MOOSE ACCESS ROUTES TO AN AQUATIC FEEDING SITE

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ABSTRACT: The relationship between travel routes of moose to an aquatic feeding site and the characteristics of forests and topography surrounding the site were examined. A total of 79 moose trails in standing timber were identified. We suggest moose establish regular trails to aquatic feeding sites that avoid steep slopes and dense vegetation. Waterbody characteristics and particularly the characteristics of the backshore areas, appear to influence where moose enter to feed. The strategy of retaining forest reserves to provide security near aquatic sites is discussed.

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Aquatic feeding by moose (*Alces alces*) is common where aquatic plants are available (Joyal and Scherrer 1978, Timmermann and McNicol 1988). In Ontario, moose generally begin feeding on aquatics in late May or early June and often continue to mid-October. De Vos (1956) and Cobus (1972b) reported that regular trails were used by moose to access aquatics in both Chapleau Crown Game Preserve and Sleeping Giant Provincial Park of northern Ontario.

A standard 120 metre reserve was routinely applied by wildlife managers to Timber Management activities around most Ontario waterbodies during the 1960's and early 1970's. Rationale for 'donut' reserves near water was defended on the basis of aesthetics, erosion control, or for protection of wildlife habitat (Brusnyk and Gilbert 1983). Wood shortages and the multiple-use strategy resulted in re-examination of the standard reserve concept. As a result, the Ontario Ministry of Natural Resources has changed from designating modified management areas (MMA's) in the late 1970's to currently identifying areas of concern (AOC's) in dealing with a variety of resource values, including standing vegetation around lakes and streams (OMNR 1988a, b).

Shoreline reserves of standing vegetation are considered important for allowing moose free access to and from aquatic feeding sites. A 120 metre reserve of vegetation to provide security cover is recommended in the guidelines for moose habitat management in Ontario (OMNR 1988a). These guidelines are applied adjacent to high and moderate aquatic use or potential use areas (Thompson 1978). Some high-use sites get larger reserves if they are deemed particularly significant for moose. At other sites, selective harvest of timber may take place if reserves are composed of high quality stands.

Few studies have evaluated the use of the 120 metre reserve or its importance to moose for accessing aquatic feeding areas. Fraser and Hristienko (1983) suggested the relative use of an aquatic feeding area could be evaluated from moose tracks, trails, summer pellet groups, and other sign around the lake perimeter.

In this study, initiated in 1971, our objective was to document the location of moose trails, the extent of trails, and persistence of their use by moose to access aquatics surrounded by standing timber. We hoped this information would assist in better understanding the amount and type of vegetative cover that would ensure continued use of the aquatic site.

STUDY AREA

The study was carried out on Joeboy Lake in Sleeping Giant (formerly Sibley) Provincial Park, Ontario (48o 20' N, 88o 45' W, Fig. 1). The Park (243 km2) lies on a peninsula in Lake Superior (Cobus 1972a, Fraser and Hristienko 1983). Joeboy Lake, one of numerous shallow lakes in the park, was one of the most readily accessible view-

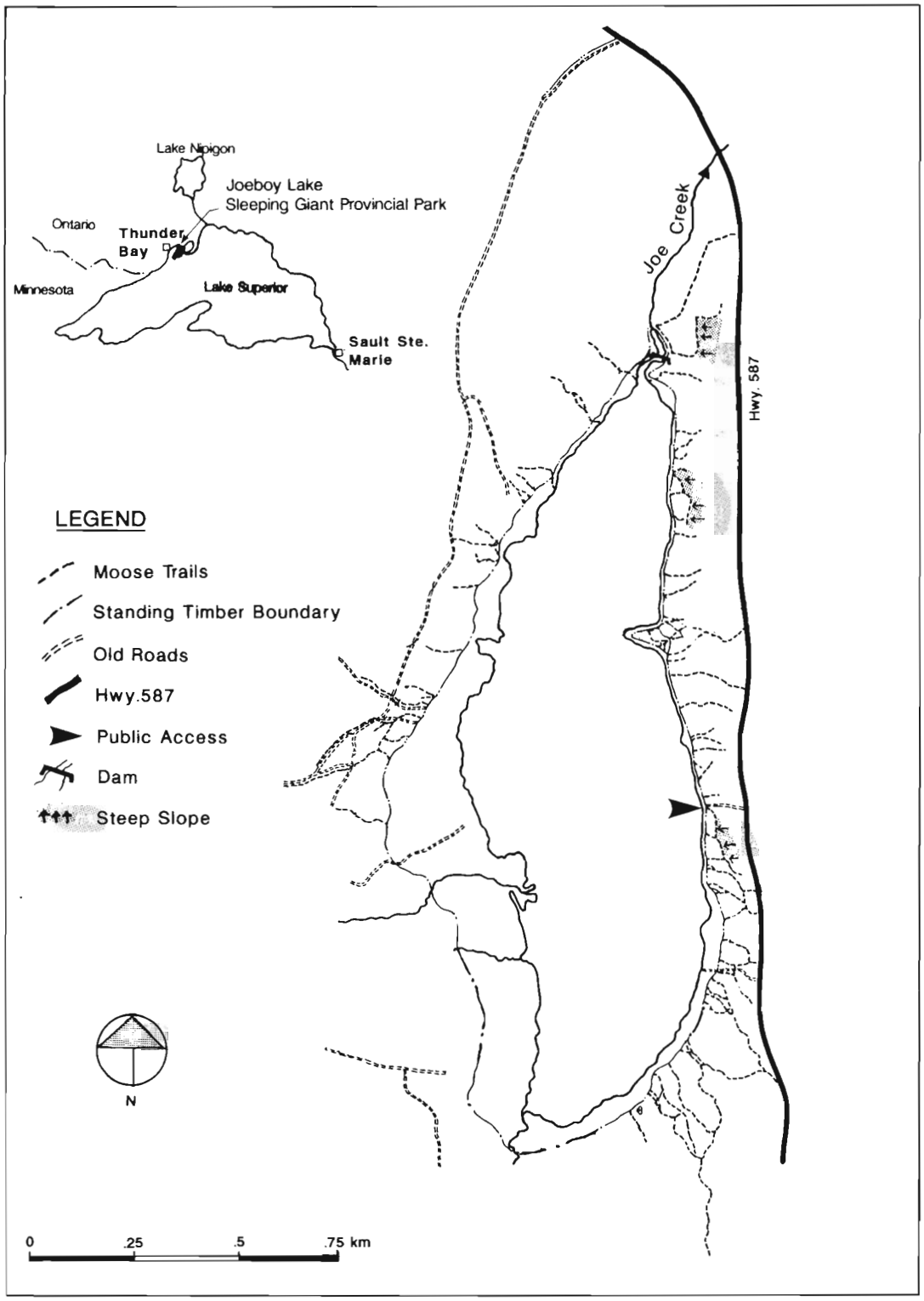

Fig. 1. Location of trails used to access aquatic vegetation in Joeboy Lake, Sleeping Giant Provincial Park, Ontario, August 1971.

ing areas for moose in Ontario in 1971. As many as 20 moose, feeding simultaneously on aquatic vegetation, have been documented (Cobus 1972a, b).

Forest cover around Joeboy Lake is a mixture of balsam fir (*Abies balsamea*), white spruce (*Picea glauca*), black spruce (*Picea mariana*), white birch (*Betula papyrifera*), trembling aspen (*Populus tremuloides*), cedar (*Thuja occidentalis*), red pine (*Pinus resinosa*), and white pine (*P. strobus*). These species reflect the fact that the Park is considered to be in the transition zone between boreal forest and the Great Lakes forest (Rowe 1972). Logging occurred in the vicinity of Joeboy Lake from the early 1920's to approximately 1950 (Anon. 1931 and Park files). In addition, evidence suggests that both fire and spruce budworm (*Choristoneura fumiferana*) influenced vegetation in the early 1950's. The entire border of Highway 587, running along the eastern shore of Joeboy, was planted to red and white pine in 1955.

The lake, about 1.6 km long and 0.4 km wide, contains 5.2 km of shoreline encompassing an area of 74.7 ha. Joeboy is highly eutrophic with a maximum summer water depth of 60 cm (Cobus 1972a). Very soft silt (2 - 6 m) covers the lake bottom. A narrow strip of hard gravel covers a portion of the east shore, while the west side is bordered by a floating mat of grasses (Graminae) and sedges (*Carex* spp.). The lake bottom along the west shore consists of deep silt, making it more difficult for moose to enter or leave the water. The main park access route (Hwy. 587) runs parallel to the east side of the lake between 150 and 200 m from the lakeshore.

METHODS

Field studies were carried out 28 June through 3 July, 1971, during which all current moose trails leading to the lake were flagged, numbered, and plotted on a large-scale map, (1 cm = 1.75 m). Each trail was described and mapped beginning at the edge of standing timber adjacent to the shoreline. A compass and 2-chain tape were used to determine direction and distance as the trail went inland. Major changes in trail direction were recorded as were features which may have influenced trail direction, such as slope and old road locations. All trail forks and connecting, or "feeder" trails, were noted and sketched in as accurately as possible.

Eighteen years later, on 13 June, 1989, the trails around Joeboy were re-examined. Trails mapped in 1971 were re-located, where possible, and vegetation associations were evaluated. Vegetation was classified on 10 m x 10 m plots, according to the Northwestern Ontario Forest Ecosystem Classification (NWO FEC) (Sims *et al.* 1989). Sample plots were located on trails, sufficiently removed from the shoreline to eliminate the "edge effect."

RESULTS AND DISCUSSION

Trail Location and Vegetation

A total of 79 major trails leading inland from the lakeshore were described in 1972 (Fig. 1). In 1989, prior to the peak of aquatic feeding, only 35 of these trails could be readily relocated, and no new trails were observed. Of the 79 trails originally described, 56 (71%) were located on the eastern shoreline, and the balance 23 (29%) accessed the northwestern portion of Joeboy Lake. The shoreline was subdivided into 6 arbitrary sections to facilitate discussion on trail location, length, feeder trails, and NWO FEC vegetation types (Table 1, Fig. 2). Those in section 1 (24) were regularly interconnected by feeder trails that facilitated movement between trails and across highway 587 (Fig. 1). Nine trails in section 2, north of the public access point, were generally isolated from each other, with several leading to Highway 587. An additional 9 trails in section 3 were clustered and interconnected around a point of land jutting into the lake. Section 4 contained 14 trails along the northeast shoreline between the point and Joe Creek outlet. All

Table 1. Numbers of moose trails and stand ecosystem classifications around Joeboy Lake, northcentral Ontario

Shoreline Section	*n* Trails	Trail Length (m) $\bar{x}$	Range	*n* Feeder Trails $\bar{x}$	Range	NWO FECa
1	24	142	17-644	11	0-41	V14/21/6/7/10/24
2	9	84	16-201	2	0-6	V14/21
3	9	88	18-241	5	0-15	V4
4	14	105	40-322	4	1-9	V14/21/7/6
5[b]	9	438	43-1340	9	3-25	V14/21/22/24/6
5[c]	14	78	12-201	5	0-15	V14/21/22/24/6
6	0	--	--	--	--	V22[d]
Total	79	145	12-1340	6.8	0-41	

[a] Sims et al. (1989)

[b] Connected to old roads

[c] Not connected to old roads

[d] Cedar, alder/sphagnum to speckled alder bog

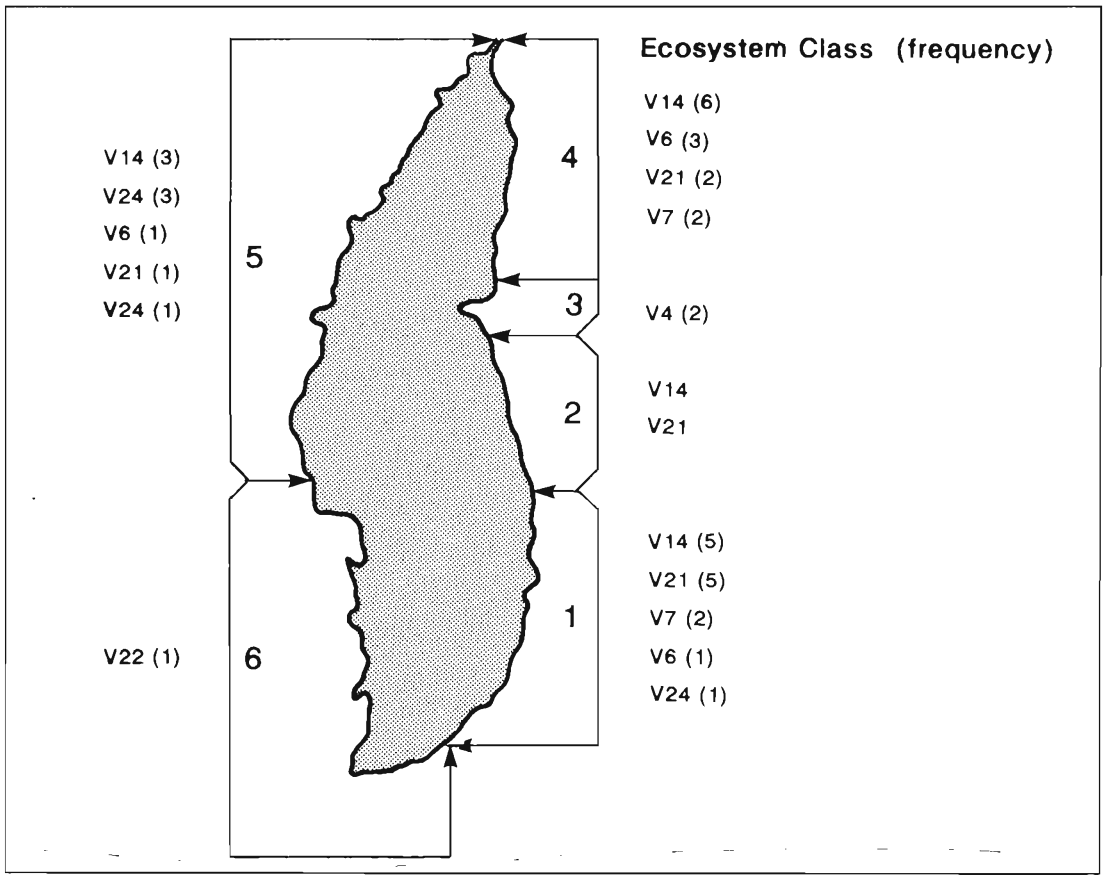

Fig. 2. Vegetation types defined by the Northwestern Ontario Forest Ecosystem Classification Sims *et al.* 1989) around Joeboy Lake, Sleeping Giant Provincial Park, June 1989.

[1]V22 is a cedar, alder, sphagnum stand that merges to speckeld alder, willow wetland with much more open water and no trees exceeding 10 m in height as moisture levels increase.

were well spaced with only one interconnection. The longest (322 m) was traced from the old dam site at the mouth of Joe Creek and paralleled an old logging road through heavy balsam regeneration to Highway 587. Twenty-three trails were identified in section 5. Nine of these were associated with old logging roads and all were longer and showed more use than those not connected to old roads. No permanent trails were observed in section 6, a cedar-alder/sphagnum dominated bog around the southwestern shore of the lake. Among trails leading to the lake, where slope was > 30 - 40%, direction tended to follow the contour of the slope, while on more level ground, it tended to be perpendicular to the shore.

The overstory vegetation around Joeboy Lake is dominated by balsam fir and white cedar with white birch prominent locally. The most frequently observed NWO FEC vegetation types were V14 *Balsam Fir Mixedwood* and V21 *Cedar including Mixedwood/Mountain Maple*. These types often occurred in close proximity to each other (Fig. 3). These stands represent a productive, nutrient-rich condition that is usually variable in species composition and in shrub richness. In dense stands, understory development was limited by light availability. Understory was composed primarily of *Abies balsamea, Acer spicatum, Aralia nudicaulis,* and *Thuja occidentalis*. The stands were beginning to break up in places, with patches of blowdown a common occurrence. Scattered pockets of V4 White Birch, Hardwood and Mixedwood, V6 *Trembling Aspen (White Birch)-Balsam Fir/Mountain Maple, V7 Trembling Aspen-Balsam Fir/Balsam Fir Shrub, V24 White Spruce-Balsam Fir/Shrub Rich,* and *V22 Cedar (including Mixedwood/ Speckled Alder/Sphagnum*) occurred throughout the forest surrounding the lake, but not as large stands. Some large, mature overstory trees of trembling aspen and white birch occurred as remnants of a logging operation 25 - 50 years ago.

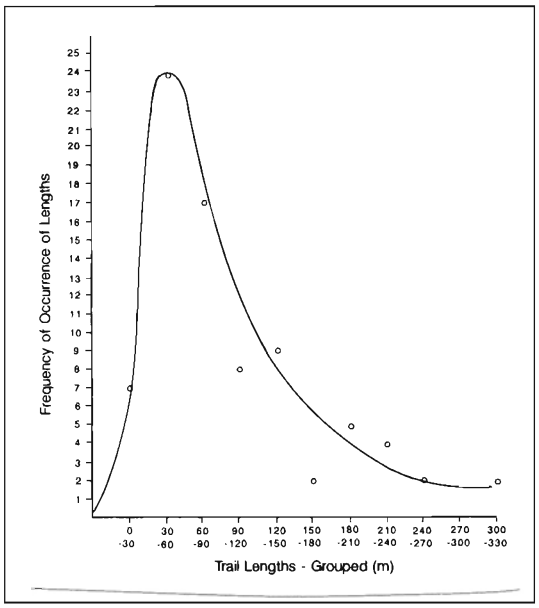

Fig. 3. Moose trail length frequency around Joeboy Lake, Sleeping Giant Provincial Park, Ontario August 1971. Minimum and maximum lengths for each interval are listed.

Trail Length and Utilization

Nearly 70% (55 of 79) trails were 30 - 150 m in length (Fig. 3). Fifteen percent were 150 - 300 m, 6% > 300 m, and 7% were < 30 m. Mean trail length, including 9 trails connected to old roads (section 5), was 145 m (range 12 - 1340, n = 79, Table 1). Mean trail length decreased to 107 m (range 12 - 644, n = 70), when road-connected trails were excluded.

Trail Longevity

There has been a pronounced decline in moose activity around Joeboy Lake and the Park between 1971 and 1989 (Fraser and Hristienko 1983, personal observ.). *Parelaphostrongulus tenuis*, carried by an increasing white-tailed deer (*Odocoileus virginianus*) population, and a deterioration of aquatic vegetation (Fraser and Drysdale 1975) in Joeboy, are believed to have contributed to the decline in use. In addition, older stands (> 40 yrs.) now dominate much of the Park, and habitat conditons for moose are considered poor. Nearly half of the trails (35

of 79) have persisted for eighteen years, suggesting some continue to be used for many years despite declining herd sizes.

Shoreline Utilization

Shoreline characteristics appeared to have the strongest influence on where moose enter the water to feed. Cobus (1971a, b) described major areas of moose movement in 1971. He related these observations to water depths, location of submergent and emergent aquatics, and areas of hard sand or gravel bottom along the shoreline (Fig. 4). A lack of permanent trails in section 6 (Fig. 2) coincides with Cobus' (1971b) report of little moose activity around that portion of Joeboy Lake. This appears related to an area of bog development (V22) where substrate is of organic or silty muck that could make footing unstable for moose. Use of aquatics by moose may be affected where timber cutting has been extended to the shoreline, because escape or security cover is lacking (McMillan 1954). The entire shoreline may not require a fixed width reserve. Adequate cover may only be necessary for security cover adjacent to the actual aquatic feeding site(s) or entry point(s) which can be readily identified on the ground from an examination of the trail network.

We believe this study gives managers some understanding of moose access trails around an aquatic feeding site. Results, however, are limited to one heavily utilized aquatic site. Further studies are obviously needed to determine the variability of these findings.

SUMMARY

There was no indication that access to Joeboy Lake by moose was limited by shoreland vegetation types, except where extremely unstable footing was evident. The location of trails seems most influenced by characteristics of the waterbody itself, primarily its substrate. Trails were found more numerous in areas of firm footing and were largely absent in areas characterized by deep organic soils, blowdown, and dense stocking of alder and willow.

The location of aquatics and associated water depths may also have influenced moose movement to and from aquatic sites. Moose appeared to establish and maintain access routes in areas that offer least resistence from topography and vegetation. Deadfalls and steep slopes were skirted, and, we assume, the easiest route of travel favoured. Old logging roads were often heavily utilized as trails by moose to access aquatics. The presence of Highway 587, the main access route into the Park, and paralleling the eastern lakeshore, did not appear to limit access to the lake. Some trails interconnected with each other, while others were completely isolated from other trails.

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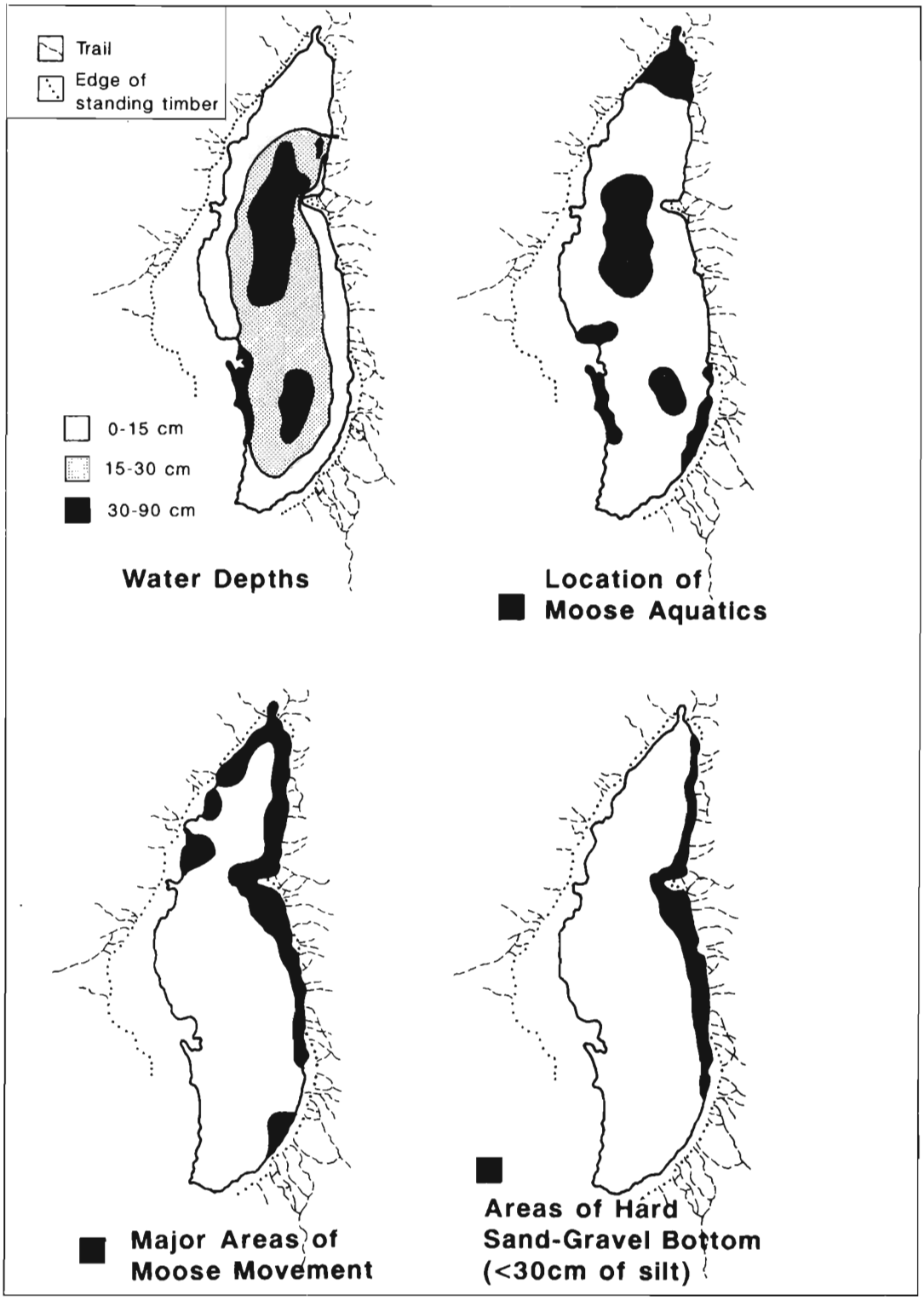

Fig. 4. Water depth, location of moose aquatics, major areas of moose movement, and areas of hard sand-gravel bottom in Joeboy Lake, Sleeping giant Provincial Park, Ontario (Cobus 1971a, b).

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