A New Shrub for Ontario: Mountain Bilberry, *Vaccinium membranaceum*, in Pukaskwa National Park

P. BARCLAY-ESTRUP

Biology Department, Lakehead University, Thunder Bay, Ontario P7B 5E1

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A vegetation survey in Pukaskwa National Park carried out in conjunction with lake, soil, and rock studies resulted in the confirmation of a new shrub species for Ontario. This species, Mountain Bilberry (*Vaccinium membranaceum*), is common in the study area. It is found on shallow acid soils in mature and over-mature mixed forests. It occurs in a sparse to moderately dense shrub layer over a usually well-developed herb layer (possibly a response to severe Spruce Budworm defoliation). Lists of vascular plants, bryophytes, and lichens associated with Mountain Bilberry are included.

Key Words: New species, *Vaccinium membranaceum*, Mountain Bilberry, Ontario, Pukaskwa National Park.

In the course of acid precipitation studies conducted from 1983 to 1985 at eight lake areas in Pukaskwa National Park, a new Ontario shrub was discovered. This new ericaceous shrub, Mountain Bilberry (*Vaccinium membranaceum* Dougl.), was found to be present in large numbers in Pukaskwa. The purposes of this paper are to report this new occurrence and the Pukaskwa locations of Mountain Bilberry, and also to describe some aspects of the Pukaskwa habitat and the associated species.

Mountain Bilberry is a small-to-medium sized shrub (up to 2.0 m in British Columbia, but mostly less than 0.5 m in Pukaskwa) with serrate deciduous leaves. The solitary flowers are in the leaf axils and have awned anthers. These flowers produce sweet blue to black berries. Usually, no infraspecific taxa are recognized. However, Scoggan (1978-79) does divide the species into two varieties, *rigidum* and *membranaceum*. If varieties are used, then the Pukaskwa collections are var. *membranaceum*.

Mountain Bilberry is widely distributed in North America. In Canada it occurs in the southwestern Northwest Territories (Porsild and Cody 1980), western Alberta (Moss 1983) and in much of British Columbia (Szczawinski 1962; Taylor and MacBryde 1977). It also occurs in the northwestern United States as far south as northern California (Jepson 1960). In eastern North America it is found in three counties that border on Lake Superior in the state of Michigan, but neither Fernald (1950) nor Gleason (1963) reports Mountain Bilberry from eastern Canada. Two recent publications, *Shrubs of Ontario* (Soper and Heimburger 1982) and a checklist of Superior Provincial Park (Anonymous 1985), also do not include Mountain Bilberry.

Records have been made in two localities in Ontario, the Bruce Peninsula and Little Pigeon River, but there is no verifying specimen for the record from the Bruce Peninsula (George Argus, personal communication), and a collection from "Little Pigeon River" near Thunder Bay held by the Harvard University Herbarium is actually *Vaccinium myrtilloides*. The present report, therefore, is the first verified record of Mountain Bilberry in Ontario.

Study Area

Pukaskwa National Park is located on the northeastern shore of Lake Superior (Figure 1). The eight study lakes are inland in the park between Oiseau Bay and Otter Island (Figure 2).

The park has a cool temperate climate with mild summers (July $\bar{x}$ = +16° C) and cold winters (January $\bar{x}$ = –13° C). The climate is humid with an average annual precipitation of 87 cm (about 18 cm is water equivalent of snow). Cloud and fog are relatively common.

The study sites are in an area of rugged topography, mostly at relatively high elevations. The highest lakes are at 435 m; the lowest of the eight lakes (6A-22) is at 310 m (Lake Superior has an elevation of 183 m). The bedrock associated with these lakes is primarily granite with intrusions of pegmatite, prophory, and diabase. The soils of the areas are classified, using the Canadian system of Soil Classification, as humo-ferric podzols.

The vegetation of the park is boreal forest. It is variously classified as strongly Humid Southern Boreal by Ahti (1964), as Boreal Forest Superior Section by Rowe (1972), and as Low Boreal by Zoltai and Pollett (1983). Garton (1976, 1977) produced

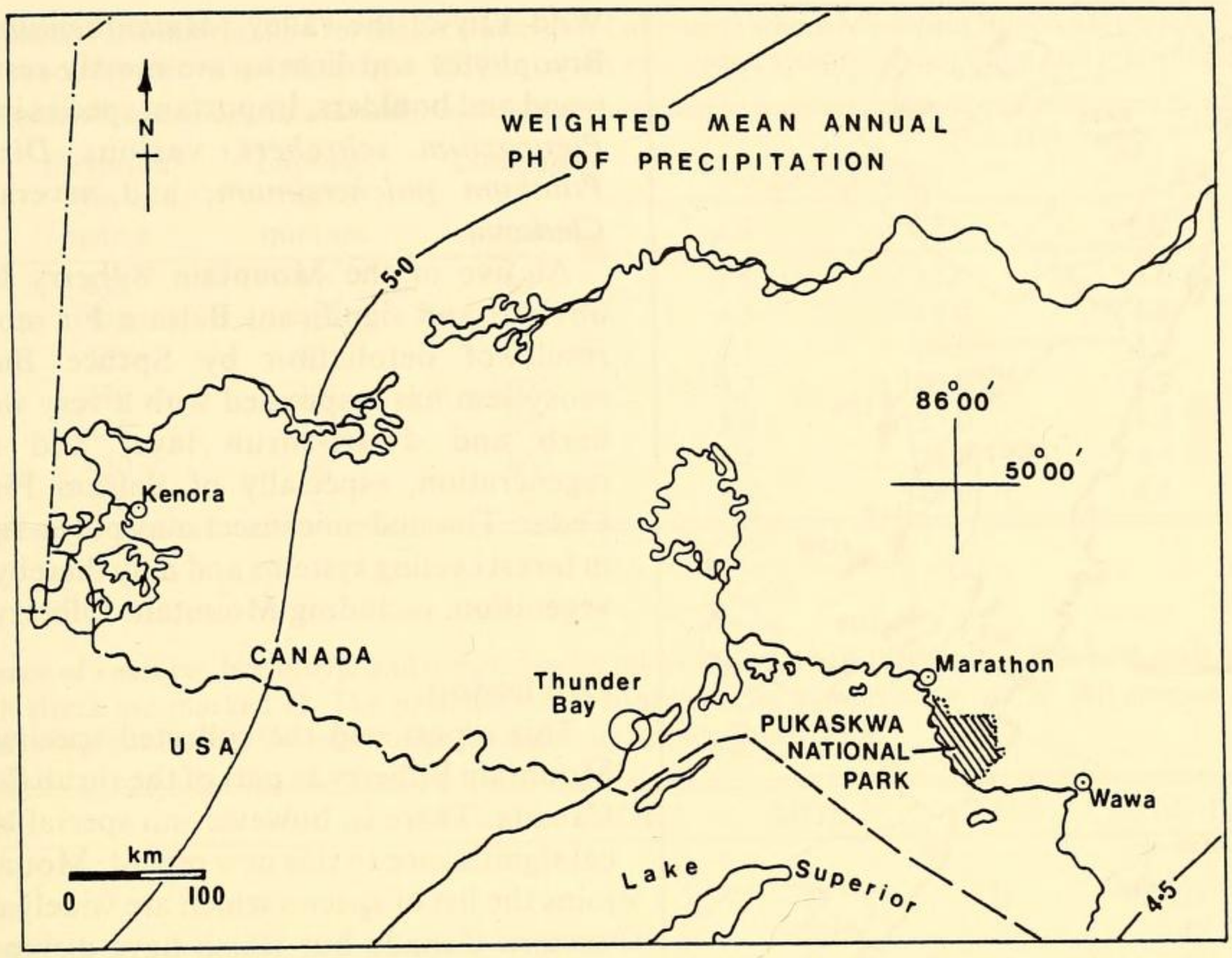

FIGURE 1. Pukaskwa National Park, Ontario, Canada. Isolines of the weighted mean annual pH of precipitation are also included.

check-lists of vegetation found along the Lake Superior coast. A more detailed study of forest types, including a check-list, has been done by Gimbarzevsky et al. (1978).

The study area has not been affected by logging since it is quite inaccessible. The study lakes are situated in areas that tend to be fire-resistant owing to the humid climate, dissected topography, areas of open rock, and many lakes. Alexander (1978, 1980) has described some of the fire history of Pukaskwa. While logging and fire have had little effect on the vegetation of the study areas, Spruce Budworm (*Choristoneura fumifera*) is an important biotic factor. The moderate to severe infestation of Spruce Budworm in the park from 1975 to the present has resulted in considerable modification of the Balsam Fir (*Abies balsamea*) and White Spruce (*Picea glauca*) components of the forest.

Methods

The study area (Figure 1) in Pukaskwa National Park was visited three times: 12 September 1984, 21 May 1985, and 18 June 1985. As the area is remote and the terrain is difficult, transport to the lake study areas was by a float-equipped Bell 206B helicopter. Eight lakes, previously studied for lake and soil characteristics, were visited for vegetation studies.

These were carried out near soil pit study areas. Table 1 has data for the six lake areas where Mountain Bilberry is present. At each soil pit 10-x-10-m areas were marked, the dbh (diameter at breast height) was measured for all tree species, species lists were prepared, and cover estimations were made. General area species lists were also made as time permitted. (Details of these studies are in Barclay and Viitala 1983). Some collections were made of not readily identifiable species. Mountain Bilberry was collected at three lakes: MOE-1 deposited in the Pukaskwa Park Herbarium; LU-8 deposited in the National Herbarium of Canada, and LU-10, retained in the author's personal herbarium.

Nomenclature of vascular plants is according to Scoggan (1978-79); mosses are according to Ireland (1980); liverworts are according to Stotler and Crandell-Stotler (1977); and lichens are according to Hale (1979).

Results

Mountain Bilberry was found at six of the eight lakes visited in Pukaskwa National Park. At five of these locations it is one of the two most dominant shrub species. Therefore, in this area of about 5 X 10 km it can be considered common. The remaining two lakes with no Mountain Bilberry present (MOE-9

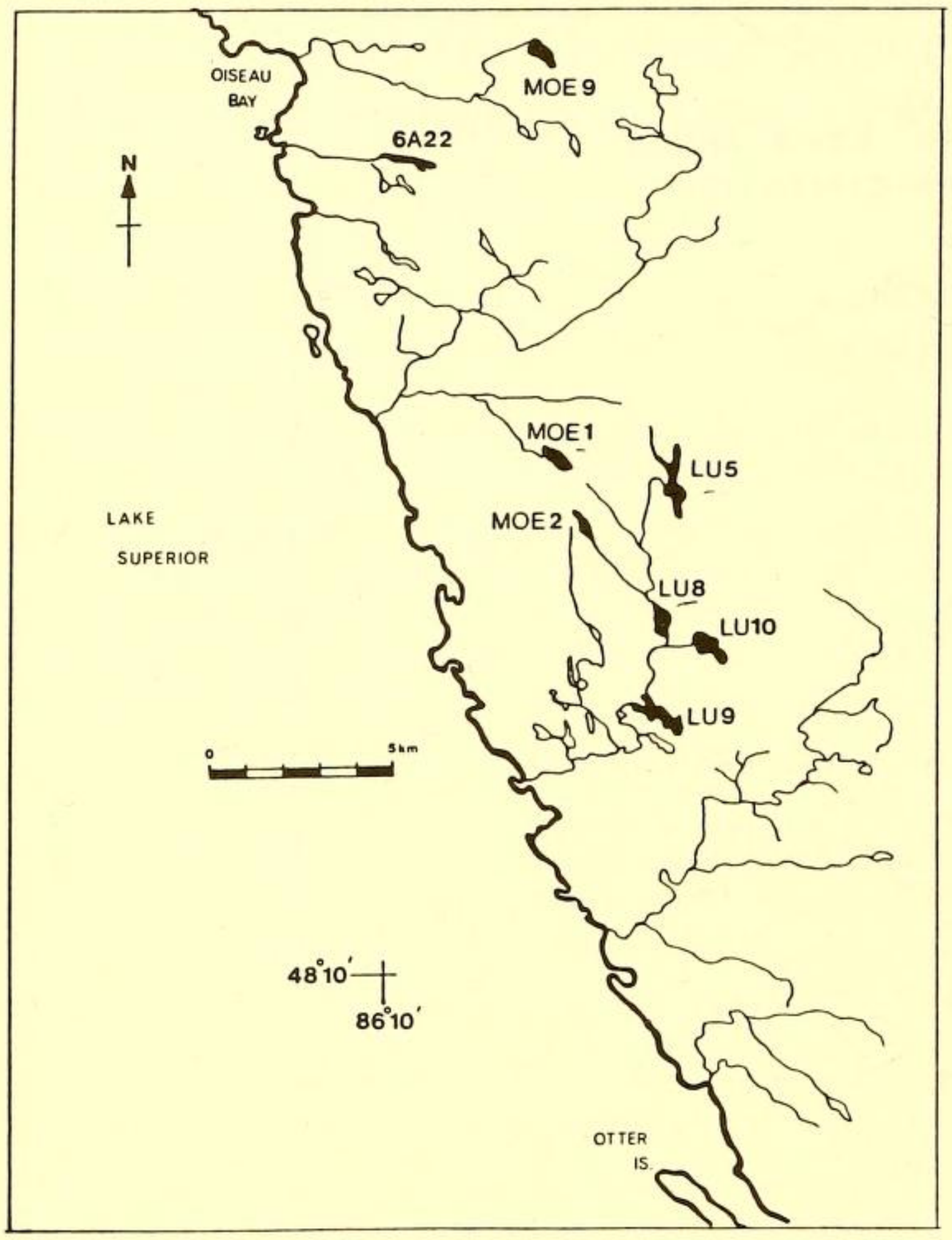

FIGURE 2. Location of the APIOS (Acid Precipitation in Ontario Study) study lakes in Pukaskwa National Park.

and 6A-22) are both north of the other six lakes (Figure 2). They also have significantly different vegetation, as can be shown by single axis polar ordinations (Bray and Curtis 1957). Lake 6A-22 is the only site with a well-developed moss layer which is dominated by *Pleurozium schreberi* and *Dicranum polysetum*. Lake MOE-9 has a mixed forest and is the only one of the eight areas with Trembling Aspen, *Populus tremuloides*.

The six lake areas where Mountain Bilberry occurs (Table 2) have mature and over-mature forests dominated by White Birch (*Betula papyrifera*) and Balsam Fir. Black Spruce (*Picea mariana*), White Spruce and White Cedar (*Thuja occidentalis*) are also common. The shrub layer is sparse to moderately dense and is dominated by Mountain Bilberry and Mountain Juneberry (*Amelanchier bartramiana*). It also often includes Mountain Maple (*Acer spicatum*) and Ground Hemlock (*Taxus canadensis*). There is a well-developed herb and dwarf-shrub layer, which is usually dominated by Bracken (*Pteridium aquilinum*), Canada Bunchberry (*Cornus canadensis*) and Wild Lily-of-the-valley (*Maianthemum canadense*). Bryophytes and lichens are mostly restricted to old wood and boulders. Important species in this layer are *Pleurozium schreberi,* various *Dicranum* spp. *Ptilidium pulcherrimum*, and several species of *Cladonia*.

At five of the Mountain Bilberry lakes there is obvious and significant Balsam Fir mortality as the result of defoliation by Spruce Budworm. the ecosystem has responded with a very well-developed herb and dwarf-shrub layer and considerable regeneration, especially of Balsam Fir and White Cedar. This endemic insect may play a significant role in forest cycling systems and may thereby affect all the vegetation, including Mountain Bilberry.

Discussion

This report and the collected specimens establish Mountain Bilberry as part of the shrub flora of eastern Canada. There is, however, no special biogeographical significance to this new record. Mountain Bilberry joins the list of species which are widely distributed in western Canada but which have disjunct and much smaller populations in eastern Canada, such as Giant Rattlesnake Plantain (*Goodyera oblongifolia*), Thimbleberry (*Rubus parviflorus*), Devil's Club (*Oplopanax horridum*), and Oval-leaved Bilberry (*Vaccinium ovalifolium*). In Ontario all these species, including Mountain Bilberry, are primarily found in the cool humid region that occurs close to the upper Great Lakes.

There are no specific studies of the ecology of Mountain Bilberry in western Canada (R. Ogilvie and T. C. Brayshaw, personal communication). However, a number of Land Management Reports have been published by the British Columbia Ministry of Forests (eg. Haeussler et al. 1984). Several of these reports give ecological information about Mountain Bilberry. This information shows that Mountain Bilberry has a broad ecological amplitude in British Columbia. Generally, it is found in most higher elevation forests except the wettest outer coastal region and the driest interior regions: It is found on soils that vary from oligotrophic to sub-minerotrophic.

The sub-alpine forests of central and northern British Columbia have many similarities with the cool humid oligotrophic mature and over-mature mixed forests of Pukaskwa Park that are the Ontario habitats of Mountain Bilberry. The presence of Mountain Bilberry in these two widely separated locations would tend to indicate, perhaps, that these now separate populations were, as has been often suggested, part of a larger single population in the past.

TABLE 1. Location and soil information for the six Pukaskwa Lake areas where Mountain Bilberry is present. The pH of the soil is taken in a 1:1 ratio of water to soil by weight. CEC is cation exchange capacity in me/100 g and is expressed at a pH of 4.5.

Name	Elevation in metres	Latitude 48° minutes	Longitude 86° minutes	Soil Horizons: Organic (LFH) pH	Organic (LFH) CEC	Mineral (A) pH	Mineral (A) CEC
LU-5	435	17′	03′	3.5	17.0	4.6	1.4
LU-8	370	15′	03′	4.3	19.0	4.8	1.8
LU-9	335	13′	03′	4.1	20.0	4.6	1.6
LU-10	380	15′	02′	3.7	20.0	4.7	1.6
MOE-1	435	18′	05′	3.9	23.0	4.5	4.3
MOE-2	420	16′	05′	3.7	21.0	4.4	4.7
Mean	396	-	-	3.9	20.0	4.6	2.6

TABLE 2. Presence of vascular, bryophyte and lichen species in the Mountain Bilberry sites. The two most dominant vascular species for each strata are marked D. The presence of all other species is marked by an X. All species are listed in most common to least common order. * = most trees dead due to Spruce Budworm.

Study Site	LU-8	LU-5	MOE-1	MOE-2	LU-9	LU-10	Total
Trees (8)							
Betula paprifera	D	D	X	D	D	D	6
Abies balsamea	D*	D*	D*	X*	X*	D	6
Picea mariana	X	X	X	D	X	X	6
Thuja occidentalis	X	X	D	X	D		5
Sorbus decora	X	X	X	X	X		5
Picea glauca	X	X			X	X	4
Acer rubrum					X		1
Pinus strobus			X				
Shrubs (10)							
Amelanchier bartramiana	X	D	D	D	D	D	6
Vaccinium membranaceum	X	D	D	D	D	D	6
Taxus canadensis	X	X	X	X	X		5
Acer spicatum	D		X	X		X	4
Vaccinium angustifolium	X				X	X	3
Vaccinium myrtilloides	D			X			2
Diervilla lonicera	X						1
Corylus cornuta	X						1
Prunus virginiana	X						1
Sorbus americana	X						1
Herbs and Dwarf Shrubs (21)							
Clintonia borealis	X	X	D	X	X	X	6
Cornus canadensis	D	X	D	D	X	X	6
Coptis groenlandica	X	X	X	X	X	X	6
Dryopteris austriaca	X	X	X	X	X	X	6
Lycopodium annotinum	X	X	X	X	X	X	6
Maianthemum canadense	X	X	X	D	D	D	6
Pteridium aquilinum	D	D	X	X	D	D	6
Aralia nudicaulis	X		X	X	X	X	5
Gaultheria hispidula	X	X	X	X			4
Lycopodium obscurum	X	X			X	X	4
Osmunda claytoniana	X	X			X	X	4
Cypripedium acaule	X	X	X				3
Linnaea borealis	X	X				X	3

(continued)

TABLE 2. Continued

Study Site	LU-8	LU-5	MOE-1	MOE-2	LU-9	LU-10	Total
Epigaea repens		X			X		2
Goodyera oblongifolia			X		X		2
Lycopodium clavatum	X		X				2
Lycopodium lucidulum		D			X		2
Carex arctata	X						1
Lycopodium complanatum						X	1
Streptopus amplexifolius	X						1
Streptopus roseus					X		1
Mosses (18)							
Dicranum montanum	X	X	X	X	X	X	6
Dicranum scoparium	X	X	X	X	X	X	6
Drepanocladus uncinatus	X	X	X	X	X	X	6
Pleurozium schreberi	X	X	X	X	X	X	6
Dicranum ontariense	X	X	X	X		X	5
Pogonatum alpinum	X		X	X	X	X	5
Plagiothecium laetum	X	X	X		X	X	5
Ptilium crista-castrensis		X	X	X	X	X	5
Pohlia nutans	X	X	X	X			4
Polytrichum juniperinum	X		X		X	X	4
Brachythecium reflexum	X	X					2
Hylocomium splendens				X	X		2
Hylocomium umbratum		X			X		2
Pylaisiadelpha recurvans		X		X			2
Brachythecium curtum					X		1
Brachythecium sp.	X						1
Dicranum polysetum			X				1
Sphagnum russowii		X					1
Liverworts (8)							
Ptilidium pulcherrimum	X	X	X	X	X	X	6
Barbilophozia attenuata	X	X	X		X	X	5
Blepharostoma trichophyllum		X	X		X	X	4
Barbilophozia hatcheri	X	X					2
Bazzania trilobata		X			X		2
Cephalozia lunulifolia					X		1
Jamesoniella autumnalis		X					1
Lophozia prophyroleuca		X					1
Lichens (11)							
Cladonia coniocraea	X	X	X	X	X	X	6
Cladonia chlorophaea	X	X	X	X	X	X	6
Cladonia squamosa	X		X		X		3
Cetraria pinastri	X	X		X			3
Cladina rangiferina	X		X	X			3
Cladonia cenotea		X		X			2
Cladonia phyllophora	X					X	2
Cladonia conista			X				1
Hypogymnia physodes	X						1
Lecidea berengeriana	X						1
Peltigera aphthosa					X		1
Total species = 76							
Total species per study site	54	46	41	35	45	35	

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