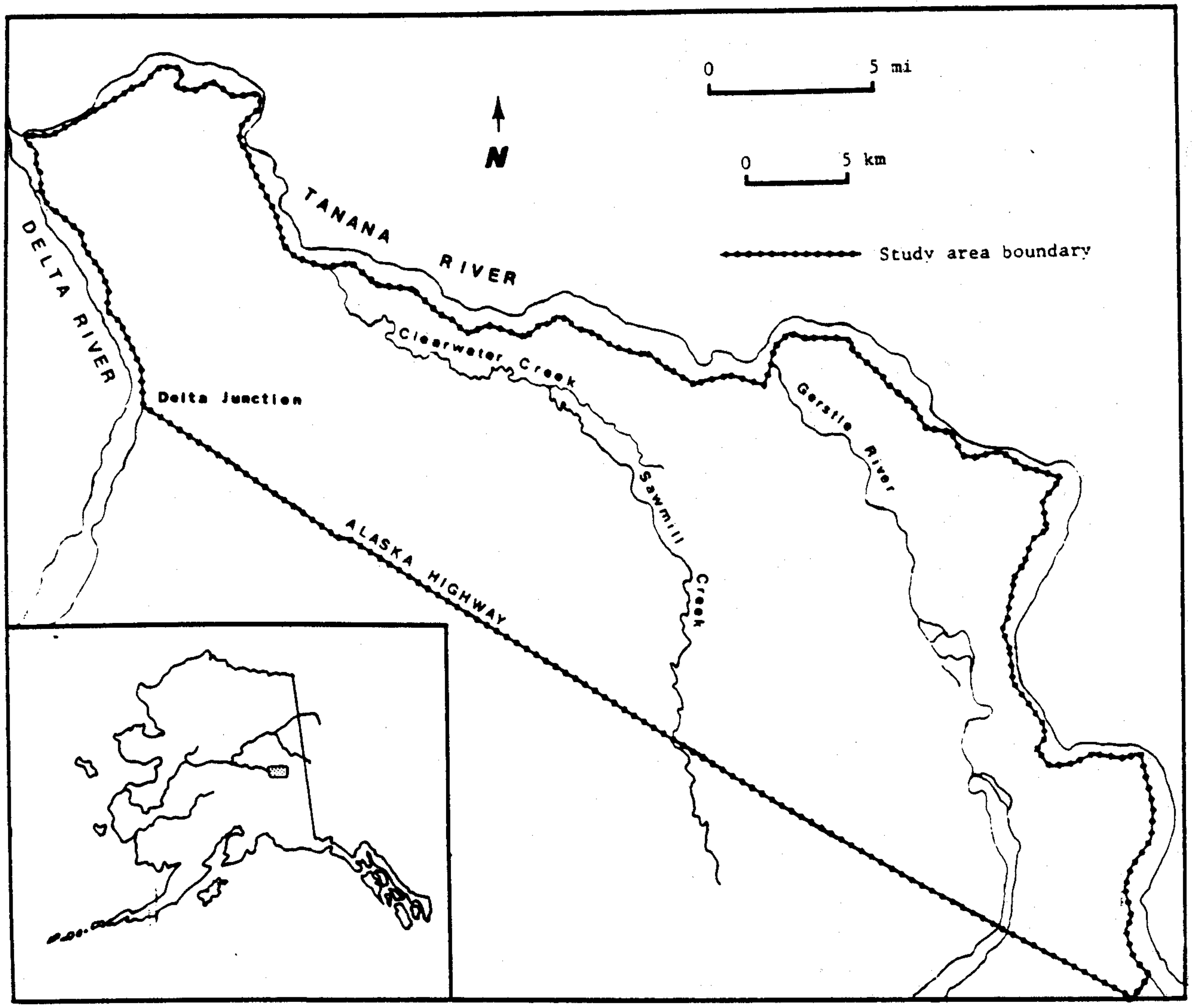

Fig. 1. Study area near Delta Junction in interior Alaska.

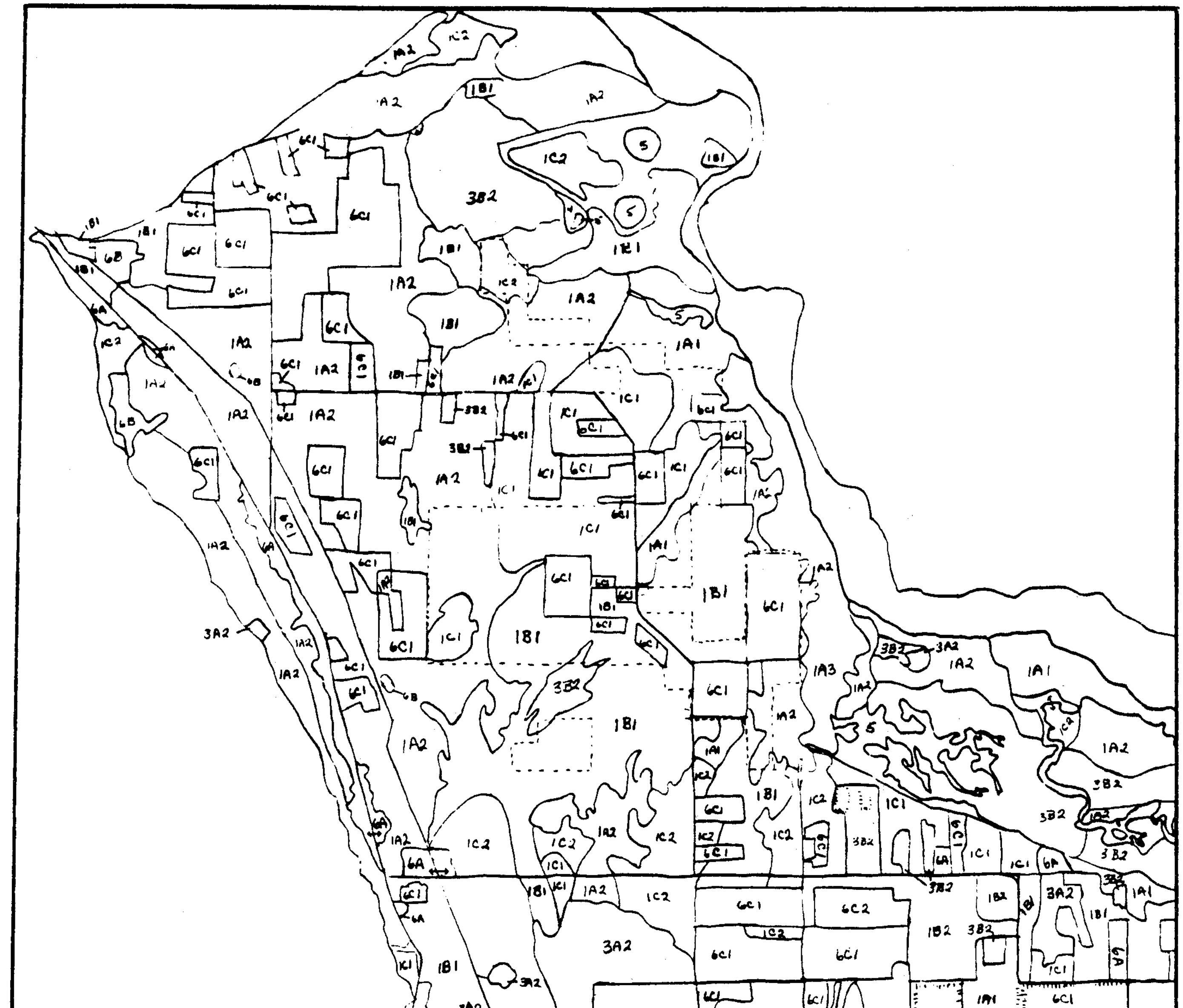

Fig. 2a. Distribution of habitat types in the northwestern section of study area near Delta Junction, Alaska, 1982.
Habitat classification described in Table 1.

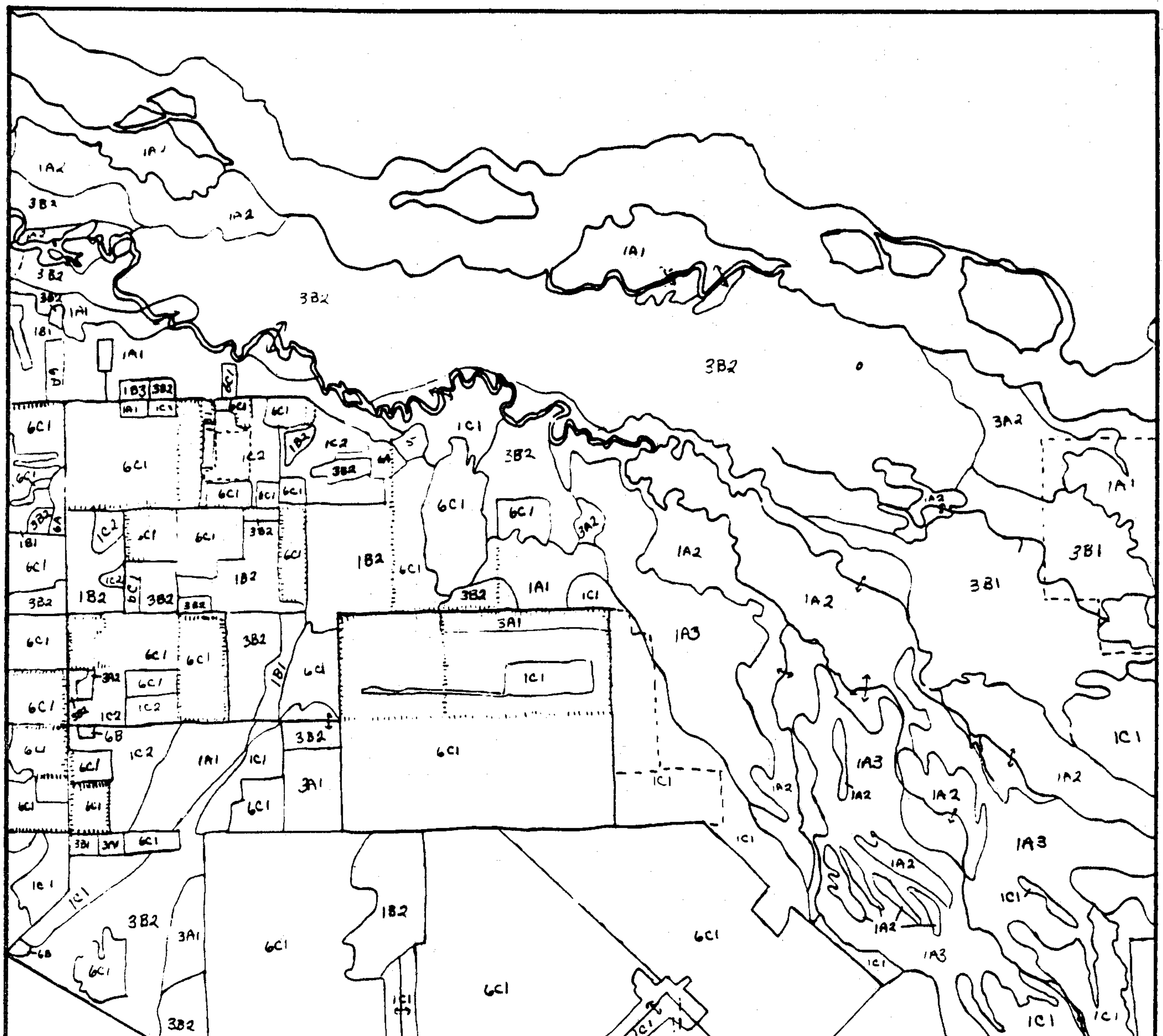

Fig. 2b. Distribution of habitat types in the westcentral section of study area near Delta Junction, Alaska, 1982.

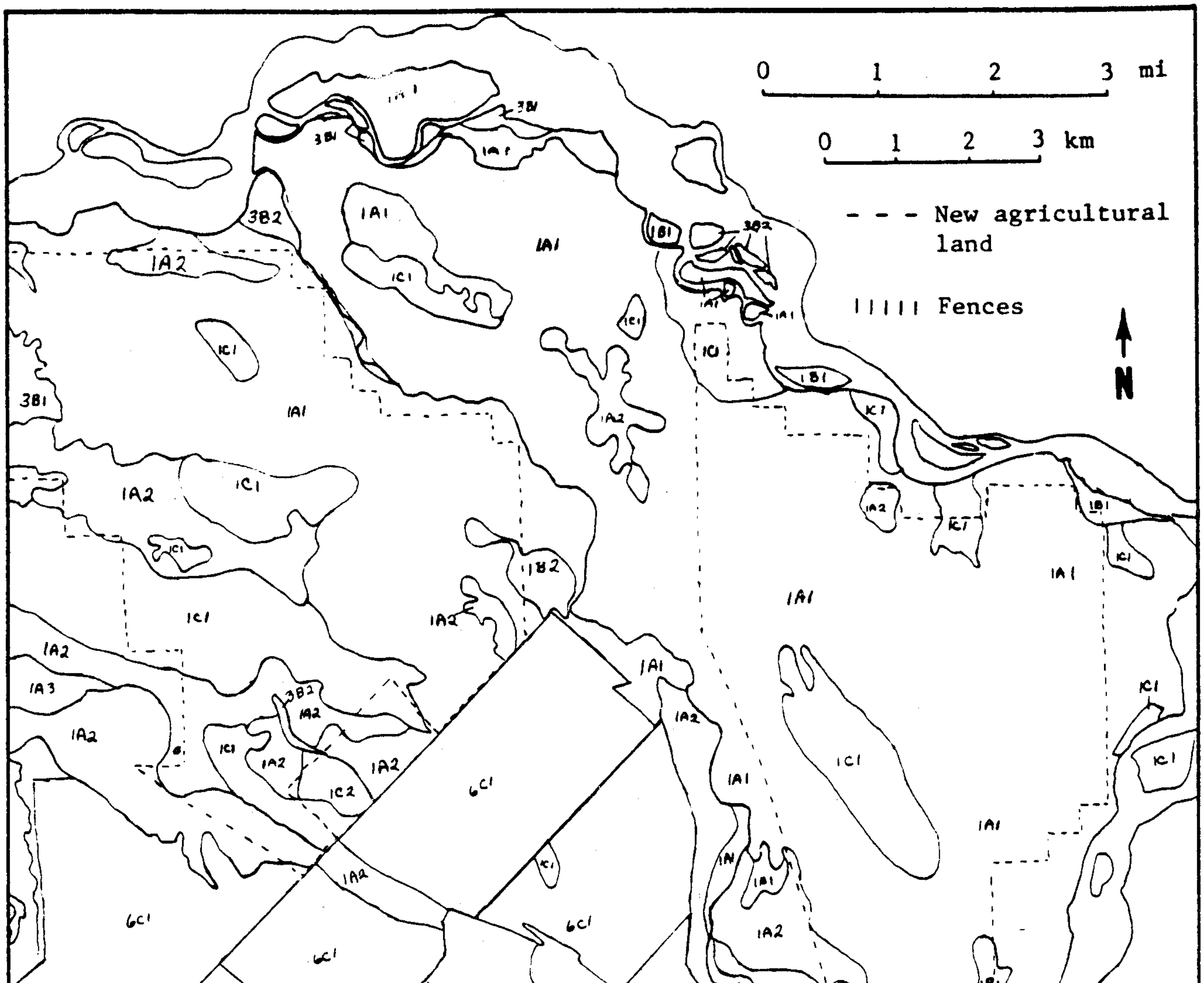

Fig. 2c. Distribution of habitat types in the eastcentral section of study area near Delta Junction, Alaska, 1982.

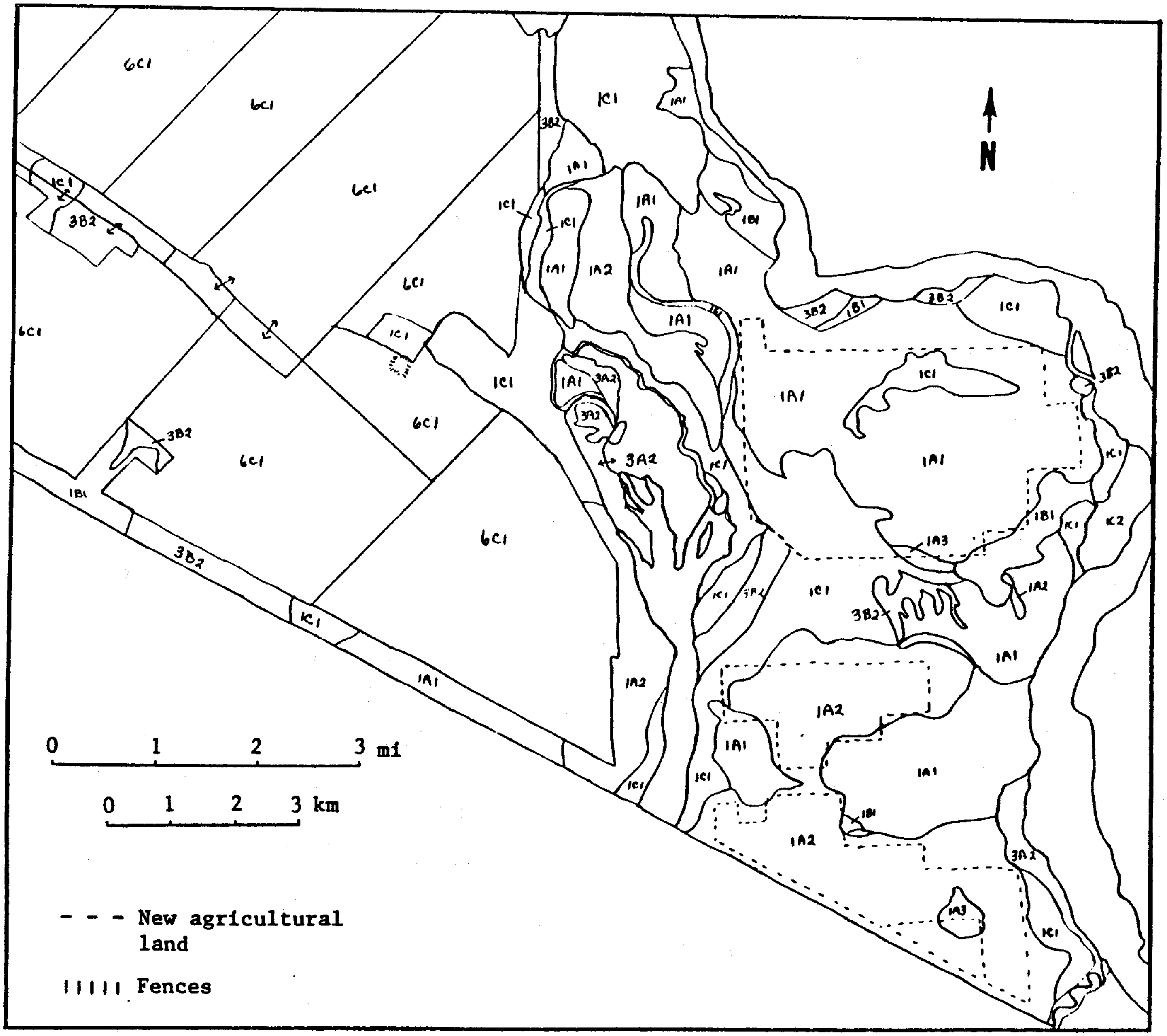

Fig. 2d. Distribution of habitat types in the southeastern section of study area near Delta Junction, Alaska, 1982.

Table 1. Criteria used to define habitat types in the study area near Delta Junction, Alaska, 1982.

Notation on habitat map	Habitat type	% total tree cover	% canopy cover tree (T) shrub (S)	Common species
1A1	Closed conifer forest	>75 Conifer	60-100(T)	*Picea mariana* *Picea glauca*
1A2	Open conifer forest	>75 Conifer	25-60(T)	Same as 1A1
1A3	Conifer woodland	>75 Conifer	10-25(T)	*Picea mariana*
1B1	Closed deciduous forest	>75 Deciduous	60-100(T)	*Populus balsamifera* *Populus tremuloides* *Betula papyrifera*
1B2	Open deciduous forest	>75 Deciduous	25-60(T)	Same as 1B1
1C1	Closed mixed forest	25-75 Conifer 25-75 Deciduous	60-100(T)	*Picea mariana* *Picea glauca* *Populus balsamifera* *Populus tremuloides* *Betula papyrifera*
1C2	Open mixed forest	25-75 Conifer 25-75 Deciduous	25-60(T)	Same as 1C1
3A1	Closed tall shrub >1.5 m in height	<10	>75(S)	*Salix* sp. *Alnus* sp.
3A2	Open tall shrub >1.5 m in height	<10	25-75(S)	Same as 3A1
3B1	Closed low shrub	<10	>75(S)	*Salix* sp. *Alnus* sp. *Betula nana* *Betula glandulosa*
3B2	Open low shrub	<10	25-75(S)	Same as 3B1
4	Herbaceous	0	0	Not determined
5	Aquatic	0	0	Not determined
6A-B	Residential/ industrial	Varies	Varies	Varies
6C1	Current agricultural land	0	0	Grasses, forbs, or agricultural crops

Table 2. Current and projected habitat types within the study area near Delta Junction, Alaska, 1982.

Habitat type	Entire study area spring 1982		Uncleared agricultural land in study area, 1982[a]		Projected habitats in study area after clearing agricultural land[b]	
	km^2	% of study area	km^2	% of new ag. area	km^2	% of study area
Coniferous closed	142.2	17.4	63.0	55.0	90.4	11.1
Coniferous open	118.3	14.5	19.3	16.8	103.3	12.6
Coniferous woodland	20.7	2.5	0.3	0.2	20.5	2.4
Deciduous closed	36.6	4.5	4.9	4.3	34.1	4.2
Deciduous open	11.0	1.4	0.3	0.2	10.8	1.3
Mixed closed	81.5	10.0	23.0	20.1	64.9	8.0
Mixed open	23.6	2.9	1.0	0.9	22.8	2.8
Tall shrub	24.2	3.0	0.5	0.4	23.8	2.9
Low shrub	63.3	7.7	2.3	2.0	61.4	7.5
Herbaceous	0.3	<0.1			0.3	<0.1
Aquatic	2.5	0.3			2.5	0.3
Residential/industrial	7.9	1.0			7.9	1.0
Agricultural	284.2	34.8			373.6	45.8
Totals	816.3		114.6		816.3	

[a] Includes Delta II East, Buffalo Agriculture, and undeveloped portions of Fourmile Hill Disposal.

[b] Delta II East 83% cleared; Buffalo Agriculture and Fourmile Hill 50% cleared.

Table 3. Areas of habitat types and numbers of moose observed during aerial surveys of portions of the study area near Delta Junction, Alaska, 1981-82.

	Early winter 1981		Late winter 1982	
Habitat type	km^2	No. moose observed	km^2	No. moose observed
Coniferous closed	72.6	4	26.2	
Coniferous open	43.8	3	11.4	
Coniferous woodland	16.8		.6	
Deciduous closed	9.1	1	8.2	3
Deciduous open	7.8	16	9.7	
Mixed closed	45.1	16	17.7	4
Mixed open	6.1	6	6.6	1
Tall shrub	12.1	13	14.4	27
Low shrub	32.9	29	8.8	7
Herbaceous				
Aquatic	0.2		0.2	
Residential/industrial	0.8		0.9	
Agricultural land	221.7	5	137.7	4
Totals	469.0	93	242.0	46

Table 4. Habitat selection by moose in a 468-km^2 portion of the study area near Delta Junction, Alaska, early winter 1981.

Habitat type	No. of moose observed	Expected no. of moose	Proportion of total area	Confidence interval on proportion of observations	Significant habitat selection(+) or avoidance(-)[a]
Coniferous forest	7	26	0.284	$0.007 \leq P_1 \leq 0.144$	-
Deciduous and mixed forest	39	13	0.145	$0.292 \leq P_2 \leq 0.547$	+
Shrubland	42	9	0.096	$0.323 \leq P_3 \leq 0.580$	+
Agricultural land	5	44	0.473	$-0.005 \leq P_4 \leq 0.112$	-
Totals	93	93			

[a] Significant (P < 0.05) selection or avoidance occurs when the proportion of total area for each habitat type falls out of the confidence interval.

Table 5. Habitat selection by moose in a 241.4-km^2 portion of the study area near Delta Junction, Alaska, late winter 1982.

Habitat type	No. of moose observed	Expected no. of moose	Proportion of total area	Confidence interval on proportion of observations	Significant habitat selection(+) or avoidance(-)[a]
Coniferous forest	0	7	0.158	0.000	-
Deciduous and mixed forest	8	7	0.174	$0.034 \leq P_2 \leq 0.314$	0
Shrubland	34	4	0.096	$0.577 \leq P_3 \leq 0.901$	+
Agricultural land	4	26	0.568	$-0.017 \leq P_4 \leq 0.191$	-
Totals	46	45[b]			

[a] Significant ($\underline{P}$ < 0.05) selection or avoidance occurs when the proportion of total area for each habitat type falls out of the confidence interval.

[b] Difference between observed and expected no. of moose due to rounding errors.