MOOSE DISTRIBUTION ALONG THE LOWER MOUNTAIN AND HUME RIVERS DURING OIL DRILLING, WINTER 1989/90

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ABSTRACT

The distribution of moose (*Alces alces*) in the vicinity of an oil drilling rig and its associated haul road was monitored during 12 December 1989 - 23 March 1990. Eight survey flights, approximately 13 days apart, were flown in two separate study blocks centering about the lower Mountain River and the drilling rig respectively. The haul road traversed the lower Mountain River, a recognized important wintering area for moose. The drilling rig was situated 7 km from the Hume River valley, also a recognized wintering area for moose. Moose abundance increased then stabilized during the study period in the former area and remained low and constant in the latter area. In the lower Mountain River, moose remained in the vicinity of the haul road all winter (i.e., within 0-2 km) despite regular, but variable, vehicular traffic on the road. Moose were absent within a 5 km radius of the oil rig itself, but this was most likely a result of the poor moose habitat there. The haul road did not cause an increase in hunting by Norman Wells residents. Native hunters continued to hunt in the area.

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INTRODUCTION

During the winters of 1987-88, 1988-89 and 1989-90, the area west of Sans Sault Rapids and drained by the Mountain, Hume, and Ramparts rivers has been the site of considerable hydrocarbon exploration involving a joint venture between Chevron Canada Resources and the community of Fort Good Hope, NWT (Fig. 1). In the first and second winters primarily geophysical work was conducted, while in the third, four exploratory wells were drilled. Access from the main camp at the mouth of the Mountain River to the drilling rigs was maintained by haul roads plowed along existing cutlines.

Within the exploration area, the lower Mountain River floodplain and certain sections of the Hume River valley have been identified as important wintering areas for moose (Presott et al. 1973, Jingfors et al. 1987). The access road to the I-66 drilling location crossed the mouth of the Mountain River then ran in a westerly direction for 16 km; along this distance it varied from 1-2 km north of the main riverbed (Fig. 2). The road then angled directly toward the Hume River, crossed it perpendicularly, and proceeded northwesterly to the I-66 location, angling steadily away from the Hume River valley the entire way (Fig. 3). The extensive stands of high quality browse (primarily *Salix* spp.) that occur along these river courses and adjacent slopes provide abundant and relatively accessible forage especially in the late winter during maximum snow accumulation.

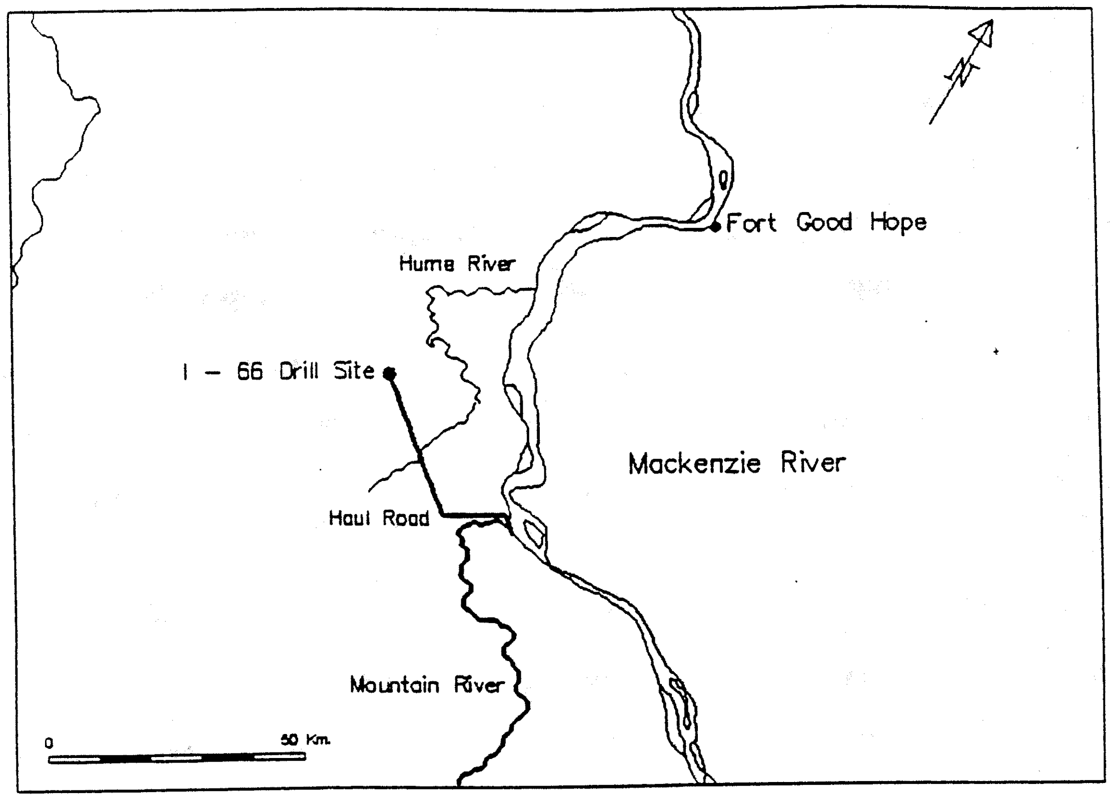

Fig. 1. The lower Mountain River/Hume River study area.

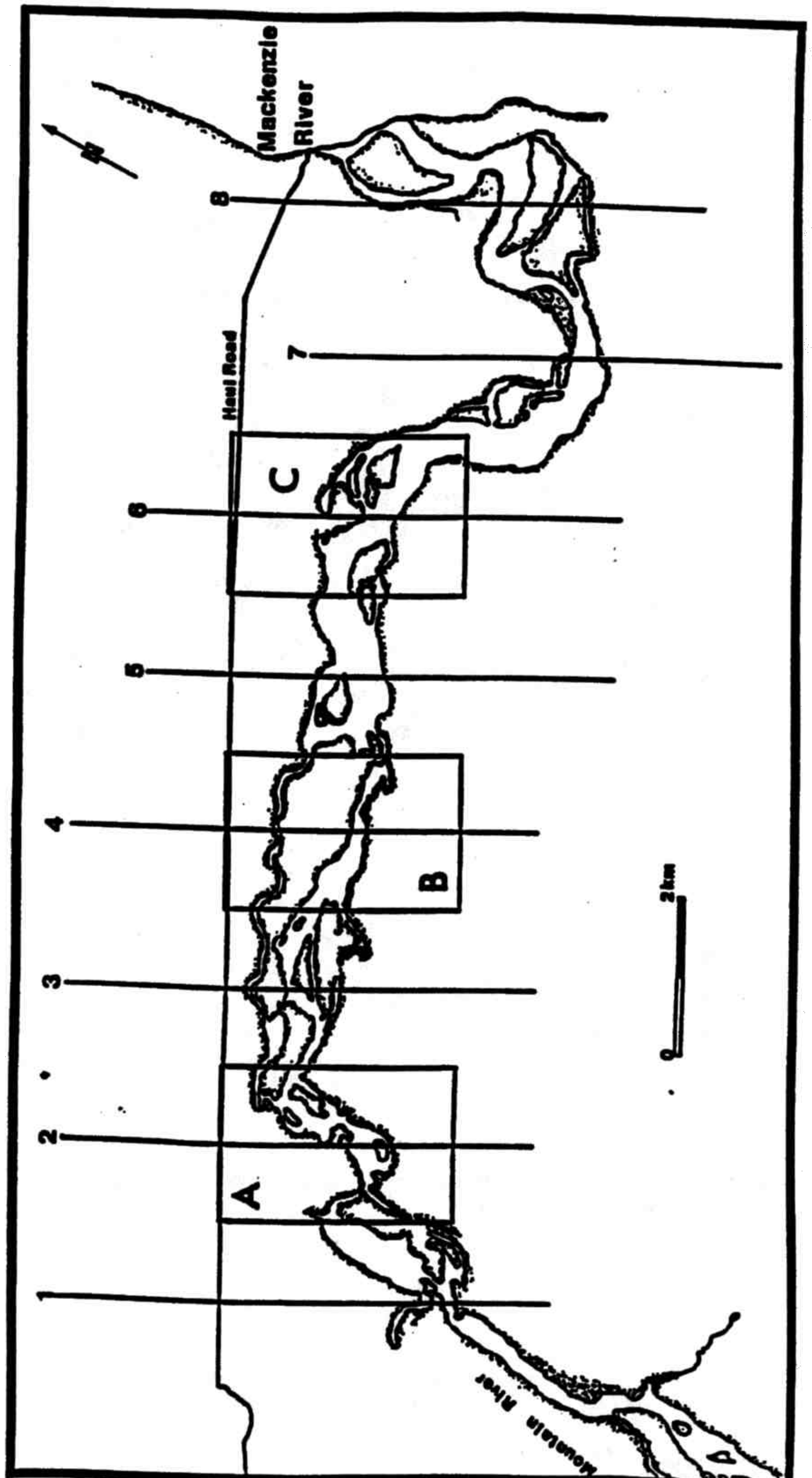

Fig. 2. The eight transects and three blocks in the lower Mountain River.

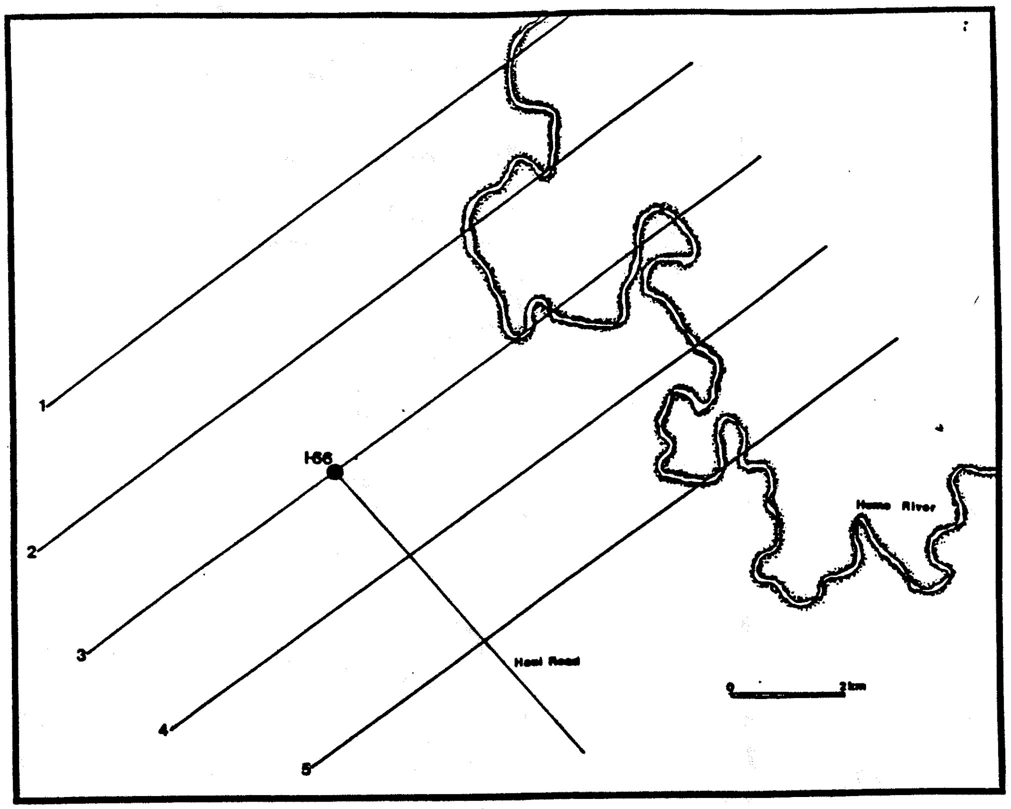

Fig. 3. The five transects relative to the I-66 drilling rig in the Hume River area.

At present there is scant information on the possible effects that roads, regular vehicular traffic and drilling rigs positioned at the same location for several weeks may have on the movements of moose and their use of important wintering areas. In the Northwest Territories, Donaldson and Fleck (1980) reported an 'extremely low' density of moose in all areas near roads in the lower Liard Valley (i.e., within 10 km) and they suggested that hunting may have, in part, been responsible for this. In Alaska, the only relevant information comes from investigation along elevated pipelines and mainly involved migratory moose (Van Ballenberghe 1978).

In mid-1989, Dene hunters from Fort Good Hope expressed concern that the previous winters' exploration work may have caused moose to move out of the Mountain, Hume, and Ramparts rivers area. This area has long been an important area for moose hunting by these people. The present opportunity was considered ideal to examine the possible effects of a winter haul road associated with oil exploration on the abundance of moose in adjacent and important winter concentration areas. Chevron Canada Resources and the Department of Renewable Resources, therefore, decided to undertake a cooperative study designed to examine this question.

METHODS

Limited funds, the relatively small areas of concern along both the Mountain and Hume rivers, plus the assumption that moose distribution in both areas would be highly clumped precluded an intensively surveyed block design (Jingfors and Gunn 1981). Instead, the methodology used was designed to indicate relative abundance of moose at periodic intervals during the three month study period.

Permanent transects were established in the lower Mountain River and Hume River blocks. In the lower Mountain River block, the transects were 6 km long and 2 km apart and located perpendicular to the river (Fig. 2). In the Hume River block they were 13-15 km in length and 2 km apart, centered about the I-66 drilling rig, and covered the 23 km stretch of the Hume River closest to the rig (Fig. 3). The two blocks were surveyed on the same day and flights were attempted every 10 days. A total of 3.5 hrs of flying, including ferrying, was required for each survey. All surveys but one were conducted from a Helio Courier aircraft at 150 m agl. and 80-90 knots. One survey used a Twin Otter. Observers in the right front and left rear seats reported all sightings of moose and moose tracks which appeared to be fresh regardless of distance from the aircraft and these were recorded on maps by the right front observer. Because antler shedding occurred immediately prior to and during the early stages of the study, no attempt was made to indentify the sex of moose.

In the lower Mountain River block, three 6 km^2 blocks were established mid-way along three of the transects (Fig. 2). These regularly spaced blocks covered approximately 40% of the survey block. A total count of moose sighted within each block was made by following a tight zig-zag pattern within each block. The block and transect counts were interspersed during the total block survey.

RESULTS

A total of eight survey flights were made between 12 December 1989 and 23 March 1990. The time between flights varied from 12 to 19 days with an average of 13 days. Temperatures during the flights ranged from -36°C to -2°C and visibility ranged from unlimited to 2 km. Some days were very bright and ground detail, including moose tracks, could be readily discerned while on other days the light was flat and tracks were not easily seen. Because of this variability, the track data were not used in this analysis.

In the lower Mountain River block, the fewest moose were seen at the beginning of the study in December. Moose were most abundant during January as indicated by both the number of moose seen in the quadrat counts (Fig. 4) and the encounter rate of moose along the eight transects (Table 1). During February and March numbers remained constant (Fig. 4). Numbers of moose in the Hume River block were consistently low throughout the survey period.

Moose were more abundant in the lower Mountain River block than in the Hume River block. The respective encounter rates (Table 1) during the eight survey flights were significantly different between the two study blocks (Mann-Whitney test, $z=2.79$, $P<.01$).

A significant difference between the quadrat counts in the lower Mountain River block (Kruskal-Wallis test, $X^2=6.71$, $P<.05$) suggests that moose were distributed unevenly within the block. Figure 5 indicates that the counts were consistently highest in uadrat A in the western end of the study block. Furthermore,

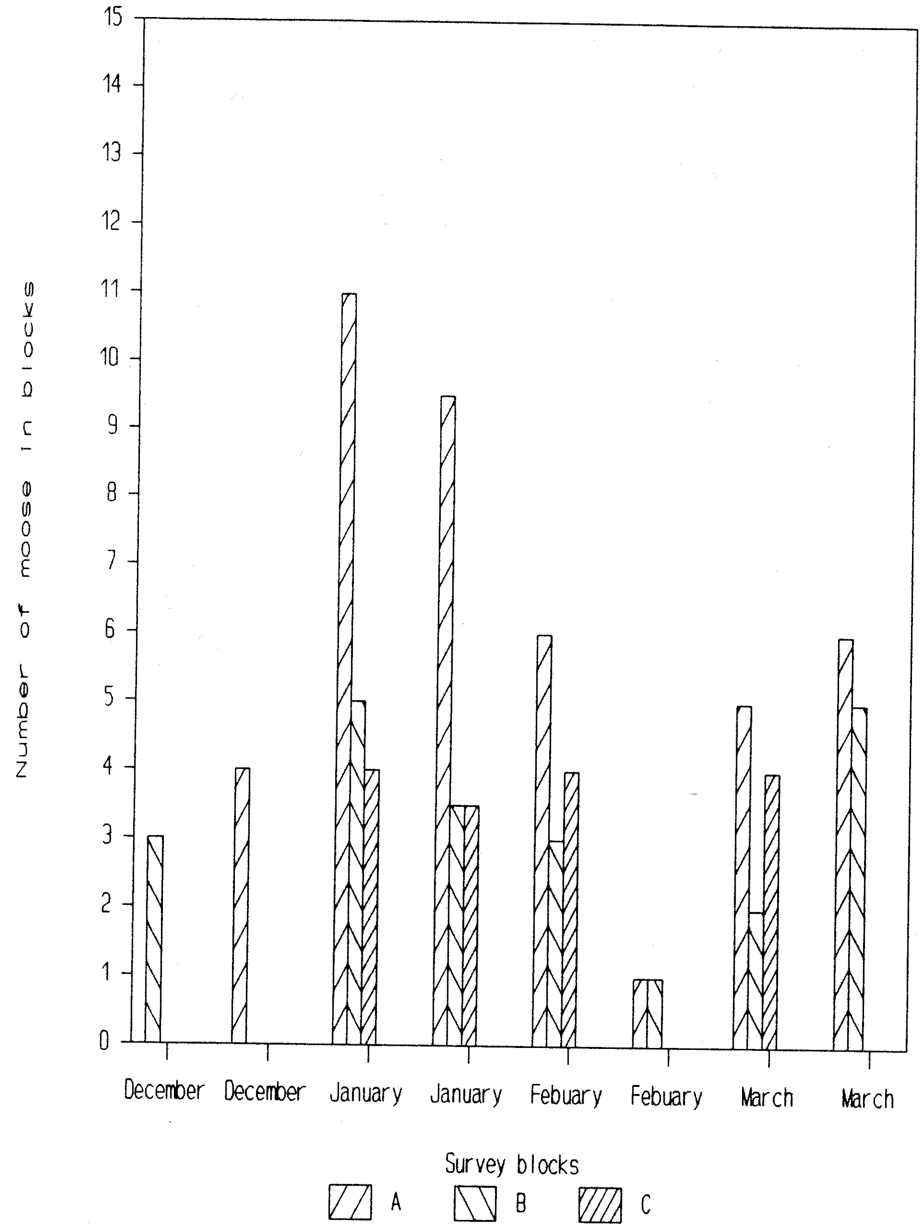

Figure 4. Counts of moose in each of the three blocks during each survey.

throughout the survey period, moose were most concentrated within, or adjacent to, the actual Mountain River floodplain (Fig. 5) and avoided upland areas away from the river, especially on the south side. Relatively few moose were sighted north of the rig access road (Fig. 5). In the Hume River block, the few moose seen were in close proximity to the river; the area within a 5 km radius of the I-66 rig site was completely devoid of moose or moose sign (Fig. 6).

Table 1. Number of moose encountered per kilometer of transect in Mountain River and Hume River blocks

	Moose observed/km of transect during each survey flight							
Date (day/mo.)	12/12	22/12	06/01	19/01	08/02	26/02	09/03	23/03
Mountain River	.06	.08	.43	.27	.27	.08	.23	.23
Hume River	.04	.01	.04	.03	.07	.03	.10	.07

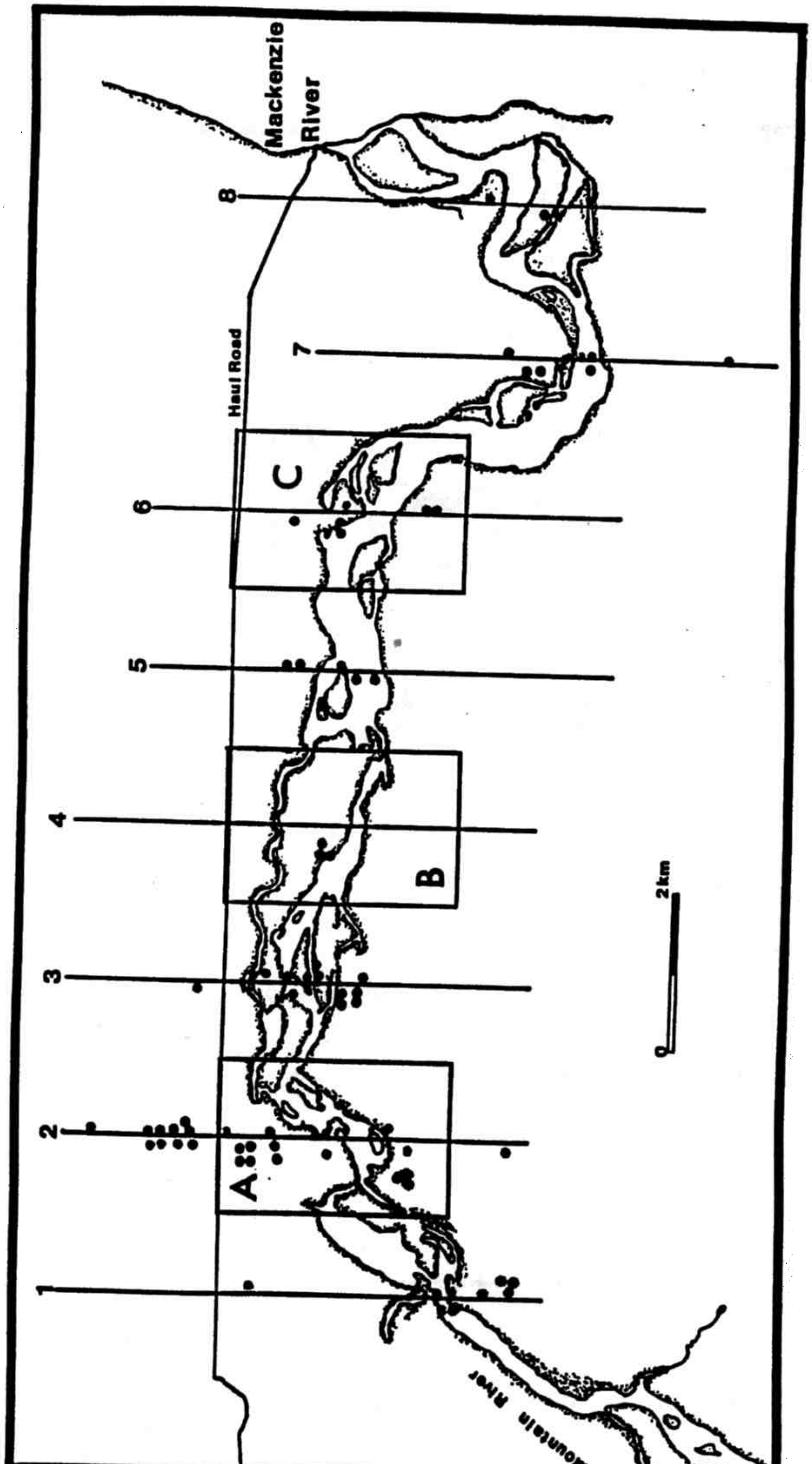

Fig. 5. Locations of all moose observed while on transect in the lower Mountain River

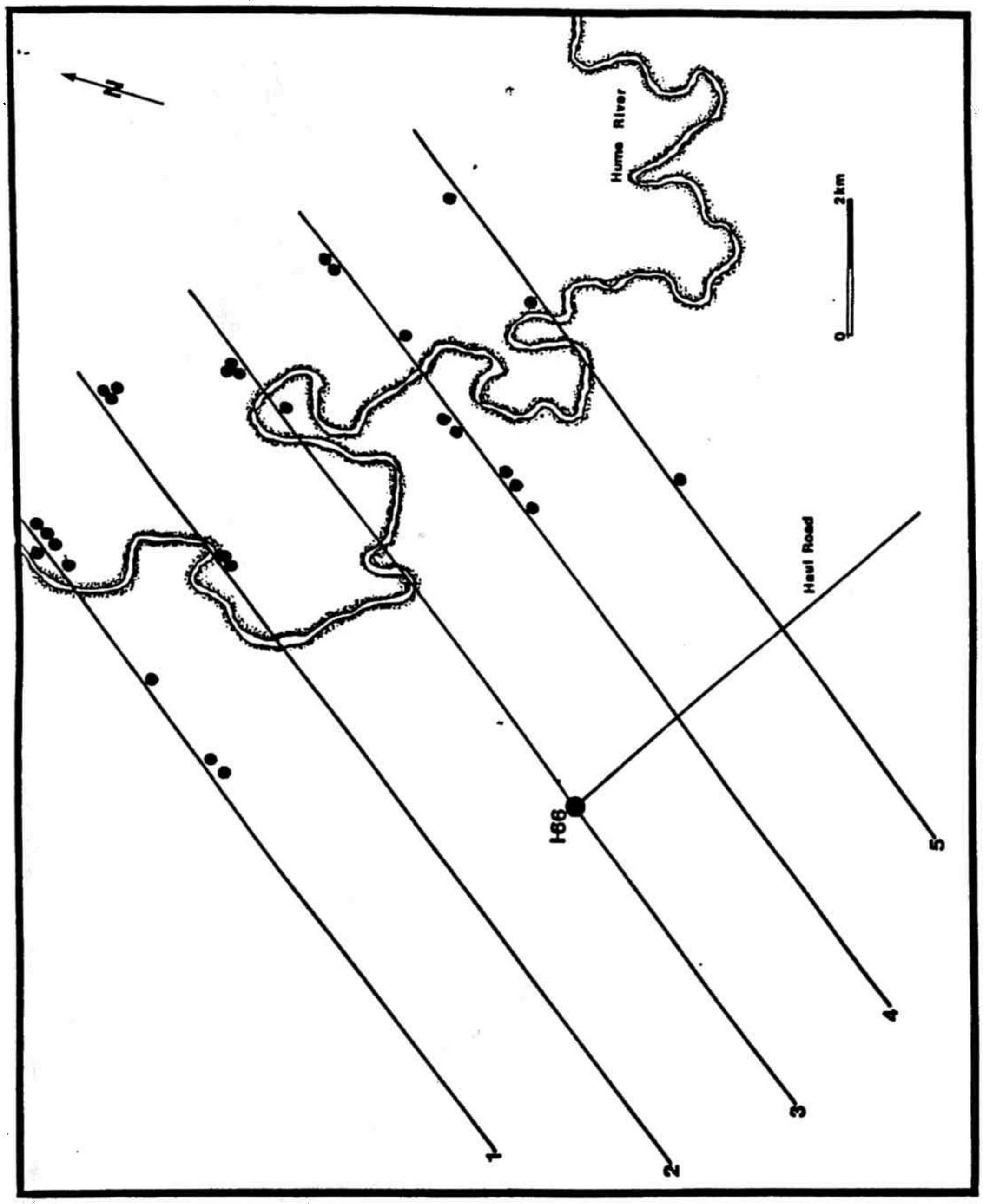

Fig. 6. Locations of all moose observed while on transect in the area of the I-66 drilling rig (Hume River)

DISCUSSION

The access road to the I-66 location was initially cleared around 1 December and regular traffic associated with snow clearing and watering was present throughout December and early January. Vehicular traffic increased on the road during 4-15 January when the equipment haul (approximately 80 loads) for the I-66 location occurred. The increase in numbers of moose within the lower Mountain River block in January suggests that moose were not hindered in their use of this traditionally important wintering area (Prescott et al. 1973, Jingfors et al. 1987) by the presence of the road or by the regular traffic on it. Furthermore, moose were most abundant in the quadrat closest to the actual road (block A-Fig.4). Jingfors et al. (1987) also observed greater numbers of moose in the area of this block with fewer numbers immediately downstream. The decline in numbers of moose during February did coincide with the cessation of drilling at I-66 on 9 February and another temporary increase in vehicular traffic associated with moving the rig off-site during 3-13 February. However, no cause-effect can be ascribed to this since this decline also coincided with the annual build-up of moose along the Mackenzie River and islands at this time of the year. Some moose may have simply moved out of the lower Mountain River area and relocated along the Mackenzie River. The fact that moose were seldom sighted north of the access road was more likely a result of its location rather than a hesitancy by moose to cross it. Much of the road ran along the extreme edge of riparian habitat associated with the Mountain River. This habitat is favoured by moose because of the presence of extensive stands of browse (i.e., *Salix* spp.). Browse was much less plentiful north of the road.

The proximity of the road to favoured habitat likely meant that moose would have been continually aware of the road and associated vehicles through a combination of both auditory and olfactory cues. Considering the inhibitory effect that such linear developments have had on the movements of large ungulates in certain circumstances, the possibility that the I-66 access road may have limited, to some extent at least, the northward movement of moose away from the Mountain River cannot be disregarded completely. Rudd and Irwin (1985), for instance, found that trucks associated with oil exploration caused disturbance to some moose, but the majority showed little if any response. Horejsi (1979) found that moose avoided seismic lines that were in active use but once traffic ceased, moose used and crossed the lines more regularly. Van Ballenberghe (1978) suggested, from limited data, that 'certain' moose, whose winter ranges were near an elevated oil pipeline and associated facilities, may avoid these structures. On the other hand, he found that moose moving between seasonal ranges were seldom deterred from crossing under an elevated oil pipeline. Before the exact and perhaps more subtle effects (Klein 1980, Donihee and Gray 1982), if any, of a winter haul road could be determined a more detailed approach would be required. This would involve ground-based study of moose and sign of moose along and beside the road, precise quantification of the vehicular traffic on the road, and detailed study of the behavior and movements of specific individuals (e.g. direct observation, radio telemetry).

The finding of relatively small numbers of moose in the Hume River valley agrees with Jingfors et al. (1987) who classified this same section of the Hume River valley as low moose density while sections immediately upstream and downstream were of medium density. Possible reasons for the avoidance of this particular stretch of the Hume River by moose were not offered by Jingfors et al. (1987) and were not apparent in the present study. The complete lack of moose in the uplands within a 5 km radius of the I-66 drilling location would be expected regardless of the presence of the drilling rig. The stunted, open black spruce forest contained, at best, a very thin shrub layer and as such would not be favoured by moose as winter habitat.

The winter haul road paralleling the lower Mountain River and crossing the Hume River did not result in increased hunting in these areas. Approximately 10 moose were taken by GHL holders from Fort Good Hope hunting on snowmobiles along the lower Mountain River and away from the road. The Department of Renewable Resources is not aware of any resident hunters from Norman Wells, or elsewhere, hunting in these areas. It is likely that the general exploration area is isolated enough, the winter haul road of sufficiently low grade, and the availability of moose as good closer to Norman Wells that resident hunters do not bother. This is not to say, however, that given an increased population in the

Norman Wells area (therefore more resident hunters), and an upgrading of the winter road, that a situation of over-harvest similar to the Liard Valley (Donaldson and Fleck 1980) could not happen in the present study area. Continued monitoring of both GHL and resident hunting will be required in future winters should oil exploration in this area continue.

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