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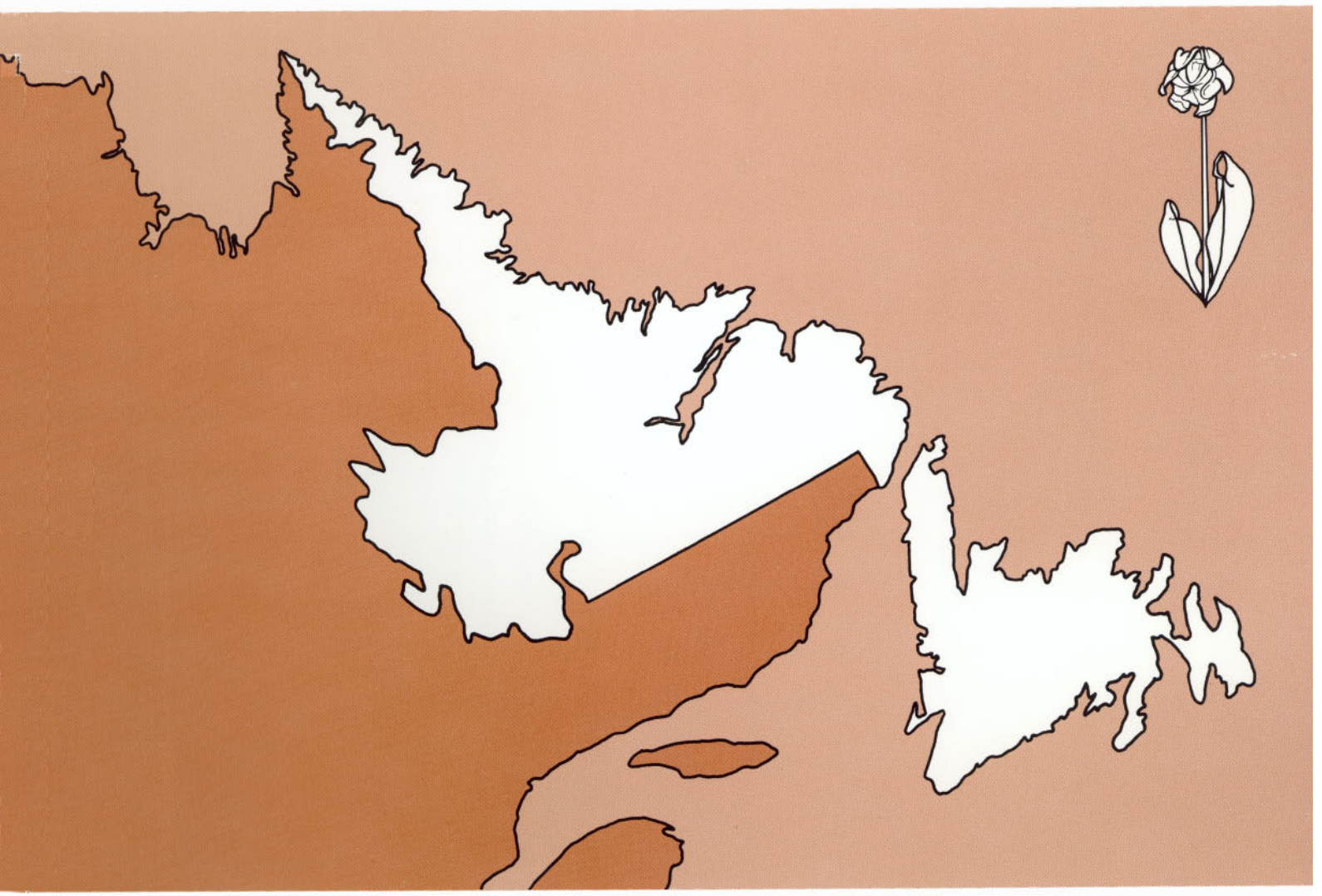
Soils of the Pasadena-Deer Lake area, Newfoundland

Report No. 17 Newfoundland Soil Survey 1988



Canada

Soils of the Pasadena-Deer Lake area, Newfoundland

Report No. 17
Newfoundland Soil Survey

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Land Resource Research Centre
Contribution No. 85-05

(Map sheet 12H4-East)

Research Branch
Agriculture Canada
1988

Copies of this publication are available from
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Cat. No.: A57-118/1988E
ISBN: 0-662-16377-X

Produced by Research Program Service

Staff editor: S.V. Balchin

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ABSTRACT

The soil survey of the Pasadena-Deer Lake area was started under the Canada-Newfoundland 1978-1983 Agriculture Development Subsidiary Agreement and was completed by the provincial Department of Agriculture.

The report contains detailed descriptions of the major soils and their range of characteristics, along with general information about the areas, climate, geology, vegetation, and surficial geology. The maps and report provide information on the type, extent, and distribution of the soils, with special reference to their agricultural potential.

SUMMARY

The Pasadena-Deer Lake area is located in the western portion of the province (see Fig. 3). The survey area covers 24 000 ha.

The climate of the Pasadena-Deer Lake area is greatly influenced by the Humber Valley. In this valley situation, late springs and early frosts are common, but summers are short and warm. Mean daily summer temperatures from June to August range from 11.7 to 16.4°C, with temperatures above 30°C being common. Mean daily winter temperatures from December to February range from -9.0 to -2.6°C, with February being the coldest month. Temperatures of -25°C are common during the winter months. Annual precipitation ranges from 1023 to 1133 mm.

The soils in the Pasadena-Deer Lake area have formed on tills and water-lain deposits derived primarily from sedimentary rock of local origin, but they also include igneous rock from the Long Range Mountains. The dominant soils are Humo-Ferric Podzols, Ferro-Humic Podzols, Dystric Brunisols, and Orthic Gleysol groups. Organic soils make up a small proportion of the area and are found in highland depressions, lowland, and meltwater channels. Also mapped within the Organic group are Folisols, which are found primarily at the higher elevations.

In general, the soils near the lakeshore have formed on waterlain deposits and are relatively level, stone-free, and coarse-textured. Farther away from the shoreline the soils have formed on till deposits and have more complex slopes, more stones, and finer textures.

The mineral soils suitability for agriculture was assessed, using the Canada Land Inventory classes. The soils were assigned Canada Land Inventory class ratings 3, 4, 5, and 7.

ACKNOWLEDGMENTS

The author gratefully acknowledges the following contributions:

A. Stewart for guidance and report editing; P.K. Heringa for reviewing the report and for moral support; W. Snow for assisting in the field and mapping work throughout the project; W. Williams, L. Baker, and C. Hookey for assisting with the field work; B. Fardy, A. Webber, and J. Marion of the cartographic section, Department of Rural, Agricultural, and Northern Development for drafting the figures and diagrams; J. Shields and C. Tarnocai for advising on soil classification and legend modification; D. Kroetsch for editing the report for technical content; B. Edwards for making constructive suggestions regarding the map layout and design; and D. Blackmore for typing the final draft of the report and legend.

The Service Laboratory, Land Resource Research Centre, Ottawa, provided chemical and physical analyses on the soils.

INTRODUCTION

This report is one of several sponsored by the Canada-Newfoundland 1978-1983 Agriculture Development Subsidiary Agreement.

In the report the main soil-forming factors such as climate, vegetation, geology, and geomorphology are discussed; all soils mapped within the survey area are characterized by a detailed profile description, by chemical and physical data, and by classification; and the suitability for agriculture of the soils within the various Canada Land Inventory (CLI) class ratings are described.

The soil maps that accompany the report depict soils with common physical and chemical properties as they reoccur over the landscape but provide only a two-dimensional picture of the soil. The depth, or third-dimensional picture of the soil can only be obtained from the report. To make maximum use of the information collected both the map and the report should be used.

The semi-detailed soil survey of the Pasadena-Deer Lake area was undertaken to provide information on the type, extent, and distribution of the soils so that their agricultural potential could be determined.

HOW TO USE THE MAP

To use the map and legend, first locate the area on the map to be studied. The delineation(s) in which the area falls will have a specific color, along with a simple or complex map symbol (Fig. 1). The map symbols have been arranged, using a numerator-denominator type of format.

The numerator segment of the symbol contains the abbreviation of the soil name found within the delineation. For example, the Hughes Brooke soil has the abbreviated symbol HB. The Hughes Brooke soil's name has been alphabetically listed on the left-hand side of the legend, together with the associated color from the map. The legend, which is located horizontally from the soil name, contains information on the mode of deposition, lithology, drainage, water regime, texture, depth, classification, and pedoclimatic zone.

The denominator segment of the symbol contains information on slope, stoniness, and bedrock exposure and is located on the map (Fig. 2).

The legend for the Pasadena-Deer Lake area soil map is designed to be used with both the map and the report to obtain information about specific soil properties and landscape features. Due to the scale and intensity of the mapping, it is important to clarify that minor inclusions of other soils may occur with a delineated landscape. However, when used wisely, the soil map, legend, and report will enable users to obtain specific and general information about the soil and landscape to be studied.

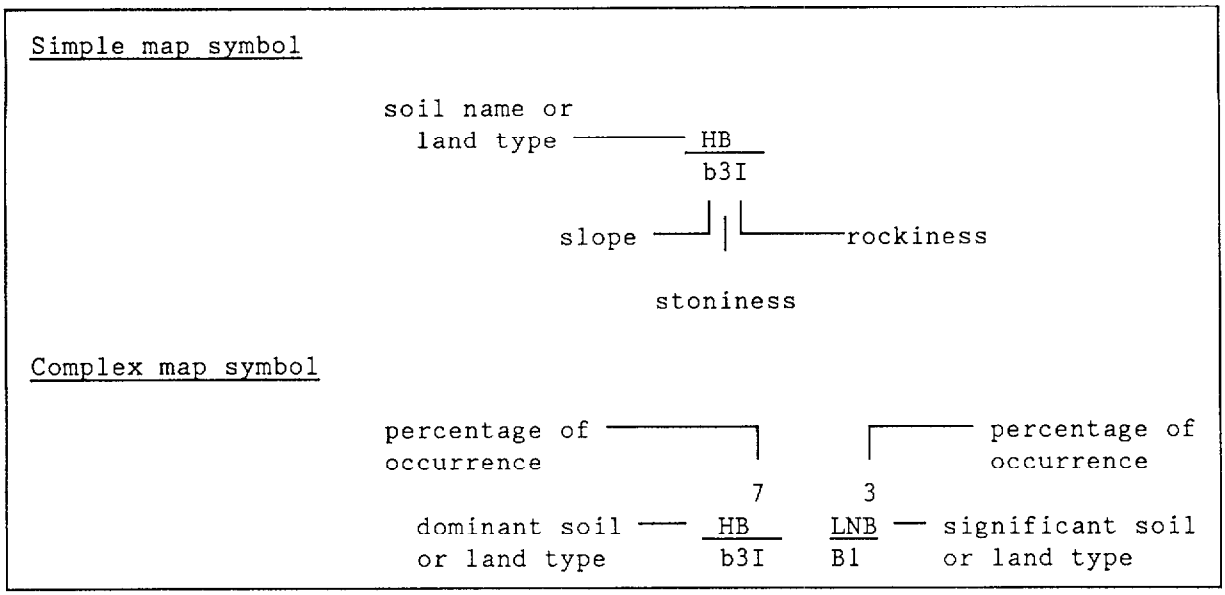

Figure 1. Simple and complex map symbols.

SLOPE CLASS

Simple	Complex	Slope (%)
A	a	0-0.5
B	b	0.5-2.5
C	c	2-5
D	d	6-9
E	e	10-15
F	f	16-30
G	g	31-45
H	h	46-70
I	i	71-100

Stoniness	Surface occupied (%)
0 - nonstony	0.01
1 - slightly stony	0.01-0.1
2 - moderately stony	0.1-3
3 - very stony	3-15
4 - exceedingly stony	15-50
5 - excessively stony	>50

Rockiness	
0 - non-rocky	2
I - slightly rocky	2-10
II - moderately rocky	10-25
III - very rocky	25-50

Figure 2. Key to elements in denominator of the map symbol.

PREVIOUS WORK

The survey area occurs in the NTS-12H mapsheet (1:250 000) of the Sandy Lake exploratory soil survey report by Kirby et al. (in preparation). The exploratory soil survey was designed to provide general information on climate, geology, and soils for use in broad-scale regional planning programs.

GENERAL DESCRIPTION OF THE AREA

LOCATION AND EXTENT

The survey area is located in the eastern section of the 1:50 000 Pasadena map sheet, National Topographic Series number 12H/4. The area is bounded to the north by latitude 49° 15' 00", to the east by longitude 57° 30' 00", and to the south by latitude 49° 00' 00". The western boundary is a straight line running approximately northeast-southwest from latitude 49° 15' 00", longitude 57° 34' 00", to latitude 49° 00' 00", longitude 57° 44' 00" (Fig. 3).

The survey area covers 29 800 ha, of which approximately 6000 ha is water, with most of that being Deer Lake. The area is comprised of 85% mineral soil and 15% rockland and organic soils.

The Trans Canada Highway and Canadian National Railway run northeast-southwest on the eastern side of Deer Lake, connecting the towns of Deer Lake, Pasadena, and Corner Brook. The town of Deer Lake, just to the northeast of the area, is serviced by an airport, from which connections can be made to most large cities in the province and eastern Canada.

A large paper company has constructed an extensive network of logging roads throughout the survey area, especially in the northeast and western regions, which affords access to many areas.

POPULATION AND HISTORY

Most of the population is confined to the extreme southern end of the study area and restricted to two main communities, Pasadena and South Brook (see Fig. 3). The west side of the lake is uninhabited.

The community of South Brook had its start in the early 1920s as a wood depot on the shores of Deer Lake to harvest wood in the South Brook Valley area. The larger community, Pasadena, which means "crown of the valley," grew as a result of its farmland. Middland, a small community next to Pasadena, was established under a prewar program of agriculture resettlement, mainly of people from the south coast of Newfoundland. Farming did not develop to any substantial scale and most people became involved in the logging industry. In 1955 the communities of Pasadena and Middland were amalgamated.

Very little growth took place in the Pasadena-Middland area until the late 1960s, at which time the provincial government made a provision to the agricultural grants in the Middland area that permitted the owners to subdivide their land. This provision made relatively cheap residential land available in close proximity to Corner Brook, which resulted in a rapid increase in population. This increase can be clearly seen in the 1971

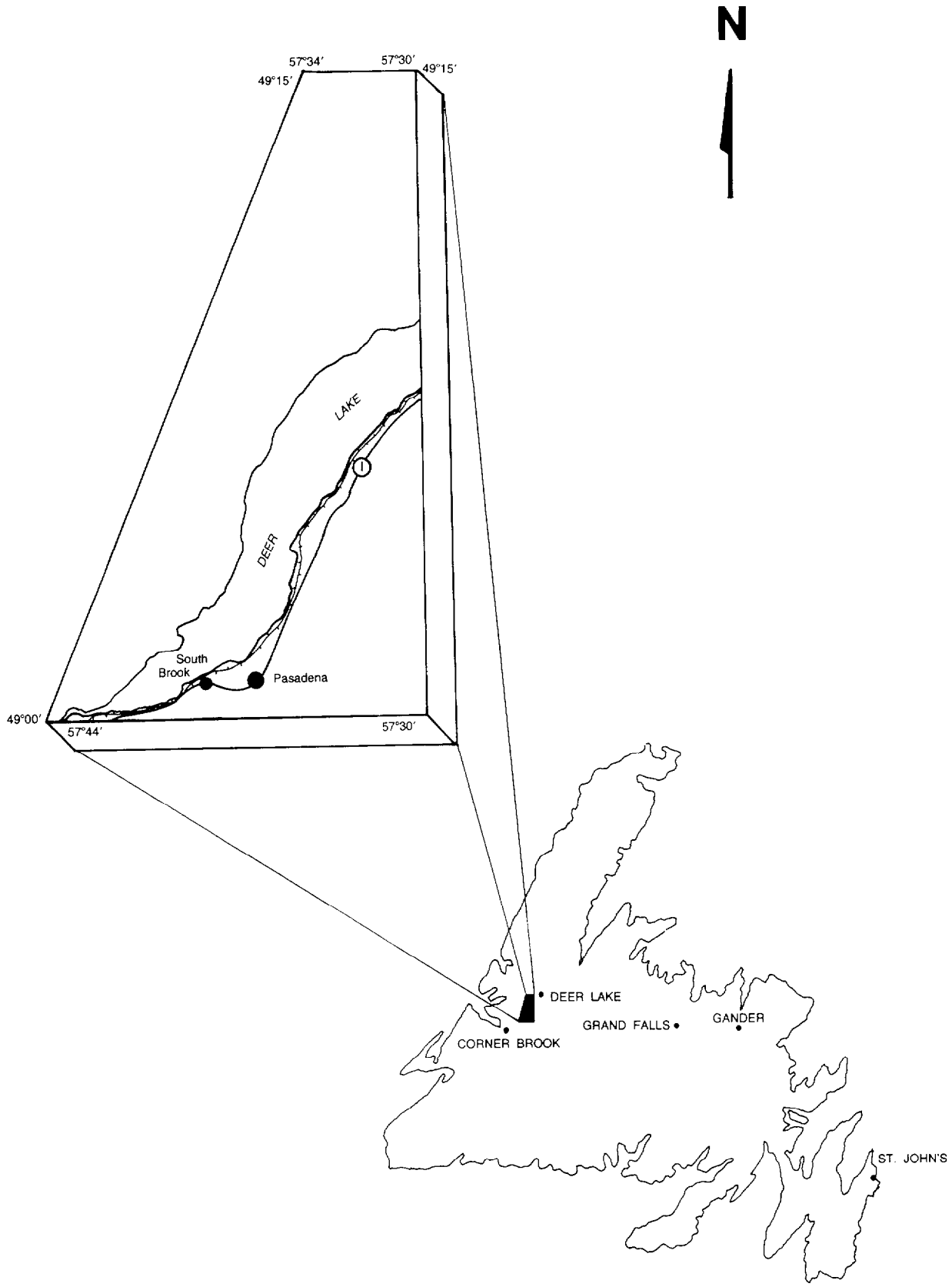

Figure 3. Location of survey area.

population statistics, which were the first ones taken after the provision to the agricultural grants were established (Table 1).

Table 1. Population of South Brook and Pasadena 1951-1981

	1951	1956	1961	1966	1971	1976	1981
South Brook	225	275	358	396	428	446	477
Pasadena	226	N/A*	502	685	964	1880	2685

*N/A - not available
Source: Census Canada 1982

Today, Pasadena, and to a certain extent South Brook, can be referred to as dormitory settlements, relying on Corner Brook (26 km to the southwest) and Deer Lake (20 km to the northeast) as the major employment centres.

PHYSIOGRAPHY

The Pasadena-Deer Lake survey area falls within the Grand Lake - White Bay Basin physiographic region, as defined by Snelgrove (1938). This large physiographic region is too extensive and varied to be of any specific use at this scale of mapping. Therefore, within the survey area the region has been divided into three physiographic zones based on elevation and topography. The zones have been named: Highland, Midland, and Lowland (Fig. 4).

The Highland zone occurs on the east and west sides of Deer Lake. On the eastern side of the lake the zone consists of a relatively flat plateau area, which rises from 150 m to 300 m a.s.l. (above sea level). Most of the area is covered by a thin veneer of stony morainal deposits, with some areas exhibiting thicker deposits. The zone is characterized by numerous small lakes and ponds, with the highest frequency occurring to the south. Many small organic deposits, usually occurring as fens or bog-fen complexes, can be found in depressional areas. Bedrock outcrops are few and where they do occur are limited to ridge crests and very steep slopes.

The western Highland zone is a highly ridged bedrock-controlled terrain covered by a thin veneer of stony morainal material. The elevation ranges from 150 m to 300 m a.s.l., with several higher ridges reaching 325 m to 350 m a.s.l. Southwest-northeast trending ridges of exposed bedrock occur near and north of Round Pond. This outcrop is the only major zone of exposed bedrock in the survey area. In the northern part of this zone, morainal deposits are generally thicker and the topography is more undulating. The entire area has a large number of small fen and bog-fen complexes scattered throughout.

The Midland zone is located between the elevations of 75 m and 150 m a.s.l. The eastern Midland zone has relatively short steep slopes covered by stony morainal deposits, but some relatively level to gently sloping, fluvial and glaciofluvial deposits occur in small river valleys.

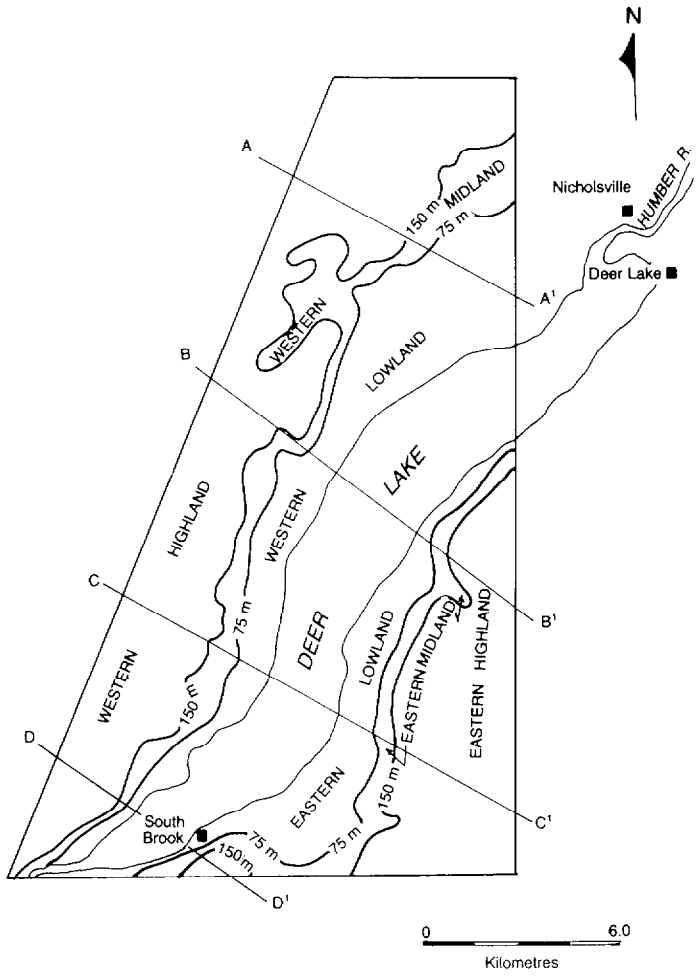

Figure 4. Generalized physiographic zones and the locations of the cross sections.

The western Midland zone has relatively long, gently inclined slopes covered by till deposits over inclined sedimentary bedrock. In small river valleys and at the lower elevation of this zone, level to gently sloping, fluvial and glaciofluvial deposits occur.

The Lowland zone extends from the lakeshore to an elevation of 75 m a.s.l. The eastern Lowland zone is dominated by gentle slopes, with the exception of the very steep slopes located at the southern end, where Deer Lake narrows and the Humber River gorge begins. Sandy fluvial and glaciofluvial deposits are found on the very gentle slopes and in close proximity to the shoreline, whereas the steeper slopes are covered by stony morainal deposits. An extensive lowland area is located around the communities of Pasadena and South Brook, where a large fluvial terrace is located. The remainder of the area is mainly hummocky to ridged terrain, with several exposures of bedrock near the shoreline.

The western Lowland zone consists of relatively long, gentle slopes, with the exception of the steep slopes of the Humber River gorge to the south. Toward the shoreline, sandy fluvial and glaciofluvial deposits are the dominant parent material, with till deposits occurring at the higher elevations and steeper slopes. A major part of the zone is a large, relatively level, fluvial terrace located to the north around Coal Brook.

Small, shallow organic deposits occur near the shoreline in small depressions and former meltwater channels. Fig. 5 shows four cross sections through the survey area from northwest to southeast, which depict the area's basin or valley situation with the surrounding Highland, Midland, and Lowland zones.

DRAINAGE

The most conspicuous drainage feature in the survey area is Deer Lake, which trends southwest to northeast and separates the area into two parts. Deer Lake is supplied by water from the upper Humber River, which enters to the northeast and empties to the south via the lower Humber River and into the Bay of Islands (Fig. 6). Small rivers and streams, which have their headwaters in the Highland zone generally enter perpendicular to the lake. The area has many small ponds scattered throughout the Highland zone, with the two largest being North Lake to the north and Blue Gulch Pond to the southeast.

BEDROCK GEOLOGY

The survey area falls within the elliptic-shaped Deer Lake Basin geological structure, as described by Hyde (1979).

The area is dominated by sedimentary rocks of Carboniferous age, composed primarily of green to red micaceous sandstone, red to gray shale and siltstone, basal conglomerates, and gray to white limestone and dolomite. Areas of massive feldspathic quartzite, quartz-mica-feldspar schist, gneiss, and quartzite also occur.

The area is influenced by the Deer Lake syncline, which is a major synclinal structure trending northeast-southwest through the middle of Deer Lake. Another minor syncline is situated to the southeast near Blue Gulch Pond, but it is separated from the Deer Lake syncline by a major fault running approximately north-south. On the west side of the lake the bedrock has been influenced by several minor east-west faults.

The Lowland and Midland physiographic zones are primarily underlain by basal conglomerates, red micaceous sandstone, and red siltstone, with a minor amount of shale. The northern part of the western Highland zone is dominated by limestone and dolomite, interbedded with shale and phyllite, whereas farther to the southwest in the same zone, extensive outcrops of massive feldspathic quartzite, gneiss, and schist occur. In the area near the Blue Gulch syncline grayish green micaceous sandstone, siltstone, and conglomerate occur, along with minor amounts of shale and augillite (Fig. 7).

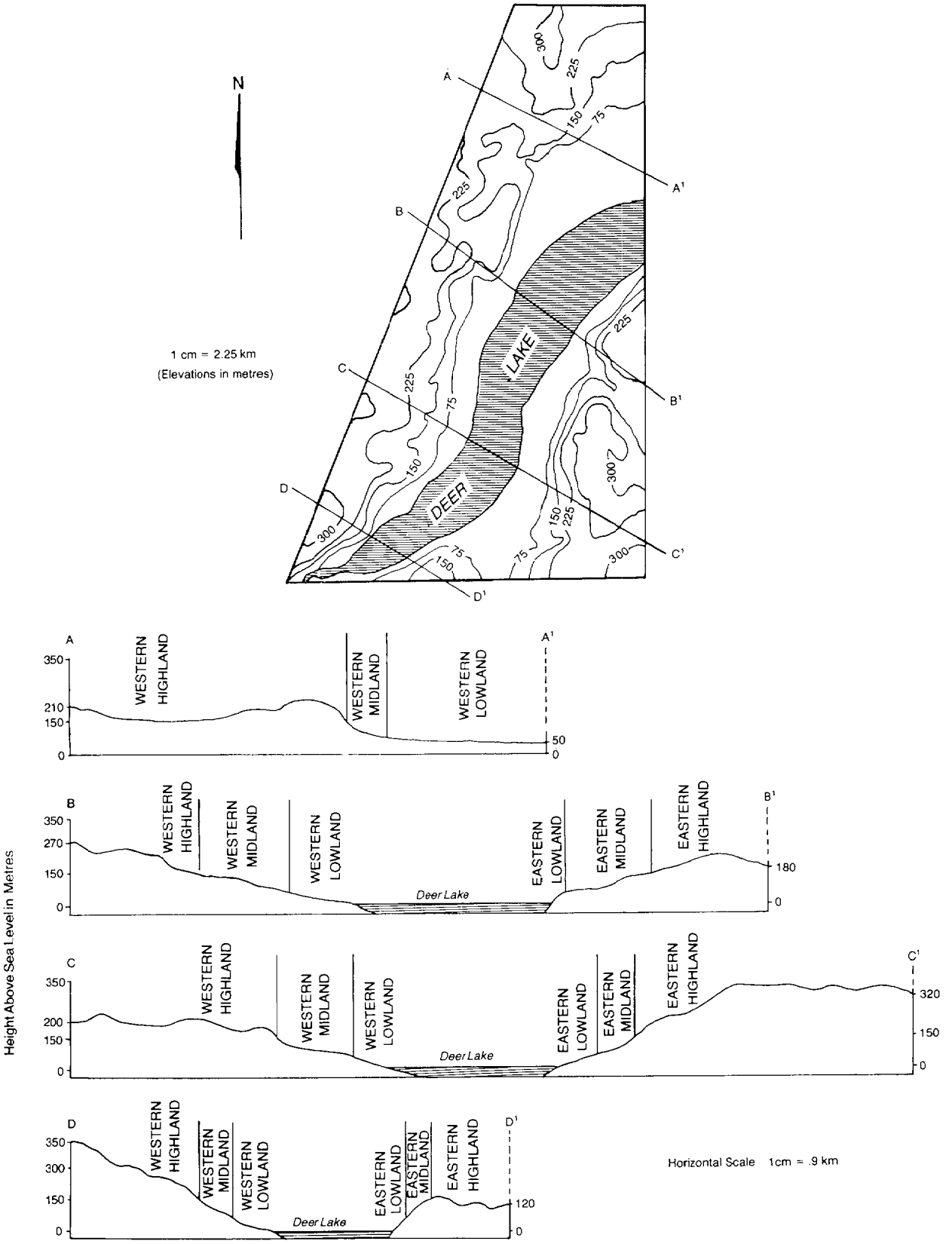

Figure 5. Cross sections and cross-section locations through the survey area.

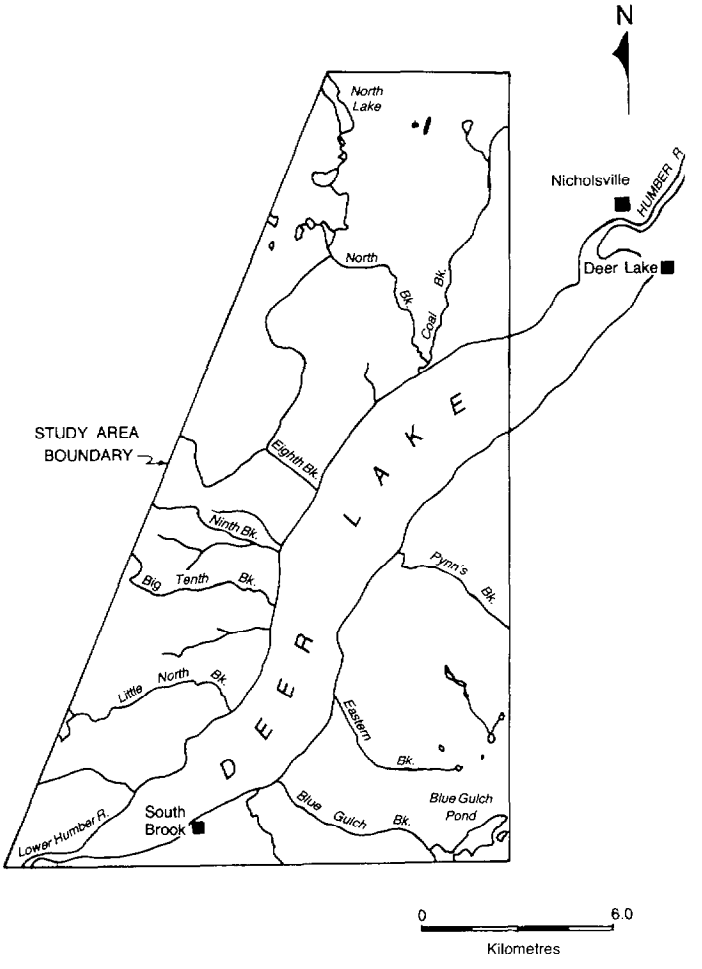

Figure 6. Generalized drainage in the survey area.

PARENT MATERIAL

The unconsolidated surface deposits in the surveyed area were deposited by glaciers active during the later Wisconsin period, which reached its maximum in this region 10 000 to 12 000 years BP. Although reworking of previously deposited material is likely, most of the glacial deposits are derived primarily from the local bedrock.

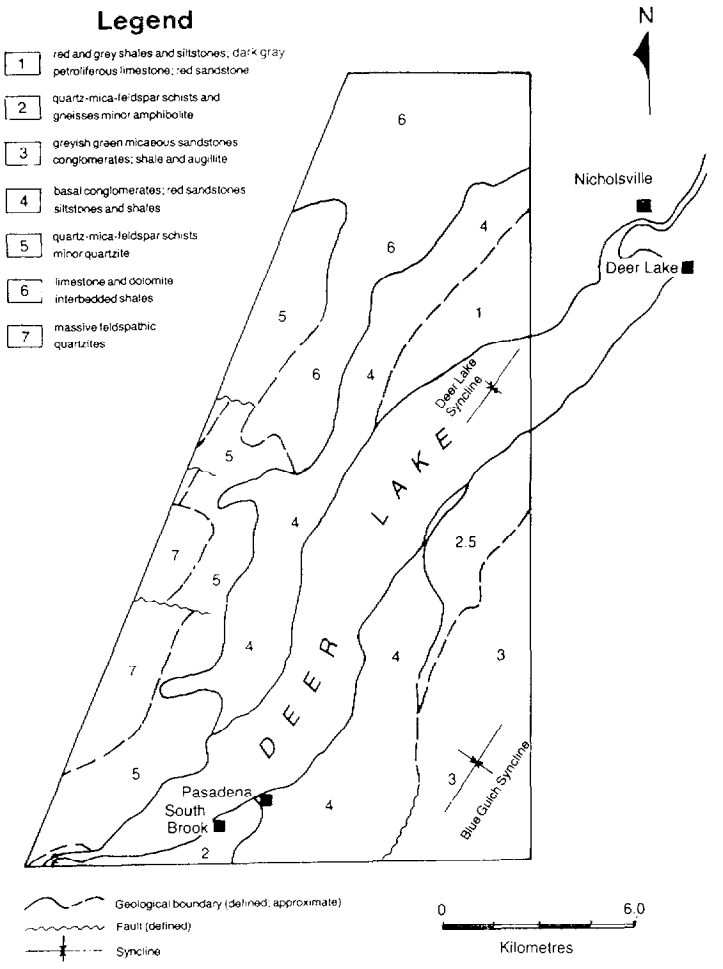

Figure 7. Generalized geology map.

Morainal deposits

Morainal, or till, deposits cover over 70% of the survey area and exhibit a wide range of lithology, texture, color, and thickness. In general, all the tills are thin, ranging in thickness from less than 1 m to 3-4 m. These tills show little evidence of being transported from long distances, since in most instances the lithology and sometimes the color reflect the underlying bedrock; however, granitic rock inclusions are evident throughout the survey area. These granitic inclusions occur as part of the lithology of the various tills and as subrounded to rounded stones and boulders embedded in the soil profile and scattered on the surface. They probably originated in the Long Range Mountains and were transported into the survey area by ice moving

southwest down the Humber Valley (see Appendix 2). They are generally more pronounced in the eastern and western Highland zone areas.

Tills derived primarily from sandstone, siltstone, shale, and/or phyllite are usually medium-textured, ranging from loam to very fine sandy loam. Tills with higher percentages of igneous rock fragments are mainly coarse- to medium-textured, ranging from sandy loam to gravelly sandy loam.

Waterlain deposits

Fluvial, glaciofluvial, and lacustrine deposits have been identified in the survey area. These deposits cover approximately 15% of the survey area. The fluvial and glaciofluvial deposits are coarse-textured and generally contain a high percentage of sand and gravel. They are usually of mixed lithology, mainly composed of sedimentary rocks of local origin and igneous rocks, possibly of Long Range origin. These deposits are restricted to relatively small, gently sloping to inclined deposits, located at or near the mouth of small river valleys, which flow into Deer Lake. Two extensive areas of fluvial and glaciofluvial deposits occur around the community of Pasadena to the south and near Coal Brook to the north. Another less extensive area occurs on both sides of the Humber gorge, just south of Pasadena.

Throughout the area the sorting and stratification of the fluvial and glaciofluvial deposits are highly variable. Grain size varies both horizontally and vertically throughout the deposits, with strata ranging from fine sand to gravelly channery sand, whereas thicknesses vary from several centimetres to 2 m (see Plate Ia). In areas that were more proximal to the ice front, grain size is less varied. The strata are dominantly sand and gravel, with boulders and stones being common.

The lacustrine or glaciolacustrine deposits found in the area have been categorized under three headings: (1) nearshore sandy gravelly beach ridges, (2) lacustrine silts and clays or rhythmites, and (3) gently sloping lacustrine plains.

The nearshore sandy gravelly beach ridges occur primarily on the west shore of Deer Lake as distinct ridges or beach berms that run approximately parallel to the current shoreline. They occur within 1 km of the lakeshore edge and at a maximum elevation of 20 m. Although long, continuous ridges do occur, small, successional ridges are the most common. These deposits constitute a relatively small percentage of the total lacustrine deposition.

Lacustrine silts and clays or rhythmites occur as highly laminated or varied layers of silt, clay, and very fine sand. They occur on both sides of Deer Lake, close to the shoreline but are overlain by gravelly sandy fluvial or glaciofluvial material, which is 3-4 m deep. Closer to the edge of the lake the depth of the fluvial or glaciofluvial material decreases to less than 1.5 m. The rhythmites were only exposed where small streams or gully erosion had exposed a cross section, revealing the sandy gravelly outwash material over the silts and clays. Nowhere in the survey area has silt and clay formed the parent material of a soil. However, in local areas these deposits occur close to the surface and can affect certain soil properties, especially drainage.

Gently sloping lacustrine plains occur near the shoreline on both sides of Deer Lake, but they are more extensive on the western side. These deposits are coarse-textured, whereas stratification and sorting can be well to poor. They have a highly mixed lithology primarily composed of sedimentary rocks such as sandstone, siltstone, conglomerate, and schist, with some influence of granite.

Organic deposits

Numerous shallow organic deposits are found throughout the survey area. These organic deposits cover approximately 10% of the survey area. They are found in former meltwater channels, depressions, and at the bottom, or toe, of moderately steep slopes, whereas other organic deposits have developed as a result of the filling in of small ponds or depressional areas. In general, the area is characterized by fens and bog-fen complexes (see Plate Ib).

Fen deposits are the most common. They are rich in nutrient and are made up of moderately well-decomposed sedges and grasses. They are usually shallow, less than 2-3 m, and are often associated with small streams that meander through the deposit. Bog deposits are usually poor in nutrient and are composed of moderately decomposed sphagnum with a minor amount of sedge. These bogs are shallow, usually less than 1.5 m, and the surface morphology is characterized by small areas of open water or flashets.

Another type of organic soil consists of a thin organic mat derived from moderately decomposed woody fragments, mainly roots, small tree stumps, and branches, with some twigs and leaves. In some areas the organic mat is composed almost entirely of a thin layer of sphagnum mosses. These deposits, which are classified as Folisols, vary in thickness from less than 10 cm to 50 cm, and usually occur on steep sloping bedrock and boulder talus at the toe of steep slopes below rockland landscapes (see Plate IId).

Land types

The western Highland zone is the only area where land types have been extensively mapped and identified. These land types consist of (a) bedrock that has 75% or more of its surface occurring as exposed bedrock, and (b) bedrock that is covered by a very thin organic mat but still has 50-75% of its surface occurring as exposed bedrock. These land types cover approximately 5% of the survey area.

For the purposes of this report till deposits have been divided into eight types based on their lithology, texture, and color. The fluvial, glaciofluvial, and lacustrine deposits have been grouped under the heading of waterlain, with two subdivisions. These subdivisions were based on the similarity of the parent materials and soils that developed on them. Organic soils have been grouped into five different types, four based on their different stages of decomposition and nutrient status and one developed on bedrock. Two rockland land types were also identified. Table 2 outlines the breakdown of the different parent materials on which the soils of the Pasadena-Deer Lake area have developed.

Table 2. Lithological classification of parent materials

Morainal deposits
Dark reddish brown to red sandy loam till derived from red micaceous sandstone.
Red to reddish brown sandy loam to loam till derived from red micaceous sandstone, red siltstone, and minor granite.
Gray to light gray till derived from gray conglomerate sandstone and minor granite.
Brownish red stony till derived from red sandstone, granite, minor shale, and/or phyllite.
Olive to green gravelly till derived from gray siltstone, gray sandstone, and minor granite.
Grayish brown loamy till derived from gray schist, gneiss, with minor red sandstone and granite.
Olive to green loamy till derived from phyllite and shale.
Reddish brown till derived from sandstone and granite.
Waterlain deposits
Reddish brown to brown gravelly sand.
Brown to yellow brown sand.
Organic deposits
Shallow organic soils composed of sedge and grass.
Shallow organic soil composed of sphagnum.
Organic mat over bedrock and/or boulder talus.
Land types
Greater than 75% of the surface occurring as bare rock.
Between 50 and 75% of the surface occurring as bare rock.

CLIMATE

There are no climatic stations located within the Pasadena-Deer Lake survey area, but two stations are established just outside the survey boundaries. One is located inland at Deer Lake Airport (22 m above mean sea level (a.m.s.l.)), approximately 12 km past the eastern boundary. Another is located at the eastern end of the Bay of Islands at Corner Brook (5 m a.m.s.l.), which is 30 km beyond the southern boundary (see Fig. 3). A station located at the Bowater power plant in Deer Lake was not considered in this report because of its similarity with the Deer Lake Airport data.

These stations can provide a general description of the climate in the area; however, the Corner Brook data should be interpreted with caution because of Corner Brook's coastal location and its separation from the survey area by a small mountain range just south of Pasadena. The Deer Lake Airport station is located on a relatively flat area away from the influencing effect of the large water body of Deer Lake, but it should still reflect the overall climate of the area, with the exception of the Highland zones.

Temperatures

The Pasadena-Deer Lake area experiences relatively warmer summers and colder winters than many coastal and eastern regions of the province. Mean daily air temperatures between June and August range from 12.6°C to 16.4°C, as recorded for Corner Brook Airport, with Deer Lake Airport values ranging from 11.7°C to 15.9°C. July has the highest mean daily air temperature for both stations. From December to February the area exhibits cold temperatures, with mean daily air temperature readings of -2.6°C to -9.0°C. February is the coldest month for both stations. In winter, temperatures lower than -25°C are common, whereas in summer, temperatures higher than 30°C often occur (Table 3).

Table 3. Mean daily air temperatures (°C) for Corner Brook and Deer Lake Airport stations

	Corner Brook	Deer Lake Airport
January	-5.1	-8.1
February	-6.3	-9.0
March	-2.6	-4.8
April	2.3	0.8
May	7.1	6.4
June	12.6	11.7
July	17.0	15.9
August	16.4	15.0
September	12.1	10.5
October	7.1	5.3
November	2.9	1.0
December	-2.6	-5.3
Elevation	5 m	22 m

These temperatures are probably indicative of most of the survey area, with the exception of the Highland zone, which may exhibit colder winter temperatures and cooler summer temperatures because of the higher elevations and exposure to wind.

Precipitation

The Corner Brook and Deer Lake Airport stations have mean annual total precipitation of 1133 mm and 1023 mm, respectively, with both stations having approximately 65% of their totals falling as rain. From May to October precipitation falls as rain, but from December to February 78% of the precipitation falls as snow. The ground is snow covered during an average winter season.

Frost-free period

The average frost-free period for the Corner Brook and Deer Lake airport stations are 130 and 97 days, respectively. However, the average 130-day frost-free period for Corner Brook is probably not indicative of most of the survey area because of the station's coastal location and the resulting moderating effects. Therefore, the Deer Lake Airport data are probably more representative.

The relatively short frost-free period of 97 days at the Deer Lake Airport station is due to the reduced marine influence and settling of cool night air into the valley during late spring and early fall. Fig. 8 shows the percentage of occurrence of days with frost from 1 May to 30 September over a 16-year period. It demonstrates the relatively high occurrence of frost during early June and mid-September. With respect to agriculture, this would be a major concern if low-frost-tolerant crops were planted.

Growing degree-days system

The growing degree-days system is a method of evaluating accumulated temperatures above 5°C during the growing season to determine the type and variety of plants best suited to the climatic conditions. Plants require a minimum amount of heat to reach specific stages of development. The system is a relative measure or value for the amount of heat a plant needs for growth. But for practical reasons, growing degree-days are only relative to the growing season. The growing season can be defined as time between the average last and first frosts. For the Deer Lake Airport the average dates are 8 June to 14 September, whereas the Corner Brook dates are 25 May to 3 October (Table 4).

Deer Lake is probably more indicative of the area. It has a range of 1140-1520 growing degree-days, with a mean of 1240 growing degree-days, sufficient for the growth of the locally adapted crops grown in the area (Fig. 9).

Potential evaporation and soil moisture

Among the most important elements to good plant growth and development are the amount and the availability of water. Precipitation in the form of rain and snow helps to recharge the soil, which can enable plants to obtain moisture during times of little or no recharge. The two graphs in Fig. 10 illustrate how precipitation and potential evaporation are plotted to establish soil moisture utilization. Assuming that an average soil (sandy loam texture) has a moisture-holding capacity of 100 mm (Thornthwaite 1948), the graphs demonstrate that moisture is always available to the plant. The diagonally marked areas indicate that soil moisture utilization is only 57 mm for Deer Lake and 79 mm for Corner Brook, well below the assumed 100 mm moisture-holding capacity.

Within the Pasadena-Deer Lake area certain soils, especially near the lakeshore, are very light-textured, ranging from loamy sand to gravelly sand. These soils have a reduced moisture-holding capacity and plants could require additional moisture during dry years. Similarly, shallow or very shallow soils may also experience drought-like conditions.

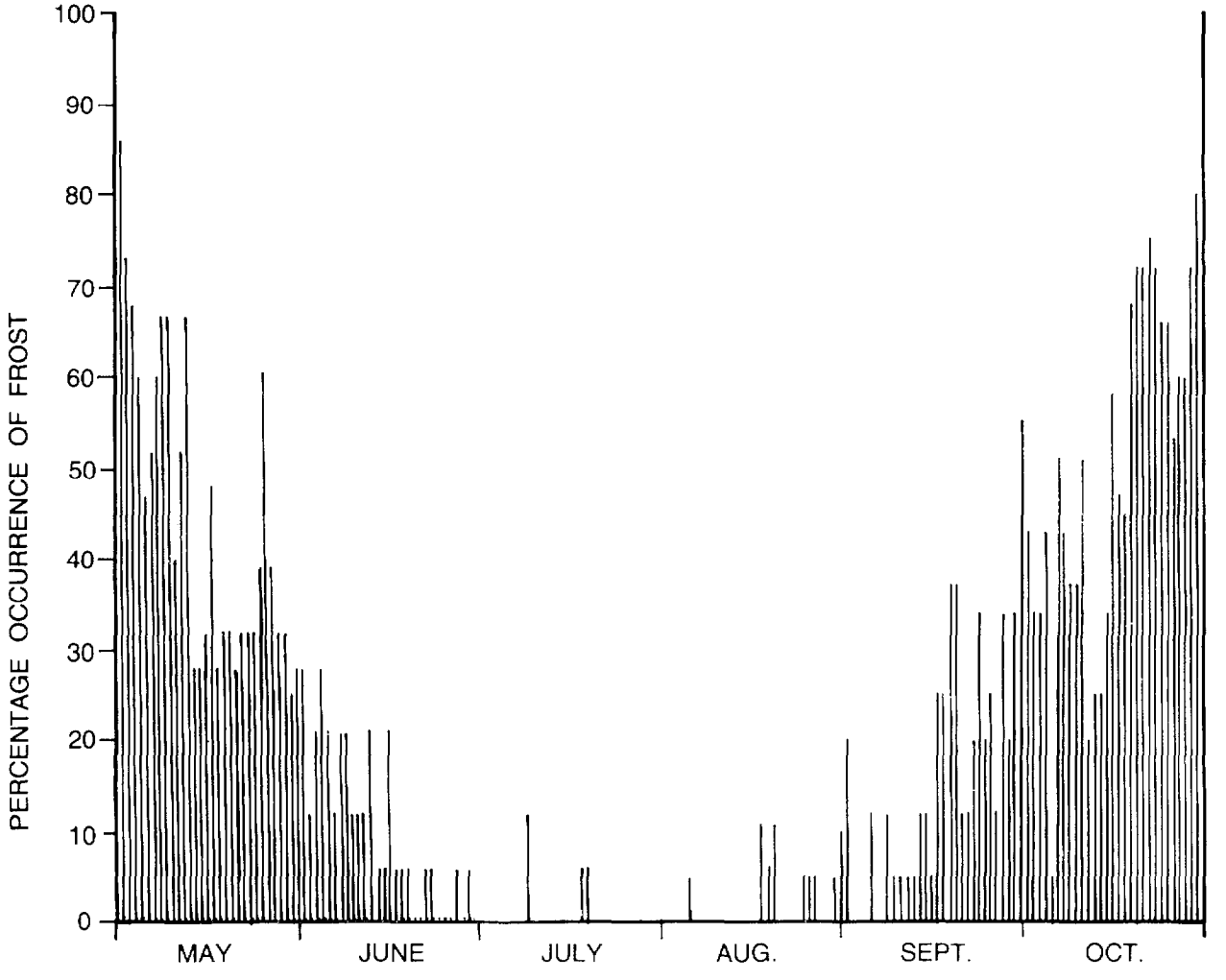

Figure 8. Occurrence of temperatures at or below 0°C recorded at Deer Lake Airport, 1966-1980.

VEGETATION

The natural forest vegetation of the study area is composed of softwood stands, mixed soft and hardwood stands, and small hardwood stands. The indigenous forest communities have been greatly modified by direct and indirect influences of human activities since the late 1800s.

Table 4. Duration and dates of growing season, degree-days, precipitation, and frost for Corner Brook and Deer Lake Airport stations

	Corner Brook	Deer Lake Airport
Earliest last spring frost	5 May	8 May
Latest spring frost	28 June	30 June
Earliest fall frost	31 August	21 August
Latest fall frost	11 November	10 October
Average last spring frost	25 May	8 June
Average first fall frost	3 October	14 September
Frost-free period, days, longest	169	136
shortest	69	57
average	130	97
Total precipitation (mm)	1133	1023
Total rainfall (mm)	722	693
Total snowfall (mm)	411	370
Month with most rain	October	August
Month with most snow	January	January
Days with rain	122	106
Days with snow	90	69
Days with precipitation	202	165
Degree-days (above 5°C)	1370	1240
Degree-days (below 0°C)	598	775
Elevation (m)	5	22
Years of record	46	15

The study area is forest covered except for residential areas, farmland, and areas of rockland found in the western Highland physiographic zone. Balsam fir (Abies balsamea) is the dominant softwood species, followed by black spruce (Picea mariana), larch (Larix laricina), white spruce (Picea glauca), and some white pine (Pinus strobus).

Among the hardwoods, white birch (Betula papyrifera) is dominant and is third in stand volume after balsam fir and black spruce. Other hardwood that occur in the area are mountain maple (Acer spicatum), trembling aspen (Populus tremuloides), speckled and mountain alder (Alnus rugosa, A. crispa) pin cherry and chokecherry (Prunus pensylvanica, P. virginiana), American mountain ash (Sorbus americana), and balsam poplar (Populus balsamifera).

Balsam fir and black spruce can thrive on soils with drainage classes ranging from well drained to imperfectly drained, as observed in the Blue Gulch Pond, South Brook Valley, and North Lake regions. These species have been harvested extensively in these regions for the pulp and paper industry. In very poorly drained areas, such as depressions, black spruce appears as scrub, usually in association with alder and larch.

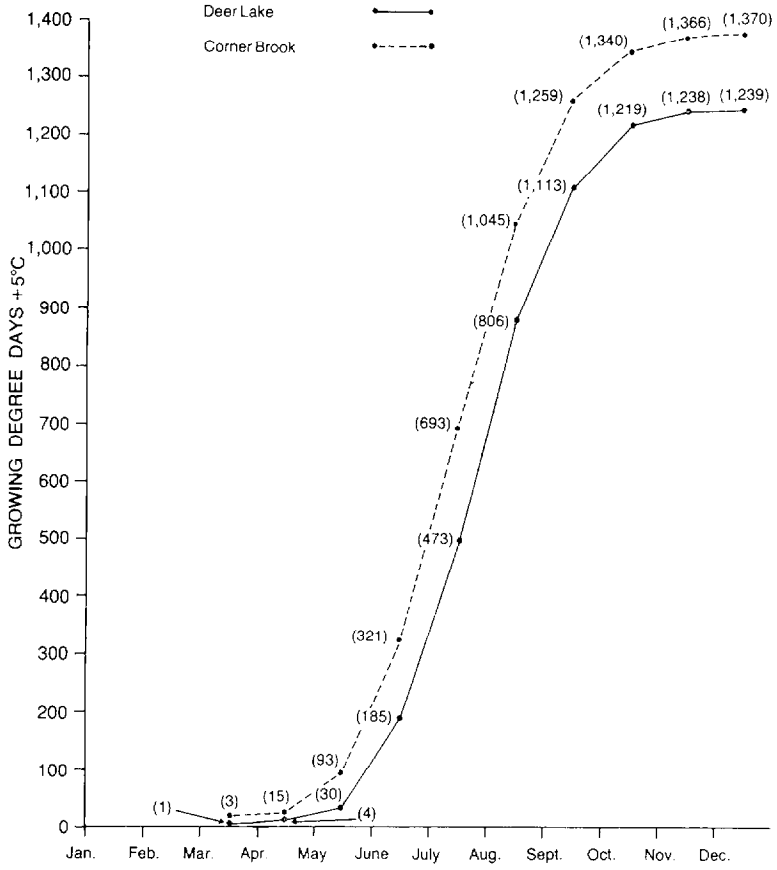

Figure 9. Accumulative growing degree-days for Deer Lake Airport and Corner Brook, 1951-1980.

White and yellow birch can be found throughout the study area, but large extensive stands can be found in the Coal Brook region, extending as far south as Ninth Brook. Much of the black spruce and balsam fir in these regions has been harvested and the birch has been left standing.

Larch, a species that can tolerate a wide range of drainage types, is found mostly in wet areas along the fringes of fens and bogs and in association with scrub black spruce in poorly drained areas.

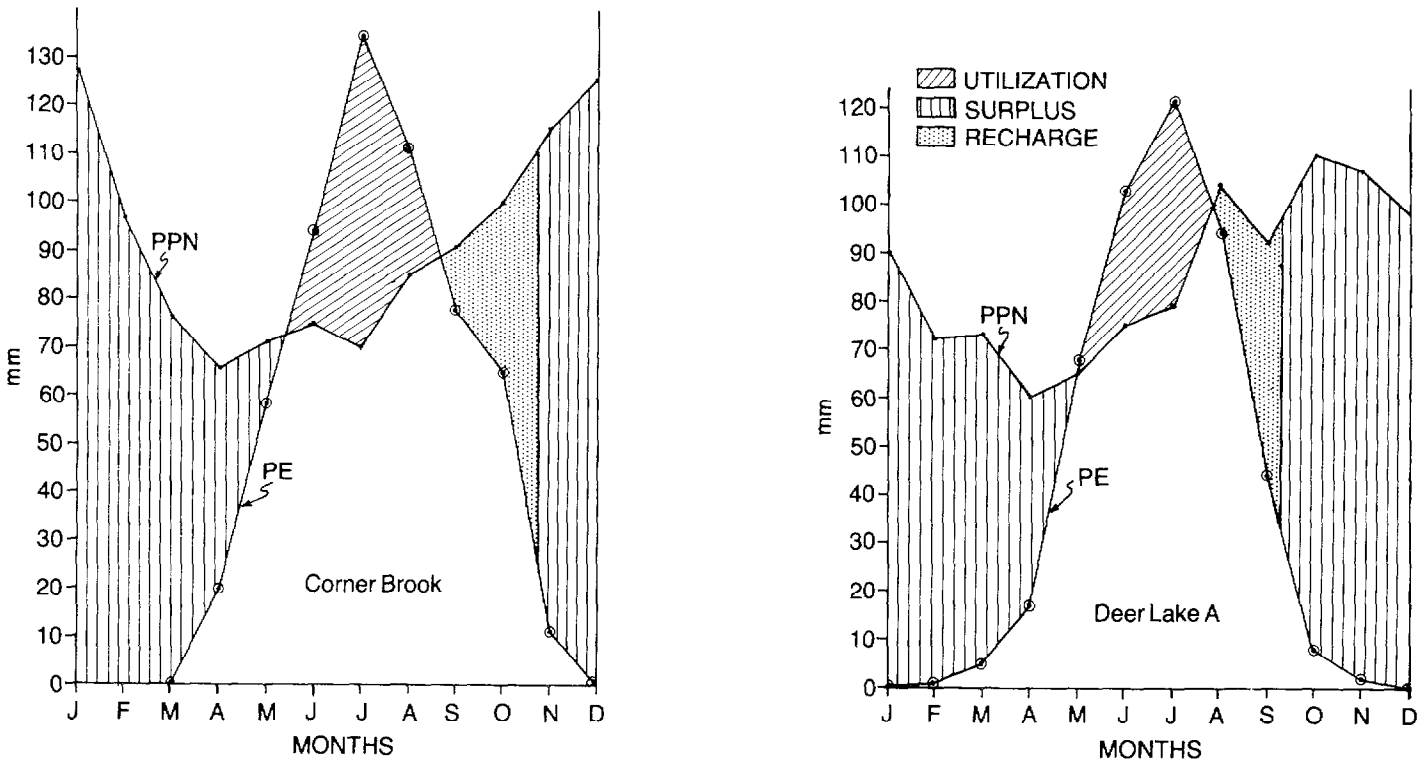

Figure 10. Precipitation and potential evapotranspiration for Deer Lake Airport and Corner Brook, 1951-1980.

The lowland area along the western side of Deer Lake holds the few remaining white pines in the study area. They are found on well to imperfectly drained sandy soils, in association with trembling aspen and black spruce. Only small pockets of white pine remain, mainly in remote areas where stands have not fallen prey to extensive harvesting or to the white pine blister rust.

Rock and fire barrens are hosts for a variety of shrubs such as blueberry (Vaccinium angustifolium), nannyberry (Viburnum lentago), Labrador tea (Ledum groenlandicum), sheep laurel (Kalmia angustifolia), and leatherleaf (Chamaedaphne calyculata).

The fens and bog-fen complexes throughout the survey area have a dominant vegetation of sedges and grasses, with a significant amount of sweet gale (Myrica gale), leatherleaf, goldenrod (Solidago canadensis), sphagnum and feather mosses, and pitcher plant (Sarracenia purpurea). Along the edge of the deposits and on small mounds kalmia, larch, and scrub spruce occur.

MAPPING TECHNIQUES AND SOIL CLASSIFICATION

SURVEY METHODS

In determining the different levels of stratification for the semi-detailed survey of the Pasadena-Deer Lake area, the level of the pedoclimatic zones, as defined for the exploratory and reconnaissance level surveys, was considered the highest in differentiating the soils. Pedoclimatic zones of the Island of Newfoundland have been described by Woodrow and Heringa (in preparation). Two pedoclimatic zones were recognized for the survey area, Mountain and Central (see legend for definition).

The Mountain zone is characterized by a short, cool growing season. Snow cover can persist in small valleys and in heavier forest cover until mid-June. The vegetation cover is markedly affected by cooler temperature and exposure to wind. However, good tree growth occurs in more sheltered, nutrient-rich sites.

The Central zone is divided into several subsections of which Humber applies to the lower elevation in the survey area. This zone has a longer, warmer growing season and is usually sheltered from the wind. The longer growing season and the relatively nutrient-rich soils are reflected in the good forest vegetation growth.

The division between the two pedoclimatic zones is usually gradual. For the purpose of this report the Mountain pedoclimatic zone approximates the Highland physiographic zone, whereas the Humber pedoclimatic zone approximates the Midland and Lowland physiographic zones.

The next major level of stratification was a breakdown of the soils developed on parent materials of similar mode of deposition, lithology, color, and texture, with an additional breakdown based on solum characteristics such as structure, consistence, drainage, and depth. Additional features of each soil such as horizon boundary and thickness, distribution and abundance of roots and pores, and size and location of clay films were also observed and considered. In combination, all these characteristics are the framework for the establishment of a named soil.

Limited work was done on organic soils, but where significant organic deposits occurred, characteristics about their stages of decomposition, depth, and drainage were recorded.

A literature review was completed, covering topics on geology, geomorphology, vegetation, climate, and soils. Specific attention was paid to previous soil work in and near the survey area. Preliminary mapping delineations were mapped on 1:12 500 color aerial photographs, using landform, vegetation, and drainage within each pedoclimatic zone as the primary differentiating criteria. To check these preliminary mapping delineations, all available roads and trails were traveled, using a four-wheel drive vehicle. Access via roads in wooded areas was fair to good for most of the survey area. However, where access was limited site inspections were conducted, using foot traverses. In more remote areas, inspections were done by helicopter.

At each area to be checked a site inspection was conducted, which constituted the filling out of a daily field sheet containing information on parent material, lithology, drainage, stoniness, texture, slope, horizon, color, and soil classification. At each site inspection location, an exposure, or pit, about 0.5-1.0 m deep was dug and the different soil horizons and characteristics were studied and recorded. A site inspection can also be made at a road cut or gravel pit.

Detailed profile descriptions were taken for most of the major soils identified in the area and entered on a Canadian Soil Information System (CanSIS) Field Description Input form. The Canadian Soil Information System (CanSIS) Manual for describing soils in the field (Day 1983) was used to assist in completing these descriptions. At all detail pits, samples were taken from each soil horizon, tagged, numbered, and returned to the office. Preparation of samples to be forwarded for analysis to the Land Resource Research Centre in Ottawa consisted of weighing, sieving, autoclaving, and drying each sample and taking a representative fraction. Autoclaving was conducted to prevent the dissemination of soil-borne diseases to other parts of Canada.

LABORATORY METHODS

Following the detailed description of each major soil is a table of chemical and physical analytical data. The analyses of all soil samples were completed by the Analytical Services Laboratory, Research Branch, Land Resource Research Centre, Ottawa. Methods used by the laboratory are outlined by McKeague (1981) and are indicated by the numbers within parentheses: pH-0.01 M $CaCl_2$ (3.11); percentage of carbon-CHN the Leco-600 resistance furnace (Sheldrick 1984); extractable Fe, Al, Mn-sodium pyrophosphate (3.53); exchangeable cations permanent charge CEC and exchangeable cations either by NaCl extraction (3.31) or by barium acetate for organic soils (3.36); available P - phosphorus extractable by medium strength Bray extract (4.43); percentage of organic matter, percentage of ash for organic soils, loss-on-ignition (4.23); total nitrogen - CHN the Leco-600 resistance furnace (Sheldrick 1984); and particle size distribution - pipette with a pretreatment to remove carbonates, organic matter, and soluble salts (2.111).

SOIL CLASSIFICATION

The different soils mapped at this stage of the survey are characterized by subgroups and phases developed on a specific parent material. This classification is based on the Canadian system of soil classification (Canada Soil Survey Committee, Subcommittee on Soil Classification 1978), and the soil description format is based on the Manual for describing soils in the field (J. Dumanski 1978). Table 5 outlines the classification of the soils by parent materials, subgroups, and pedoclimatic zone. In the Pasadena-Deer Lake area, four soil orders have been recognized: Podzol, Brunisol, Gleysol, and Organic (Table 6).

Podzolic order

Soils of the Podzolic order have B horizons in which the dominant accumulation product is amorphous material composed mainly of humified organic matter combined with varying degrees of Al and Fe. They usually occur in

Table 5. Classification of the soils by parent material, subgroup, and pedoclimatic zone

1. Morainal deposits

a) Dark reddish brown to red sandy loam till derived from red micaceous sandstone.

Hughes Brooke (HB)	- Orthic Humo-Ferric Podzol (Humber)
Little North Brook (LNB)	- Gleyed Eluviated Dystric Brunisol (Humber)
West Pond (WP)	- Orthic Gleysol (Humber)

b) Red to reddish brown sandy loam till derived from red micaceous sandstone, red siltstone, and minor granite.

Microwave (MW)	- Gleyed Eluviated Dystric Brunisol (Humber)
Lakelannd (LL)	- Orthic Gleysol (Humber)

c) Gray to light gray stony till derived from gray to red conglomerate sandstone and minor granite.

Bowater (BO)	- Orthic Humo-Ferric Podzol (Humber)

d) Brownish red stony till derived from red sandstone, granite and minor shale, and/or phyllite.

Beaver Brook (BB)	- Gleyed Ferro-Humic Podzol, peaty phase (Humber)
North Lake (NL)	- Orthic Humo-Ferric Podzol (Humber)
Keats Pond (KP)	- Orthic Humo-Ferric Podzol (Mountain)
Bingles Pond (BP)	- Gleyed Ferro-Humic Podzol, peaty phase (Mountain)

e) Olive to green loamy till derived from phyllite and shale.

North Pond (NP)	- Orthic Humo-Ferric Podzol (Humber)
North (N)	- Gleyed Dystric Brunisol (Humber)
Canal (C)	- Gleyed Dystric Brunisol (Mountain)
Island Pond (IP)	- Orthic Humo-Ferric Podzol (Mountain)

f) Green gray gravelly stony till derived from gray siltstone, sandstone, and minor granite.

Blue Gulch (BL)	- Orthic Ferro-Humic Podzol (Mountain)
Square Point (SP)	- Orthic Gleysol (Mountain)

(continued)

Table 5. Classification of the soils by parent material, subgroup, and pedoclimatic zone (continued)

g) Grayish brown loamy till derived from gray schist, gneiss with minor red sandstone, and granite.

Little Rapids (LR)	- Orthic Humic Gleysol (Humber)
Mistaken Pond (MP)	- Gleyed Humo-Ferric Podzol (Mountain)

h) Reddish brown till derived from sandstone and granite.

Glide Mountain (GM)	- Fragic Humo-Ferric Podzol, gleyed phase (Mountain)

2. Waterlain deposits

a) Reddish brown to yellowish brown gravelly sandy deposits of mixed lithology.

Earle (E)	- Orthic Humo-Ferric Podzol (Humber)
Snug Harbour (SH)	- Gleyed Humo-Ferric Podzol (Humber)
Big Tenth Brook (BTB)	- Orthic Humo-Ferric Podzol (Humber)
Camp Mortley (CM)	- Orthic Humo-Ferric Podzol (Humber)
Maxwell (M)	- Ortstein Humo-Ferric Podzol (Humber)

b) Brown to yellow brown sand deposits of mixed lithology.

Coal Brook (CB)	- Ortstein Humo-Ferric Podzol (Humber)
Logger's Cove (LC)	- Ortstein Ferro-Humic Podzol (Mountain)
Middland (ML)	- Orthic Gleysol, peaty phase (Humber)

3. Organic deposits

a) Organic deposits with varying degrees of decomposition.

Ninth Brook (NB)	- Typic Folisol, lithic phase (Mountain)
Organic 1 (01)	- Terric Mesisol (Mountain)
Organic 2 (02)	- Hydric Fibrisol (Humber)
Organic 3 (03)	- Terric Fibric Humisol (Mountain)
Organic 4 (04)	- Terric Mesisol (Mountain)

Table 6. Classification of the soils mapped in the Pasadena-Deer Lake area by order, great group, and subgroup.

Podzolic						
Humo-Ferric Podzol				Ferro-Humic Podzol		
Orthic	Gleyed	Ortstein	Fragic	Orthic	Gleyed	Ortstein
Big Tenth Brook Bowater Camp Mortley Earle Hughes Brooke Island Pond Keats Pond North Lake North Pond	Mistaken Pond Snug Harbour	Coal Brook Maxwell	Glide Mountain gleyed phase	Blue Gulch	Beaver Brook Bingles Pond	Logger's Cove

Brunisolic		Gleysolic	
Dystric Brunisol	Eluviated Dystrict Brunisol	Luvic Gleysol	Humic Gleysol
Gleyed	Gleyed	Orthic	Orthic Humic
Canal North	Little North Brook Microwave	Lakelannd Middland Square Point West Pond	Little Rapids

Organic				
Terric Mesisol	Hydric Fibrisol	Terric Fibric Humisol	Terric Mesisol	Typic Folisol, lithic phase
Organic 1	Organic 2	Organic 3	Organic 4	Ninth Brook

coarse- to medium-textured, acid parent materials, under forest or heath vegetation in cool, humid to perhumid climates. Podzolic soils can usually be recognized readily in the field. They generally have an organic surface horizon that is commonly L, F, and H and sometimes Of or Om, with an underlying light-colored eluvial horizon (Ae), which is usually present. The B horizon is usually a reddish brown to dark brown horizon with an abrupt upper boundary and underlain by a B or BC horizon with colors progressively yellower in hue and lower in chroma. Where Podzolic soils have developed on reddish-colored parent material, the B, BC, and C horizons are difficult to distinguish in the field and consequently physical and chemical analyses are needed to characterize specific horizons for soil classification purposes.

Brunisolic order

Soils of the Brunisolic order have sufficient development to exclude them from the Regosolic order, but they lack the degree or kind of horizon development specific for other orders. Soils formed under forest conditions have brownish-colored Bm horizons. The order also includes soils of various colors and having both Ae horizons and weakly expressed B horizons with accumulation of amorphous Al and Fe compounds (Bfj) or having a Bf horizon less than 10 cm thick.

Gleysolic order

Soils of the Gleysolic order have features indicative of periodic or prolonged saturation with water and reducing conditions. Gleysolic soils are usually associated with either a high groundwater table at some period of the year or a temporary saturation above a relatively impermeable layer. These soils have within 50 cm of the mineral surface either matrix colors of low chroma or distinct to prominent mottles of high chroma, which are indicative of localized oxidation of ferrous iron and deposition of hydrated ferric oxides. In areas where Gleysolic soils have formed on red to reddish brown parent materials, evidence of mottles indicative of gleying is often difficult to discern.

Organic order

The organic soils in the survey area have been divided into two types, based on their drainage characteristics.

One group of organic soils is generally saturated with water for prolonged periods, with the water table level occurring at or near the surface. These organic deposits fall into the three main great groups: Fibrisol, Mesisol, and Humisol. Their position in the landscape often determines the degree of nutrient in the water supplying them. All the organic deposits are composed of sedge, grass, moss, and other hydrophytic vegetation.

An additional organic deposit type occurs in the area and is in the Folisol great group. Folisol soils consist of a thin organic mat (10-30 cm), derived from moderately decomposed roots, leaves, twig needles, and small branches of coniferous and deciduous trees. In some areas significant amounts of mosses and sphagnum also occur in the organic mat. Unlike soils in the other great groups in the organic order these soils do not remain saturated

for prolonged periods of time. The saturation period is only 3-4 days after a heavy rainfall, and in some instances these soils are very dry. Soils of this group occur on steep to moderately inclined bedrock and boulder talus.

Determination of organic material decomposition is based primarily on a field test. In the field test collect a sample of organic material at a specific depth and squeeze it by hand. Note the color of the solution, the amount of material that passes through the fingers, and the amount and nature of the fibers that remain in the hand. Based on these observations, the von Post scale of decomposition, composed of a numbering system from 1 to 10, is assigned to each sample. Classes 1-4 range from undecomposed to weakly decomposed and are called fibric; classes 5 and 6 are moderately and moderately strongly decomposed, respectively, and are called mesic; classes 7-10 range from strongly decomposed to completely decomposed and are called humic.

SOIL-LANDSCAPE RELATIONSHIPS

Most of the soil delineations have been illustrated by a series of cross sections or soil-landscape diagrams (see soil descriptions and analyses section). These idealized cross sections contain the names of simple and complex mapping delineations located between the vertical lines. The aspect of each diagram is written on the top left- and right-hand corners. The parent material symbols have been placed on each diagram along with the symbol for seepage. Fig. 11 contains the key to the vegetation symbols used in the cross sections (see Figs. 13-18).

These diagrams are not drawn to scale: their function is to indicate each soil's occurrence and distribution and its association with other soils and non-soils over the landscape.

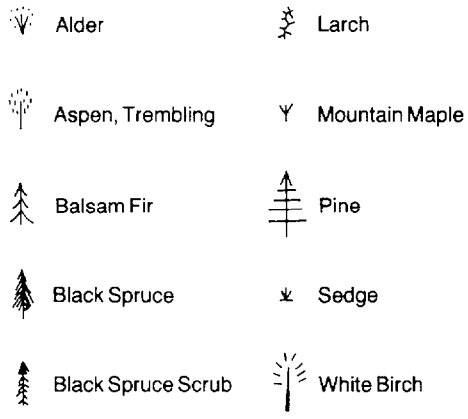

Figure 11. Vegetation symbols used in soil-landscape cross sections (see Figs. 13-18).

SOIL DESCRIPTIONS AND ANALYSES

BEAVER BROOK MAP UNIT 1080 ha

Location. The Beaver Brook soils are located in the western Highland zone around North Lake (see Plate Ic).

Parent material. The parent material is a gravelly till derived from red sandstone, granite, and minor limestone.

Topography. These soils occur on moderately steep to steep slopes in hummocky and undulating terrain.

Drainage classes. Surface: moderately well drained. Internal: poorly drained due to an impeding layer at 40-50 cm. Seepage is present just above the dense layer.

Vegetation. The main tree cover is black spruce, with minor amounts of balsam fir and white birch. Toward the toe of long slopes where seepage is generally greater, stunted black spruce is the dominant tree species, with a ground cover of ferns, horsetails, and sphagnum. Selective cutting of the forest has occurred on these soils.

Soil classification. Gleyed Ferro-Humic Podzol, peaty phase.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located 1.0 km past the southern end of North Lake, on the east side of the North Lake road, on a slope of 8% at an elevation of 190 m.

The site vegetation is black spruce, balsam fir, white birch, and red-osier dogwood, with a ground cover of ferns, horsetails, and sphagnum.

Horizon	Depth cm	
L	45-39	Range 2-7 cm; plentiful, medium, horizontal roots; very strongly acid, pH 4.7.
Of	39-27	Range 3-12 cm; very dark gray (2.5Y 3/0 m); plentiful, medium, horizontal roots.
Oh	27-0	Range 20-27 cm; black (2.5Y 2/0 m); few, fine, oblique roots.
Bhfg	0-30	Range 25-27 cm; dark yellowish brown (10YR 4/4 m); sandy loam; moderate to strong, subangular blocky structure; few, fine to medium, oblique roots; 30% by volume of coarse fragments; very firm moist consistence; common, coarse, distinct strong brown (7.5YR 5/6 m) mottles; gradual, irregular horizon boundary; extremely acid, pH 4.3.

Bg 30-60 Reddish brown (5YR 4/4 m); fine sandy loam; weak to moderate, subangular blocky structure; 25% by volume of coarse fragments; very friable, moist consistence; medium, prominent strong brown (7.5YR 5/6 m) and brown yellow (10YR 6/8 m) mottles; silt loam texture; neutral, pH 6.6.

BCg 60 +

Range of characteristics. The organic surface layer ranges from 30 to 40 cm, with some areas having less than 20 cm. Seepage is evident at the 40-50 cm depth where a dense layer (or possibly a fragic horizon) occurs. On the bottom of steep slopes mottling is more pronounced, with prominent mottles mottles above 50 cm. Although these soils have been classified as Gleyed Ferro-Humic Podzols, peaty phase areas of Orthic Gleysol do occur on the lower to middle sections of long slopes.

The mineral horizons are characterized by pockets of highly contrasting textures ranging from loamy sand to silt loam. The wide range in textures can be partially attributed to the parent material and drainage, but some textural changes are related to the in situ weathering of stones such as sandstone and gneiss. These soils also contain pockets similar to large mottles that may be yellow to yellowish brown or red to reddish brown (lepidocrocite).

Similar soils. The Bingles Pond soils are the same as the Beaver Brook soils except that they are located in the Mountain pedoclimatic zone (see Plate Ic).

Land use. Poor drainage, stoniness, and steep slopes make these soils unsuitable for agriculture. The Canada Land Inventory (CLI) class rating for agriculture is 7.

Chemical and physical analysis of a Beaver Brook soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
L	45-39	4.7	48.6	1.10	44			65.5	14.4	0.98	-	
Of	39-27							135.6	32.9	0.56		79
Oh	27-0	6.5	37.8	13.4	28			136.6	32.9	0.56		79
Bhfg	0-30	4.3	8.29	0.38	22	0.91	1.61	0.52	0.21	0.09	1.56	5
Bg	30-60	6.6	0.25	0.02	13	0.03	0.01	4.48	1.10	0.08	-	3
BCg	60 +											

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS[1] 2.0-1.0 (mm)	CS[2] 1.0-0.5 (mm)	MS[3] 0.5-0.25 (mm)	FS[4] 0.25-0.1 (mm)	VFS[5] 0.1-0.05 (mm)	Silt[6] (%)	Clay[7] (%)
Bhfg	0-30	58.4	23.8	16.9	5.7	6.4	5.6	32.1	9.5
Bg	30-60	62.2	0.1	13.4	14.0	21.0	13.7	32.1	5.7
BCg	60 +								

[1] Very coarse sand
[2] Coarse sand
[3] Medium sand
[4] Fine sand
[5] Very fine sand
[6] 0.05 - 0.002 mm
[7] <0.002 mm

BIG TENTH BROOK MAP UNIT 230 ha

Location. These soils occur in the western Lowland zone (see Fig. 14).

Parent material. The parent material is a gravelly sandy fluvial deposit of mixed lithology.

Topography. The soils occur on gently sloping terrain and on crests in gently undulating topography.

Drainage classes. Internal: well to rapidly drained, with high permeability. Moisture-holding capacity is low, owing to the soils' coarse texture.

Vegetation. The main tree cover is balsam fir, black spruce, with minor amounts of white birch. The softwoods on these soils have been extensively logged for the pulp and paper industry. In logged areas regeneration is primarily balsam fir with minor black spruce and white birch, with an understory of fireweed, raspberry, and ferns.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located near the mouth of Ninth Brook, on a slope of 4% at an elevation of 68 m.

The site vegetation is black spruce, balsam fir, yellow and white birch, with a ground cover of fireweed, raspberry, and ferns.

Horizon	Depth cm	
LF	5-1	Range 2-8 cm; abundant, fine, horizontal, exped roots; extremely acid, pH 3.1.
H	1-0	Range 0-4 cm; abundant, fine, horizontal, exped roots; smooth, abrupt horizon boundary; extremely acid, pH 3.6.
Ae	0-5	Range 3-6 cm; pinkish gray (7.5YR 6/2 m), pinkish gray (7.5YR 7/2 d); loamy sand; single grain structure; plentiful, fine, horizontal, exped roots; 20% by volume of gravelly coarse fragments; clear, wavy horizon boundary; extremely acid, pH 3.9.
Bf1	5-30	Range 26-47 cm; yellowish red (5YR 5/8 m), strong brown (7.5YR 5/6 d); loamy coarse sand; single grain structure; plentiful, medium, oblique, exped roots; 40% by volume of angular gravelly coarse fragments; wavy, gradual horizon boundary; very strongly acid, pH 4.6.

Bf2	30-60	Range 27-45 cm; reddish brown (5YR 5/4 m), light yellowish brown (10YR 6/4 d); gravelly loamy sand; single grain structure; plentiful, medium, random, exped roots; 50% by volume of angular gravelly coarse fragments; wavy, gradual horizon boundary; very strongly acid, pH 4.6.
C	60 +	Brown (7.5YR 5/4 d); loamy sand; single grain structure; 45% by volume of angular gravelly coarse fragments; very strongly acid, pH 5.0.

Range of Characteristics. The organic surface layer ranges from 2 to 8 cm. The B horizon is 40-55 cm thick, but the texture can vary greatly from coarse sand to very fine sand because of the stratified nature of the parent material. The percentage of coarse fragments by volume is between 20 and 50%, usually increasing with depth.

Similar soils. Earle and Camp Mortley soils are similar to Big Tenth Brook soils. Earle soils have less coarse fragments in the upper part of the profile, whereas Camp Mortley soils have an extremely high percentage of coarse fragments (channery), which greatly reduces the water-holding capacity of the soil. Camp Mortley soils also have a weakly cemented horizon.

Land Use. The Big Tenth Brook soils are suitable for forage production, but some areas could support certain root crops. The main factors limiting their use are low moisture-holding capacity and low fertility. CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a Big Tenth Brook soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al (meq/100 g)	Available P (µg/g)
LF	5-1	3.1						10.98	2.47	0.77	-	201.3
H	1-0	3.6	22.6	1.15	20	0.94	0.10	5.10	0.85	0.39	4.55	30.0
Ae	0-5	3.9	0.74	0.07	10	0.06	0.04	0.81	0.15	0.04	1.22	6.9
Bf1	5-30	4.6	4.12	0.24	17	0.40	0.78	1.81	0.25	0.06	0.37	70.0
Bf2	30-60	4.6	1.47	0.05	29	0.31	0.26	2.00	0.52	0.08	-	25.0
C	60 +	5.0	0.58	0.03	19	0.06	0.05	1.71	0.54	0.05	-	30.2

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-5	20.0	77.3	34.7	23.2	4.6	7.9	6.9	18.7	4.0
Bf1	5-30	40.0	82.2	44.9	27.1	3.4	4.1	2.8	11.7	6.1
Bf2	30-60	50.0	81.9	53.8	15.6	3.5	4.9	4.1	13.7	4.4
C	60 +	45.0	85.6	34.2	37.4	5.4	4.7	3.9	9.4	4.9

BINGLES POND MAP UNIT 1045 ha

Location. The Bingles Pond soils are located in the western Highland zone around North Lake (see Figs. 13 and 15).

Parent material. The parent material is a gravelly stony till derived from red sandstone, granite, and minor limestone.

Topography. These soils occur on moderately steep to steep slopes in hummocky and undulating terrain.

Drainage classes. Surface: moderately well drained. Internal: poorly drained due to an impeding layer at 40-50 cm. Seepage is present just above the dense layer.

Vegetation. The main tree cover is black spruce, with minor amounts of balsam fir and white birch. Toward the toe of long slopes where seepage is generally greater, stunted black spruce is the dominant tree species, with a ground cover of ferns, horsetails, and sphagnum. Selective cutting of the forest has occurred on these soils.

Soil classification. Gleyed Ferro-Humic Podzol, peaty phase.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located 1.0 km past the southern end of North Lake, on the east side of the North Lake road, on a slope of 8% at an elevation of 190 m.

The site vegetation is black spruce, balsam fir, white birch, and red-osier dogwood, with a ground cover of ferns, horsetails, and sphagnum.

Horizon	Depth cm	
L	45-39	Range 2-7 cm; plentiful, medium, horizontal roots; very strongly acid, pH 4.7.
Of	39-27	Range 3-12 cm; very dark gray (2.5Y 3/0 m); plentiful, medium, horizontal roots.
Oh	27-0	Range 20-27 cm; black (2.5Y 2/0 m); few, fine, oblique roots.
Bhfg	0-30	Range 25-27 cm; dark yellowish brown (10YR 4/4 m); sandy loam; moderate to strong, subangular blocky structure; few, fine to medium, oblique roots; 30% by volume of coarse fragments; very firm, moist consistence; common, coarse, distinct strong brown (7.5YR 5/6 m) mottles; gradual, irregular horizon boundary; extremely acid, pH 4.3.

Bg	30-60	Reddish brown (5YR 4/4 m); sandy loam; weak to moderate subangular blocky structure; 25% by volume of coarse fragments; very friable, moist consistence; medium, prominent strong brown (7.5YR 5/6 m) and brown yellow (10YR 6/8 m) mottles; silt loam texture; neutral, pH 6.6.
BCg	60 +	

Range of characteristics. The organic surface layer ranges from 30 to 40 cm with some areas having less than 20 cm. Seepage is evident at the 40-50 cm depth where a dense layer (or possibly fragic horizon) occurs. On the bottom of steep slopes mottling is more pronounced, with prominent mottles above 50 cm. Although these soils have been classified as Gleyed Ferro-Humic Podzols, peaty phase areas of Orthic Gleysol do occur on the lower to middle sections of long slopes.

The mineral horizons are characterized by pockets of highly variable textures ranging from loamy sand to silt loam. The wide range in textures can be partially attributed to the parent material and drainage, but some textural changes are related to the in situ weathering of stones such as sandstone and gneiss. These soils also contain pockets similar to large mottles that may be yellow to yellow-brown or red to reddish brown (lepidocrocite).

Similar soils. The Beaver Brook soils are the same as the Bingles Pond soils except that they are located in the Humber pedoclimatic zone.

Land use. Poor drainage, stoniness, and steep slopes make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Bingles Pond soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al (meq/100 g)	Available P (µg/g)
L	45-39	4.7	48.6	1.10	44			65.5	14.4	0.98	-	
Of	39-27											
Oh	27-0	6.5	37.8	1.34	28.2			135.6	32.9	0.56		79
Bhfg	0-30	4.3	8.29	0.38	22	0.91	1.61	0.52	0.21	0.09	1.56	5
Bg	30-60	6.6	0.25	0.02	12.5	0.03	0.01	4.48	1.10	0.08	-	3
BCg	60 +											

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Bhfg	0-30	58.4	23.8	16.9	5.7	6.4	5.6	32.1	9.5
Bg	30-60	62.2	0.1	13.4	14.0	21.0	13.7	32.1	5.7
BCg	60 +								

BLUE GULCH MAP UNIT 2060 ha

Location. These soils occur in the eastern Highland zone behind Pasadena and extending as far north as Pynn's Brook (see Figs. 16 and 18).

Parent material. The parent material is a gravelly till deposit consisting of mainly siltstone.

Topography. The soils have developed on till veneers that occupy steep upper slopes, and on level to very gently undulating hilltops.

Drainage classes. Internal: moderately well drained. Drainage can be impeded, especially where bedrock is close to the surface.

Vegetation. Black spruce and balsam fir grow well on these soils, and much of the stands have been harvested for the pulp and paper industry. In logged areas the dominant regeneration is balsam fir, with minor black spruce and white birch.

Soil classification. Orthic Ferro-Humic Podzol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located northwest of Blue Gulch Pond on a slope of 3% at an elevation of 250 m.

The site vegetation consists of a regeneration of black spruce, balsam fir, and white birch, with a ground cover of feather moss and cladonia.

Horizon	Depth cm	
L	12-10	Plentiful, medium, horizontal roots; abrupt, smooth horizon boundary; extremely acid, pH 3.2.
F	10-0	Range 4-14 cm; plentiful, medium, horizontal roots; clear, abrupt horizon boundary; extremely acid, pH 3.2.
Ae	0-3	Range 0-6 cm; light gray (10YR 7/1 m); fine sandy loam; structureless; very friable consistence; very few, horizontal roots; 15% by volume of coarse fragments; clear, wavy horizon boundary; extremely acid, pH 3.7.
Bhf1	3-4	Range 0-3 cm; dark reddish brown (5YR 3/3 m); loam; few, fine, oblique roots; 30% by volume of coarse fragments; clear, wavy horizon boundary; extremely acid, pH 3.9.

Bhf2	4-17	Range 8-15 cm; yellowish red (5YR 5/6 m); fine sandy loam; medium, angular blocky structure; very friable consistence; few, fine, oblique roots; 20% by volume of coarse fragments; clear, wavy horizon boundary; extremely acid, pH 4.4.
Bf	17-37	Range 18-24 cm; olive brown (2.5Y 4/4 m); very gravelly coarse sandy loam; fine, angular blocky structure; friable to firm consistence; very few, random roots; 30% by volume of coarse fragments; abrupt, wavy horizon boundary; extremely acid, pH 4.5.
BC	37 +	Dark olive gray (5Y 3/2 m); very gravelly, loamy coarse sand; single grain structure; 45% by volume of coarse fragments; loose to very friable consistence; very strongly acid; pH 4.9.

Range of characteristics. The organic surface layer ranges from 10-15 cm. The A horizon is generally very thin and sometimes absent. Textures in the B horizons range from very fine sandy loam to loam, with loam being the most common. The C horizon is characterized by a coarse-textured single grain structure.

Rock outcrops, mainly siltstone and sandstone, are common in areas of the Blue Gulch soils and vary from very to excessively stony, usually occurring as flagstones (see Plate Id).

Similar soils. The North Pond soils have a similar profile to the Blue Gulch soils. Both are shallow, but the North Pond soils have heavier textures and deeper soil development.

Land use. Shallowness, stoniness, and climate make the Blue Gulch soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Blue Gulch soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al (meq/100 g)	Available P (µg/g)
L	12-10											
F	10-0	3.2	44.3	1.13	39			17.2	4.04	2.0	4.5	
Ae	0-3	3.7	0.50	0.02	25	0.03	0.02	0.54	0.15	0.09	1.97	3
Bhf	3-4	3.9	7.33	0.27	27	2.48	1.10	0.67	0.26	0.08	5.69	-
Bhf2	4-17	4.4	6.25	0.23	27	0.89	1.53	0.36	0.10	0.06	1.26	-
Bf	17-37	4.5	1.92	0.09	21	0.15	0.48	0.17	0.07	0.05	0.56	43
BC	37 +	4.9	0.39	0.03	13	0.05	0.12	0.14	0.05	0.05	0.10	18

Particle size distribution

Horizon	Depth (cm)	Sand Fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-3	53.4	3.3	6.5	6.2	16.3	21.0	43.3	3.3
Bhf	3-4								
Bhf2	4-17	56.5	11.5	9.4	5.6	12.3	17.7	38.6	4.9
Bf	17-37	65.7	16.8	13.2	8.0	14.8	13.0	29.3	5.0
BC	37 +	77.5	13.5	22.5	12.1	19.6	9.7	22.0	0.5

BOWATER MAP UNIT 530 ha

Location. These soils occur in the western Midland zone.

Parent material. The parent material is a thin till veneer derived from gray and red conglomerate, granite, and gray and red siltstone. This deposit usually occurs over moderately inclined conglomerate bedrock.

Topography. The soils occur on till veneers on moderately steep to inclined slopes.

Drainage classes. Surface and internal: moderately well drained.

Vegetation. The natural vegetation is black spruce, balsam fir, and white birch, with stunted black spruce occurring in areas of poorer drainage. In logged areas, regeneration is balsam fir and white birch, with a ground cover of bunchberry, raspberry, ferns, and minor broom moss.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located north of Big Tenth Brook, on a slope of 5% at an elevation of 30 m.

The site vegetation consists of black spruce and white birch, with a ground cover of bunchberry, raspberry, ferns, and minor broom moss.

Horizon	Depth cm	
LFH	5-0	Range 3-15 cm; abundant, fine, horizontal roots; extremely acid, pH 3.9.
Ae	0-12	Range 3-24 cm; light brownish gray (10YR 6/2 m), pinkish white (7.5YR 8/2 d); gravelly, very fine sandy loam; structureless; abundant fine, horizontal roots; 45% by volume of angular gravelly coarse fragments; smooth, abrupt horizon boundary; common, fine to medium, vesicular and tubular pores; extremely acid, pH 3.7.
Bf	12-25	Range 14-18 cm; yellowish red (5YR 4/6 m), brownish yellow (10YR 6/8 d); gravelly sandy loam; weak, medium, angular blocky structure; slightly sticky, very friable consistence; plentiful, medium, oblique, inped roots; 40% by volume of angular gravelly coarse fragments; clear, wavy horizon boundary; common, fine, tubular pores; extremely acid, pH 4.2.

Bfgj	25-32	Range 0-10 cm; dark yellowish brown (10YR 4/6 m), yellow (10YR 7/6 d); sandy loam; few, fine, faint mottles; weak, medium, angular blocky structure; few, fine, horizontal roots; 45% by volume of gravelly coarse fragments; irregular, gradual horizon boundary; common, fine, tubular pores; very strongly acid, pH 4.6.
R	32 +	Gray conglomerate bedrock, easily split.

Range in characteristics. The Bowater soils are generally very shallow lithic. The Ae horizon is thick, ranging from 15 to 24 cm. The 40-50% of coarse fragment content is relatively high in the A and B horizons. Faint mottling occurs where the B horizon comes into contact with the underlying bedrock.

The bedrock beneath these soils is mainly soft red to gray Carboniferous conglomerate and can be easily split, using a small bulldozer. It has been used as a source of aggregate for logging roads in the area.

Land use. Shallowness to bedrock, stoniness, and topography limit these soils for agriculture. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a Bowater soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LFH	5-0	3.9						25.1	7.21	4.72	-	324.0
Ae	0-12	3.7	0.34	0.02	17	0.03	0.02	0.14	0.09	0.05	1.58	6.2
Bf	12-25	4.2	4.21	0.15	28	0.87	0.94	0.25	0.16	0.12	2.07	2.5
Bfgj	25-32	4.6	2.48	0.11	23	0.45	0.70	0.21	0.10	0.10	0.41	1.0
R	32 +											

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
LFH	5-0									
Ae	0-12	45.0	68.0	20.3	16.2	8.5	12.6	10.4	28.7	3.3
Bf	12-25	40.0	51.7	13.1	12.0	6.8	10.6	9.2	37.1	11.2
Bfgj	25-32	45.0	66.0	22.0	15.8	6.5	11.0	10.7	26.2	7.8
R	32 +									

CAMP MORTLEY MAP UNIT 110 ha

Location. The Camp Mortley soils are located near the shoreline in the northern part of the eastern Lowland zone.

Parent material. The parent material is a channery, gravelly sandy stratified fluvial deposit derived from red sandstone, siltstone, granite, and minor conglomerate.

Topography. The soils occur on gently inclined terrain. Slopes range from 4 to 7%.

Drainage classes. Surface and internal: well to rapidly drained.

Vegetation. The main tree cover is balsam fir, white spruce, white birch, and black spruce. Small stands of white birch also occur on these soils.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located near the Pynn's Brook agricultural research station, on a slope of 6% at an elevation of 45 m.

The site vegetation is balsam fir, white spruce, white birch, and black spruce, with a ground cover of bunchberry.

Horizon	Depth cm	
LFH	5-0	Range 3-6 cm; material composition, 10% leaves, 70% needles, 10% sphagnum, and 10% wood fragments; plentiful, medium, horizontal roots; abrupt, smooth horizon boundary; very strongly acid, pH 5.0.
Ae	0-5	Range 0-9 cm; pinkish gray (5YR 6/2 m), pinkish white (7.5YR 8/2 d); very fine sandy loam; single grain structure; soft, non-plastic consistence; 20% by volume of channery coarse fragments; extremely acid, pH 3.5.
Bf1	5-9	Range 2-5 cm; reddish brown (5YR 4/4 m), reddish yellow (7.5YR 6/6 d); gravelly sandy loam; single grain structure; loose, non-plastic consistence; plentiful, fine, random roots, 65% by volume of channery coarse fragments; clear, irregular horizon boundary; extremely acid, pH 4.1.

Bf2	9-41	Range 29-35 cm; reddish brown (5YR 5/4 m), yellowish brown (10YR 6/6 d); gravelly sandy loam; single grain structure; loose, non-plastic consistence; plentiful, fine, random roots; 80% by volume of channery coarse fragments; gradual, wavy horizon boundary; extremely acid, pH 4.5.
Bfcj	41-58	Light yellowish brown (10YR 6/4 d); gravelly sand; weak to moderate, medium, angular blocky structure; slightly hard consistence; humus-aluminum and iron; weakly cemented, discontinuous; very few, medium, horizontal roots; 80% by volume of channery coarse fragments; gradual, wavy horizon boundary; very strongly acid, pH 4.7.
Bf	58 +	Light yellowish brown (10YR 6/4 d); very gravelly sand; single grain, stratified structure; 80% by volume of channery coarse fragments; diffuse, irregular horizon boundary; very strongly acid, pH 4.7.

Range of characteristics. These soils are characterized by a high percentage of coarse channery fragments ranging from 60 to 80% by volume in the B and C horizons.

Similar soils. Big Tenth Brook and Earle soils are similar to Camp Mortley soils. However, both Big Tenth Brook and Earle soils have lower coarse fragment content and slightly finer textures. Big Tenth Brook soils are developed on less thick deposits; Earle soils are characterized by level slopes (see Plate Ie).

Land use. Because of the soils' high coarse fragment content and rapid drainage they have limited use for agriculture. Hay and forage crops are the best suited to these soils. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a Camp Mortley soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LFH	5-0	5.0						20.7	4.44	0.94	-	96.0
Ae	0-5	3.5	0.52	0.04	13	0.02	0.02	0.33	0.21	0.06	2.00	6.2
Bf1	5-9	4.1	4.04	0.17	24	1.01	0.66	0.39	0.24	0.12	2.18	5.8
Bf2	9-41	4.5	4.56	0.21	22	0.30	0.82	0.38	0.26	0.10	0.48	1.0
Bfcj	41-58	4.7	1.89	0.16	19	0.12	0.40	0.16	0.08	0.05	-	47.2
Bf	58 +	4.7	1.17	0.12	10	0.15	0.27	0.16	0.08	0.03	-	16.0

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-5	20.0	68.5	16.5	16.8	6.4	11.3	17.5	28.8	2.7
Bf1	5-9	65.0	51.9	18.9	10.3	3.8	6.8	12.2	37.4	10.7
Bf2	9-41	80.0	57.8	29.7	10.9	3.7	5.5	8.0	33.5	8.7
Bfcj	41-58	80.0	90.3	76.2	9.1	1.1	1.7	2.2	6.9	2.8
Bf	58 +	80.0	94.2	81.7	9.7	0.8	1.0	1.0	3.8	2.0

CANAL MAP UNIT 390 ha

Location. The Canal soils are located on the northern map sheet in the western Highland zone, primarily east of Indian Dock Pond.

Parent material. The parent material is a medium-textured olive to olive green till derived from phyllite and shale.

Topography. These soils have developed on inclined and gentle slopes (see Fig. 17).

Drainage classes. Surface: well drained. Internal: well drained, but where the bedrock is close to the surface drainage can be impeded.

Vegetation. The natural vegetation is primarily black spruce and balsam fir, with minor white birch. Ground cover is mainly bunchberry and feather moss. Where areas have been logged for the pulp and paper industry the ground cover is primarily raspberry, with balsam fir seedlings.

Soil classification. Gleyed Dystric Brunisol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located near the east end of North Lake, on a slope of 12% at an elevation of 200 m.

The site vegetation is balsam fir, black spruce, and white birch, with a ground cover of bunchberry, feather moss, and raspberry.

Horizon	Depth cm	
LF	22-15	Range 8-18 cm; plentiful, medium, horizontal roots; extremely acid, pH 4.0.
H	15-0	Range 3-15 cm; very dark gray (7.5YR 3/0 m); plentiful, medium, horizontal roots; abrupt, smooth horizon boundary; medium acid, pH 5.7.
Bmgj	0-15	Range 5-15 cm; brown to dark brown (7.5YR 4/4 m), light yellowish brown (10YR 6/4 d); very fine sandy loam; weak, medium, angular blocky structure; very friable consistence; moderately porous; very few, fine, horizontal roots; 15% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; medium acid, pH 5.6.

Bmg	15-37	Range 19-35 cm; reddish brown (5YR 5/3 m), pale brown (10YR 6/3 d); gravelly sandy loam; common, medium, distinct mottles; very friable consistence; common, very fine, massive tubular pores; 10% by volume of angular gravelly coarse fragments; clear, wavy horizon boundary; medium acid, pH 5.6.
Cg	37 +	Reddish brown (5YR 4.5/4 m), light brown (7.5YR 6/4 d); gravelly sandy loam; common, medium, prominent mottles; massive; friable consistence; few, fine, tubular pores; 25% by volume of angular gravelly coarse fragments; medium acid, pH 5.7.
R	-	Sedimentary bedrock, easily split

Range of characteristics. The organic surface layer ranges from 20 to 30 cm. An eluviated horizon is sometimes present, usually as a thin discontinuous Aegj horizon. Solum textures range from gravelly sandy loam to loam and the coarse fragment content increases with depth. Bedrock is generally within 75 cm. Rounded to subrounded granitic stones and boulders occur on the surface, with very few occurring in the soil profile.

Land use. Topography, shallowness to bedrock, and wetness make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Canal soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LF	22-15	4.0						40.9	8.59	2.09	-	175.0
H	15-0	5.7	23.6	1.14	21	0.52	0.77	65.0	12.63	0.19	-	37.5
Bmgj	0-15	5.6	0.58	0.04	14	0.20	0.10	4.21	0.60	0.04	-	3.5
Bmg	15-37	5.6	0.49	0.03	12	0.15	0.07	5.11	0.84	0.06	-	2.0
Cg	37 +	5.7	0.17	0.01	17	0.02	0.01	3.48	0.70	0.05	-	4.5
R	-											

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Bmgj	0-15	17.0	65.5	10.2	13.4	12.0	18.1	11.9	27.6	6.9
Bmg	15-37	10.0	59.9	11.2	12.8	9.4	15.0	11.5	31.0	9.1
Cg	37 +	25.0	68.2	10.3	14.5	11.1	18.1	14.3	23.7	8.1

COAL BROOK MAP UNIT 765 ha

Location. The Coal Brook soils are located in the western Lowland zone near Coal Brook and North Brook (see Fig. 13).

Parent material. The parent material is a sandy fluvial deposit of mixed lithology.

Topography. These soils have developed on level to very gentle slopes. Small sinuous depressional areas (meltwater channels) dissect the Coal Brook soil (see Plate IIId).

Drainage classes. Surface: well drained. Internal: well drained, but the ortstein layer, which is indicative of these soils, could impede vertical water movement.

Vegetation. Balsam fir, black spruce, and white birch grow well on these soils. The softwoods in the area have been extensively logged for the pulp and paper industry. Regeneration on cutover sites is primarily balsam fir, white birch, and minor black spruce. Small pockets of pine and trembling aspen also occur on these soils.

Soil classification. Ortstein Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located west of Bowater's Snug Harbour dump-off site, on a slope of 0.5% at an elevation of 15 m.

The site vegetation is primarily black spruce, white birch, and balsam fir. In some areas small stands of pine and poplar occur.

Horizon	Depth cm	
LFH	5-0	Range 2-6 cm; abundant, medium, vertical roots; extremely acid, pH 3.5.
Ae	0-3	Range 1-8 cm; loamy sand; single grain structure; few, fine, oblique roots; smooth; 10% by volume of angular gravelly coarse fragments; clear horizon boundary; extremely acid, pH 3.7.
Bhf	3-5	Range 1-5 cm; dark reddish brown (5YR 3/3 m), yellowish brown (10YR 5/4 d); sandy loam; single grain structure; few, very fine, oblique roots; 10% by volume of gravelly coarse fragments; clear, smooth horizon boundary; extremely acid, pH 3.8.

Bfc	5-15	Range 5-15 cm; dark reddish brown (5YR 3/3 m), brown (7.5YR 5/4 d); loamy sand; moderate, medium, massive; iron, strongly cemented, discontinuous; very few roots; 10% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; extremely acid, pH 4.4.
BCcj	15-25	Range 8-20 cm; yellow (10YR 7/6 d); gravelly loamy sand; very weak, coarse, single grain, stratified structure; weakly cemented, discontinuous; 20% by volume of gravelly coarse fragments; extremely acid, pH 4.3.
C	25 +	Very gravelly loamy sand; reddish yellow (7.5YR 6/6 d); single grain structure; 30% by volume of gravelly coarse fragments; extremely acid, pH 4.4.

Range of characteristics. The soils are characterized by a relatively thin Bhf horizon, which occurs below the Ae. They also have a strongly cemented Bfchorizon, and some weakly cemented or Bfcj horizons. It is difficult, if not impossible, to map the occurrence and distribution of the ortstein horizon dueto the discontinuous nature of the layer, which develops as local "pockets" or
"islands" in the soils (Fig. 12) (see also Plate IIa).

Land use. These soils are suitable for forage and hay production and certain root and cole crops. The soils are stone-free, level, and well drained. The main factors that could limit their use are reduced water-holding capacity and the ortstein layer. The CLI class ratings for agriculture are 4-5.

Chemical and physical analysis of a Coal Brook soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al	Available P (µg/g)
								(meq/100 g)				
LFH	5-0	3.5						19.26	6.22	1.43		49.0
Ae	0-3	3.7	0.52	0.04	13	0.03	0.03	0.88	0.22	0.08	0.67	9.8
Bhf	3-5	3.8	6.59	0.30	22	1.88	0.77	1.66	0.54	0.17	5.45	29.8
Bfc	5-15	4.4	3.48	0.16	22	0.49	0.72	0.76	0.20	0.12	0.86	38.0
BCcj	15-25	4.3	0.66	0.06	11	0.11	0.24	0.40	0.33	0.18	0.92	55.0
C	25 +	4.4	0.34	0.01	34	0.05	0.09	1.12	1.64	0.13	0.70	22.8

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
LFH	5-0									
Ae	0-3	10.0	78.0	12.9	36.3	15.9	7.8	5.1	18.4	3.6
Bhf	3-5	10.0	67.8	14.6	29.8	12.4	7.1	4.0	16.6	15.6
Bfc	5-15	10.0	79.7	24.7	30.9	13.7	6.5	3.8	13.8	6.5
BCcj	15-25	25.0	82.9	29.6	33.9	11.3	5.4	2.8	10.7	6.4
C	25 +	35.0	85.0	35.4	36.7	8.5	3.0	1.4	9.8	4.2

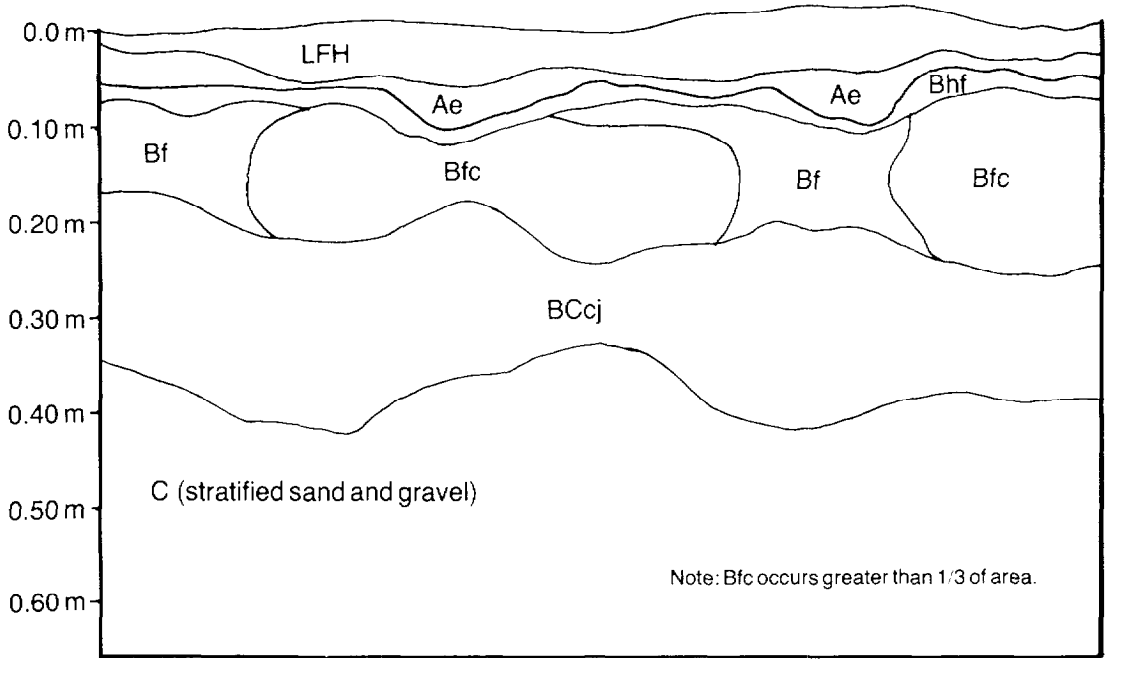

Figure 12. Pedon of the Coal Brook soil, Ortstein Humo-Ferric Podzol.

EARLE MAP UNIT 1235 ha

Location. The Earle soils occur extensively around the community of South Brook and Pasadena and along the eastern and western shorelines of the Lowland zone.

Parent material. The parent material is a very gravelly fluvial deposit derived mainly from red sandstone, gray siltstone, and granitic rocks.

Topography. These soils have developed on level to very gently sloping terrain (Figs. 13, 14, 16, and 18) (see also Plate IIIc).

Drainage classes. Surface and internal: well drained.

Vegetation. The tree vegetation on the Earle soils has been extensively logged for its stands of balsam fir and black and white spruce, which have been used in the pulp and paper industry.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located near the Pasadena softball park on a slope of 2% at an elevation of 35 m.

The site vegetation in an undisturbed site consists of white spruce, white birch, and black ash, with an understory of ferns.

Horizon	Depth cm	
LFH	5-0	Range 1-14 cm; material composition, 20% leaves, 40% needles, 10% feather moss, 20% herbaceous fragments, and 10% wood fragments; abundant, medium, horizontal roots.
Ae	0-4	Range 1-9 cm; pinkish white to pinkish gray (7.5YR 7.5/2 m), pinkish gray (7.5YR 7/2 d); loamy sand; moderate, subangular blocky structure; fine, horizontal roots; 10% by volume of gravelly coarse fragments; clear, wavy horizon boundary; extremely acid, pH 3.5.
Bf1	4-20	Range 13-21 cm; red (2.5YR 4.5/6 m), strong brown (7.5YR 5/6 d); sandy loam; weak to moderate, subangular blocky structure; fine, horizontal roots; 10% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; extremely acid, pH 4.2.

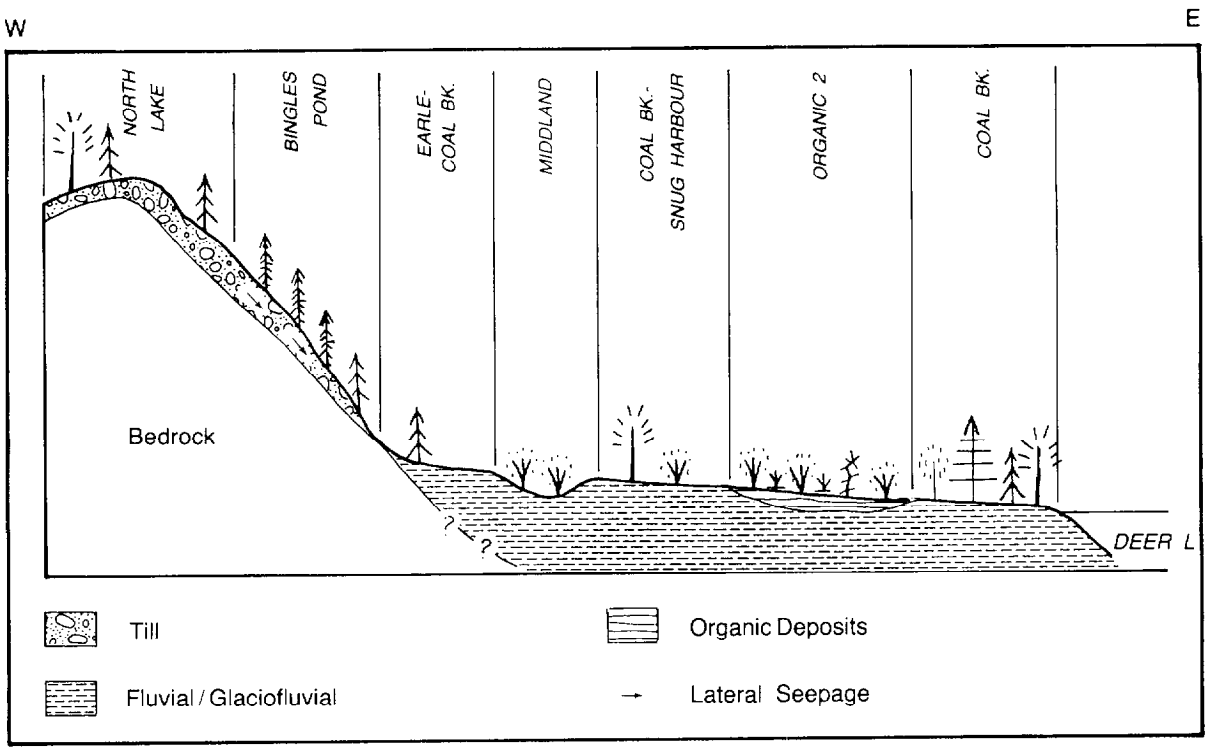

Figure 13. Western Highland-Lowland idealized soil-landscape relationship.

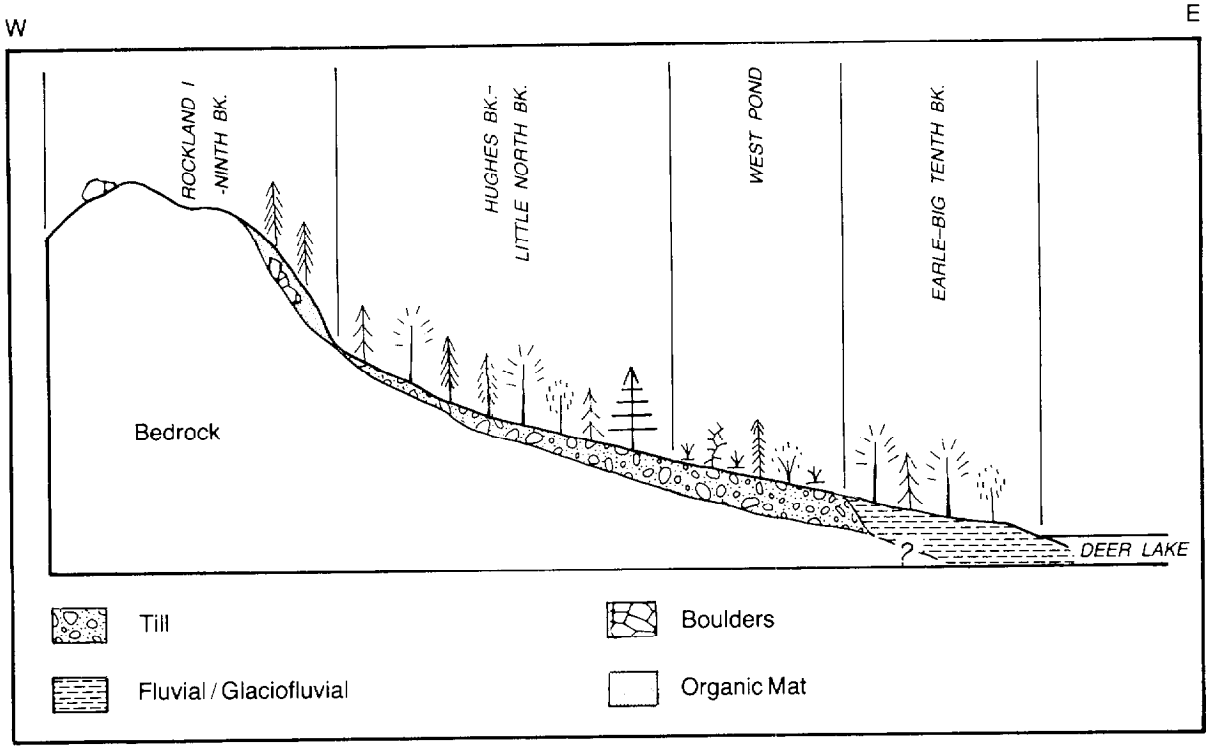

Figure 14. Western Highland-Lowland idealized soil-landscape relationship.

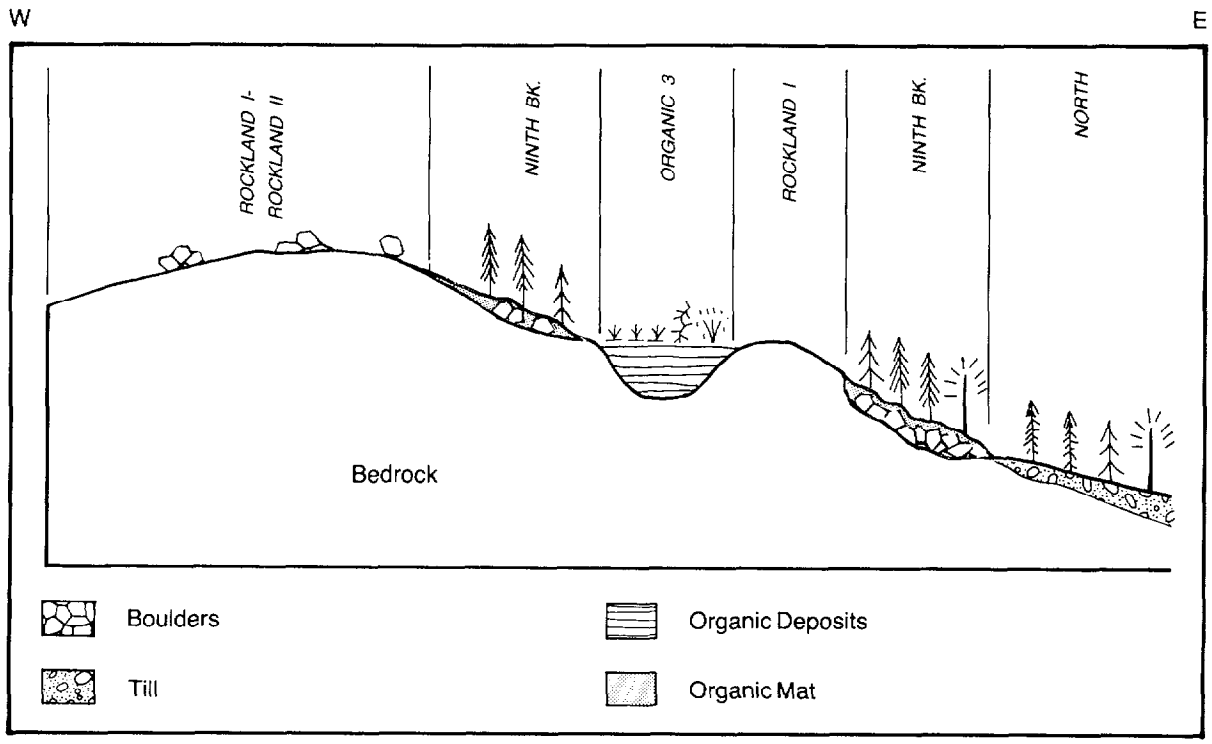

Figure 15. Western Highland idealized soil-landscape relationship.

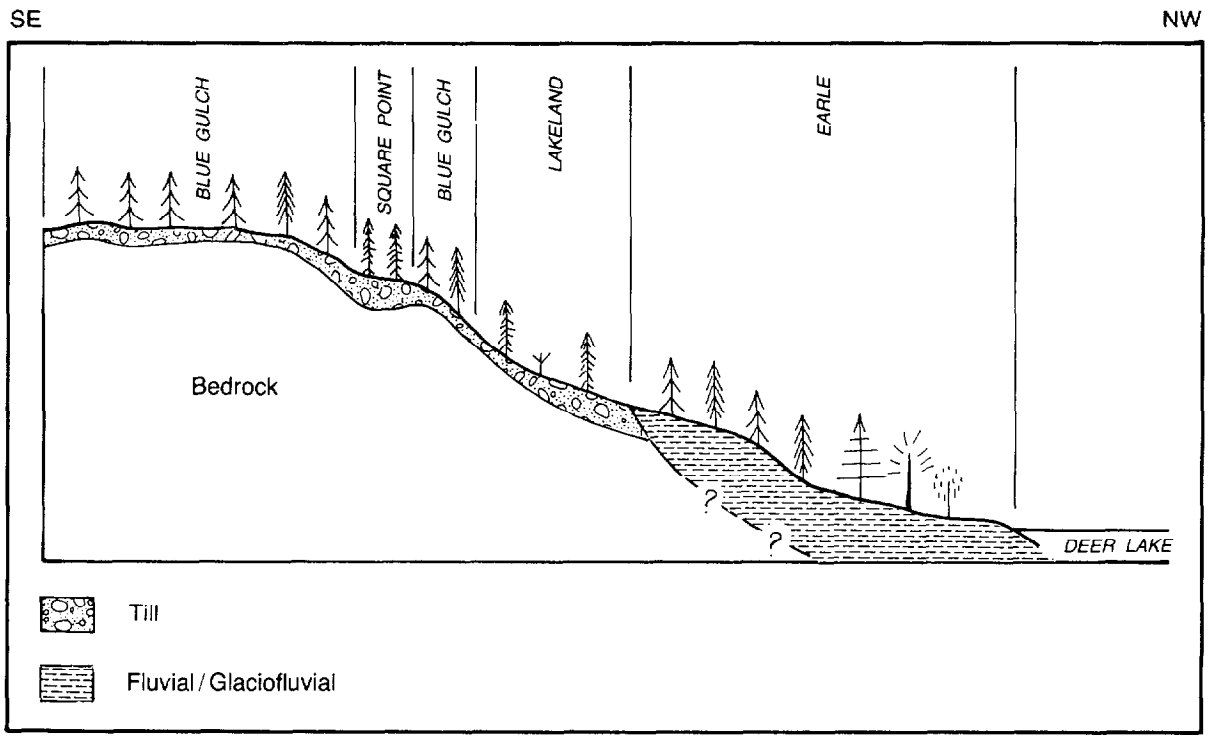

Figure 16. Eastern Highland-Lowland idealized soil-landscape relationship.

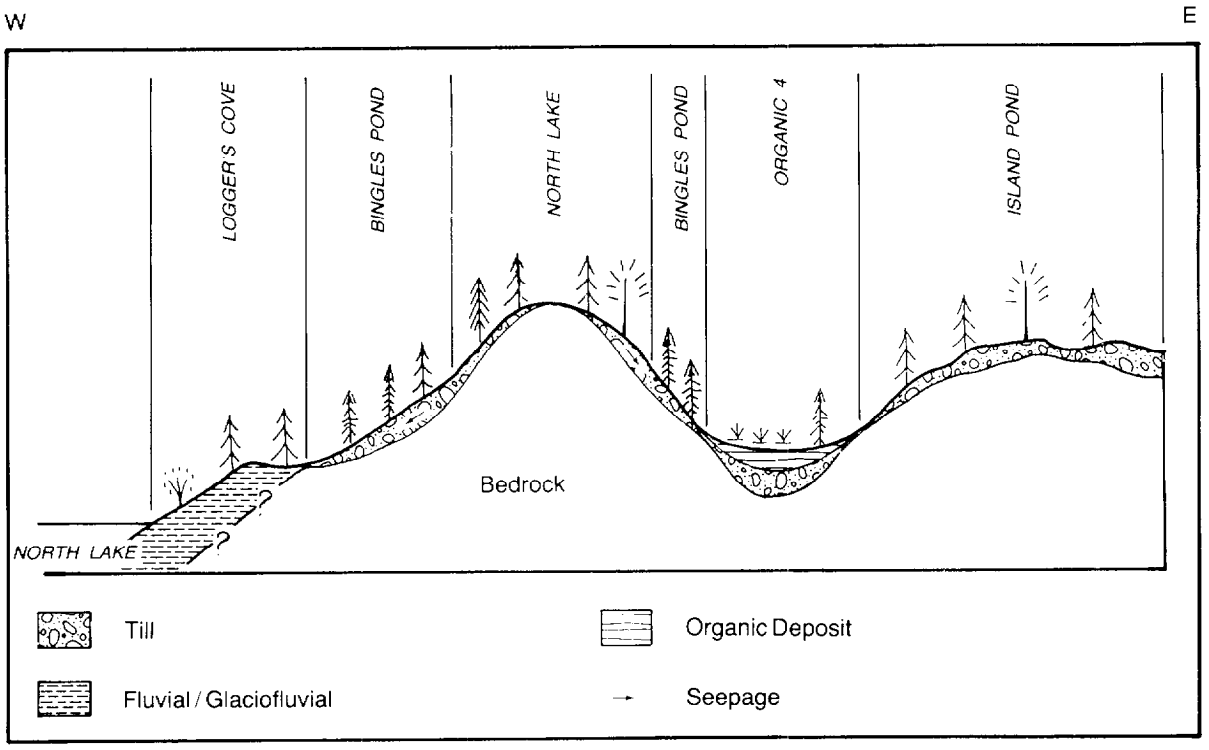

Figure 17. Western Highland idealized soil-landscape relationship.

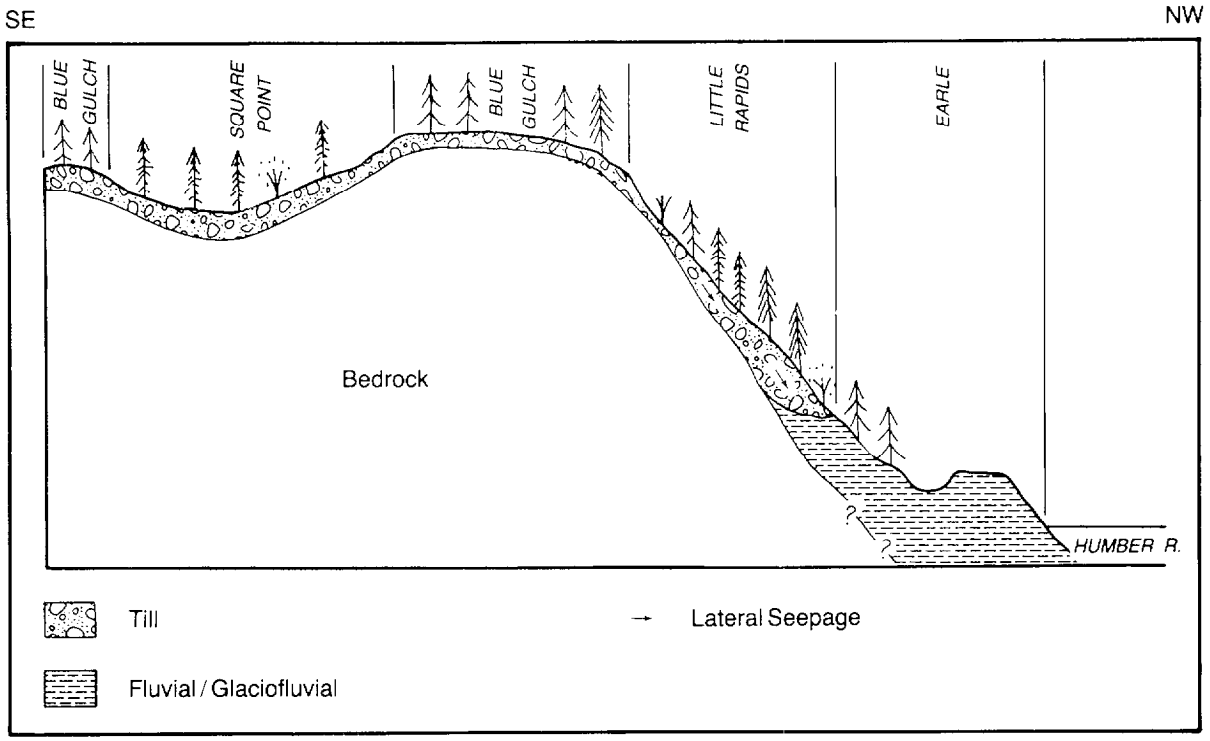

Figure 18. Eastern Highland-Lowland idealized soil-landscape relationship.

Bf2	20-27	Range 5-8 cm; reddish brown (5YR 4/4 m), reddish yellow (7.5YR 6/6 d); gravelly loamy sand; single grain structure; fine horizontal roots; 15% by volume of gravelly coarse fragments; diffuse, irregular horizon boundary; extremely acid, pH 4.3.
BC	27-51	Range 15-25 cm; reddish yellow (7.5YR 7/6 d); gravelly sand; single grain structure; 45% by volume of channery coarse fragments; diffuse, irregular horizon boundary; very strongly acid, pH 4.6.
C	51 +	Light yellowish brown (10YR 6/4 d); gravelly sand; single grain structure; 50% by volume of channery coarse fragments; irregular horizon boundary; very strongly acid, pH 4.6.

Range of characteristics. The organic surface layer is between 5 and 14 cm, but it can be very thin.

The parent material is moderately to strongly stratified, with strata of fine sands to gravelly sands and cobbly layers, which greatly affect the solum texture and stoniness of the soil.

Similar soils. Camp Mortley and Big Tenth Brook soils are similar to Earle soils, but Earle soils have a lower percentage of coarse fragments and occur on level slopes.

Land use. The soils are generally coarse-textured and have a low water-holding capacity. These soils mostly suitable for hay and forage production, but in areas where the textures are finer, they are also suitable for some root crops. The CLI class ratings for agriculture are 4-5.

Chemical and physical analysis of an Earle soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al	Available P (µg/g)
								(meq/100 g)				
LFH	5-0											
Ae	0-4	3.5	0.47	0.02	23	0.02	0.02	0.85	0.25	0.07	0.72	9.0
Bf1	4-20	4.2	2.78	0.11	25	0.68	0.70	0.54	0.11	0.09	2.81	12.0
Bf2	20-27	4.3	0.75	0	-	0.20	0.36	0.52	0.21	0.11	1.47	19.2
BC	27-51	4.6	0.69	0.03	23	0.13	0.23	0.47	0.20	0.09	0.36	34.8
C	51 +	4.6	0.53	0.01	53	0.10	0.16	0.35	0.10	0.08	0.42	25.7

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand Fraction (%)						Silt (%)	Clay (%)
			Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)		
Ae	0-4	10.0	78.9	2.1	13.5	20.5	25.7	17.0	18.0	3.1
Bf1	4-20	10.0	70.8	4.0	14.6	18.3	21.3	12.5	21.0	8.2
Bf2	20-27	12.0	78.5	13.3	18.0	17.1	20.1	10.0	17.5	4.0
BC	27-51	45.0	89.7	21.0	29.0	18.7	16.2	4.7	6.5	3.7
C	51 +	50.0	89.2	28.9	30.8	13.4	10.9	5.3	8.0	2.8

GLIDE MOUNTAIN MAP UNIT 710 ha

Location. The Glide Mountain soils occur in the eastern Highland and Midland zones.

Parent material. The parent material is a reddish brown loamy till derived from red sandstone and granite.

Topography. The Glide Mountain soils occur on level to gently undulating terrain. Slopes range from 1 to 3%.

Drainage classes. Surface: moderately well drained. Internal: poorly drained. Horizontal water movement is restricted by dense B and C horizons (possibly fragic layer).

Vegetation. The main tree cover is black spruce, balsam fir, and white birch, with a ground cover of feather and broom moss. Tree growth is generally poor; thus selective cutting has occurred where there is slightly better growth. Regeneration is generally poor for both softwood and hardwood species.

Soil classification. Fragic Humo-Ferric Podzol, gleyed phase.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located approximately 2.0 km east of the Trans Canada Highway, near the town of Little Harbour, on a slope of 2% at an elevation of approximately 335 m.

The site vegetation is dominantly balsam fir and black spruce, with a ground cover of feather and broom moss, bunchberry, and balsam fir seedlings.

Horizon	Depth cm	
LF	5-0	Range 2-7 cm; black (10YR 2/1 m); plentiful, medium, horizontal roots; extremely acid, pH 3.4.
Aegj1	0-7	Range 2-8 cm; pinkish to reddish gray (5YR 5.5/2 m); fine sandy loam; common, medium, distinct mottles; weak to moderate, coarse, angular blocky structure; very friable, plastic consistence; few, very fine, horizontal roots; 15% by volume of coarse fragments; abrupt, smooth horizon boundary; extremely acid, pH 3.8.
Aegj2	7-14	Range 1-11 cm; dark reddish brown (5YR 3/2 m); fine sandy loam; very weak, fine, angular blocky structure; very weak, very fine to fine, granular secondary structure; loose, non-plastic consistence; very few, fine, oblique roots; 30% by volume of coarse fragments; abrupt, smooth horizon boundary; very strongly acid, pH 4.6.

Bfgj	14-29	Range 7-17 cm; reddish brown (5YR 4/3 m); gravelly fine sandy loam; few, fine, faint mottles; moderate, medium to coarse; angular blocky structure; weak, fine to medium, platy secondary structure; very friable, slightly plastic consistence; many moderately thick, unspecified clay films; very few, very fine, oblique roots; 25% by volume of coarse fragments; common, very fine, random, inped, tubular pores; gradual, irregular horizon boundary; extremely acid, pH 4.4.
BCx	29-45	Reddish brown (5YR 4.5/3 m); fine sandy loam; few, fine, faint mottles; moderate, medium to coarse, angular blocky structure; firm, non-plastic consistence; many, moderately thick, unspecified clay films; common, very fine, random, inped, tubular pores; 20% by volume of coarse fragments; diffuse, wavy horizon boundary; very strongly acid, pH 4.6.
Cxj	45 +	Fine sandy loam; firm, non-plastic consistence; many, moderately thick, unspecified clay films; common, very fine, random, inped, tubular pores; diffuse, irregular horizon boundary; 25% by volume of coarse fragments; extremely acid, pH 4.0.

Range of characteristics. The soils have a dense layer (possibly fragic) that occurs in the BC and C horizons. Drainage is better in the upper portion of the profile but becomes poorer with depth. Mottles indicative of gleying are hard to distinguish owing to the reddish brown color of the horizons and parent material.

Land use. These soils are unsuitable for agriculture due to climate, drainage, and stoniness restrictions. However, with proper management, these soils could be used for reforestation. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a Glide Mountain soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LF	5-0	3.4	43.6	1.09	40			12.0	3.55	2.50	2.40	135
Aegj	0-7	3.8	0.84	0.03	28	0.06	0.08	0.18	0.15	0.05	3.02	8
Aegj2	7-14	4.6	0.17			0.02	0.10	0.14	0.03	0.04	0.32	76
Bfgj	14-29	4.4	2.7	0.11	25	0.20	0.75	0.10	0.03	0.04	1.25	6
BCx	29-45	4.6	0.26	0.01	26	0.04	0.14	0.11	0.03	0.04	0.42	
Cxj	45 +	4.0						1.02	0.30	0.16	12.90	

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Aegj	0-7	54.0	3.6	7.2	7.2	16.6	19.4	41.1	5.0
Aegj2	7-14	57.7	5.1	7.2	7.7	17.6	20.0	38.5	3.8
Bfgj	14-29	56.9	5.3	7.4	7.1	17.9	19.1	39.5	3.6
BCx	29-45	57.5	5.2	7.5	7.0	16.7	21.0	37.4	5.1
Cxj	45 +	56.4	7.7	10.7	7.1	15.6	15.2	36.6	7.0

HUGHES BROOKE MAP UNIT 630 ha

Location. The Hughes Brooke soils occur on the west side of Deer Lake.

Parent material. The parent material is a reddish brown till derived from red micaceous sandstone.

Topography. The soils have developed on gently sloping to gently inclined till veneers over inclined bedrock (see Fig. 14).

Drainage classes. Surface and internal: well drained.

Vegetation. The main tree cover is white birch, black spruce, and balsam fir. This is a cutover area and has also been subjected to a forest fire, but it has regenerated quite well with white birch and balsam fir. The ground cover consists of clintonia, bunchberry, and broom moss.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located on the west side of Deer Lake, 0.5 km north of Little North Brook, on a slope of 7%, at an elevation of 70 m.

The site vegetation is white birch, balsam fir, and black spruce. Ground cover consists of clintonia, broom moss, and bunchberry.

Horizon	Depth cm	
LF	4-0	Range 2-6 cm; plentiful, medium, horizontal roots; extremely acid, pH 4.1.
Ae	0-12	Range 6-19 cm; light gray (5YR 7/1 m); fine sandy loam; weak, medium angular blocky structure; few, fine, horizontal roots; 10% by volume of coarse fragments; loose, moist consistence; clear, wavy horizon boundary; extremely acid, pH 3.9.
Bf	12-27	Range 10-19 cm; reddish brown (5YR 4/4 m); fine sandy loam; weak to moderate, medium to coarse, angular blocky structure; very friable, moist consistence; few, very fine, oblique roots; 15% by volume of coarse fragments; gradual irregular horizon boundary; extremely acid, pH 4.5.
BC	27-47	Range 18-20 cm; dark reddish brown (5YR 3/4 m); fine sandy loam; weak to moderate, fine to medium, angular blocky structure; 15% by volume of coarse fragments; friable, moist consistence; extremely acid, pH 4.3.

C	47 +	Dark reddish brown (5YR 3/4 m); fine sandy loam; friable, moist consistence; 20% by volume of coarse fragments; extremely acid, pH 4.2.
R		Red micaceous sandstone, easily split.

Range of characteristics. The surface organic matter is generally very thin, ranging between 2-10 cm. The Ae horizon is relatively thick and often tongues into the Bf horizon. The BC and C horizon can be dense or compacted. Bedrock occurs within 75-100 cm (see Plate IIb).

Similar soils. Hughes Brook soil is the well-drained member of the Hughes Brook catena, with Little North Brook and West Pond being the imperfectly and poorly drained members, respectively. Microwave soil is similar to Little North Brook soil but has finer textures and more prominent mottling.

Land use. Hughes Brook soils have been given one of the highest suitability classes for agriculture in the survey area: CLI class ratings for agriculture are 3 and 4. They are well drained, level, and relatively stone-free. Their only limitations are their shallow depth to bedrock and their susceptibility to frost during early spring. It is possible that these soils are also susceptible to erosion for agriculture because of shallowness to bedrock (75-100 cm), texture, and structure characteristics. With these factors in combination with improper land clearing practices, slopes greater than 5%, and the area's high annual rainfall (1200 cm), gully or rill erosion could be a serious problem.

Chemical and physical analysis of a Hughes Brook soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LF	4-0	4.1	21.5	0.55	39			13.4	2.56	1.78	0.70	82
Ae	0-12	3.9	0.12	0.01	12			0.48	0.16	0.06	0.77	6
Bf	12-27	4.5	1.71	0.09	19	0.28	0.54	0.24	0.04	0.08	0.60	14
BC1	27-37	4.3	0.11	0.02	5.5	0.03	0.08	0.24	0.12	0.09	1.01	82
BC2	37-47	4.3	0.16	-	-	0.05	0.11	0.26	0.21	0.11	1.28	
C	47 +	4.2	0.08	0.01	8	0.02	0.08	0.34	0.41	0.11	1.97	

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-12	64.2	2.7	5.5	8.3	26.7	21.0	34.0	1.8
Bf	12-27	55.8	2.6	4.8	6.1	20.3	22.0	40.5	3.7
BC1	27-37	55.1	2.5	4.7	6.3	21.5	20.1	37.4	7.6
BC2	37-47	56.9	2.0	4.0	5.8	24.5	20.5	35.8	7.3
C	47 +	56.2	2.0	3.9	6.2	22.3	21.8	35.7	8.1

ISLAND POND MAP UNIT 280 ha

Location. The Island Pond soils are located on the northern map sheet, primarily east of Indian Dock Pond and west of North Lake.

Parent material. The parent material is a medium-textured olive to olive green till derived from phyllite and shale.

Topography. These soils have developed on moderately inclined and gentle slopes (Fig. 22).

Drainage classes. Surface: well drained. Internal: well drained but where the bedrock is close to the surface drainage could be impeded.

Vegetation. The main tree cover is balsam fir, black spruce, and larch. This area was previously selectively cut for the lumber industry but is now being utilized for the pulp and paper industry. Tree growth on these soils is qood, especially balsam fir and black spruce. Common ground cover consists of fir seedlings, bunchberry, clintonia, feather moss, and sphagnum moss.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located on the west side of North Lake, on a slope of 12% at an elevation of 175 m.

The site vegetation is balsam fir, black spruce, and larch, with a ground cover of fir seedlings, bunchberry, clintonia, feather moss, and sphagnum.

Horizon	Depth cm	
L	10-8	Range 1-3 cm; extremely acid, pH 4.1.
F	8-0	Range 4-8 cm; dark gray (10YR 4/1 m); medium, horizontal roots; 25% by volume of coarse fragments; clear, irregular horizon boundary; extremely acid, pH 3.6.
Ae	0-3	Range 1-5 cm; gray (7.5R 6/0 m); silt loam; medium, horizontal roots; 25% by volume of coarse fragments; clear broken horizon boundary; extremely acid, pH 4.1.
Ae2	3-7	Range 0-6 cm; dark reddish brown (2.5YR 3/4 m); gravelly loam; very weak, subangular blocky structure; few, very fine, random roots; 35% by volume of coarse fragments; loose consistence; clear, broken horizon boundary; neutral, pH 6.7.

Bf1	7-17	Range 4-15 cm; dark yellowish brown (10YR 4/6 m); loam; weak, angular blocky structure; few, very fine, random roots; 30% by volume of coarse fragments; loose, moist consistence; diffuse, broken horizon boundary; extremely acid, pH 3.8.
Bf2	17-39	Range 15-30 cm; olive (5Y 4.5/4 m); loam; few, fine, oblique roots; 40% by volume of coarse fragments; very strongly acid, pH 4.6.
R	39 +	Fragmental bedrock, easily split.

Range of characteristics. The organic surface layer ranges from 8 to 10 cm. At the detailed profile description site, the chemical data indicated that the soil had two Ae horizons. The first Ae horizon was the usual gray color; however, the second Ae horizon was dark reddish brown (2.5YR 3/4 m), the color of a B horizon, but it did not meet the chemical requirement for a podzolic B.

Land use. Topography and shallowness to bedrock make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of an Island Pond soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N Ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
L	10-8	4.1	48.2	1.10	44			19.9	11.8	2.5	0.40	
F	8-0	3.6	43.4	1.09	40			17.9	5.9	2.0	5.97	
Ae	0-3	4.1	1.79	0.09	20	0.15	0.11	1.05	1.03	0.15	4.18	
Ae2	3-7	6.7	0.19	0.01	19	0.02	0.01	5.22	0.88	0.09	-	
Bf1	7-17	3.8	3.66	0.19	19	1.13	0.53	0.43	0.21	0.08	3.05	
Bf2	17-39	46	3.40	0.13	26	0.24	0.96	0.39	0.16	0.07	0.50	

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae2	3-7	55.0	6.4	10.7	8.5	14.6	14.7	37.5	7.5
Bf1	7-17	36.4	9.3	8.9	4.4	7.3	6.5	45.0	18.6
Bf2	17-39	60.2	17.5	19.2	6.4	10.7	6.5	29.9	9.8
R									

KEATS POND MAP UNIT 1910 ha

Location. The Keats Pond soils occur extensively on the northern map sheet.

Parent material. The parent material is a reddish brown loamy till derived from granite, red sandstone, and minor shale or phyllite.

Topography. These soils can occur on gentle to steep slopes. Bedrock is often close to the surface (see Plate IIId).

Drainage classes. Surface and internal: well drained.

Vegetation. These soils are characterized by a good growth of balsam fir, black spruce, and minor white birch. The fir and spruce on these soils have not been extensively utilized.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit is located northeast of the dam on Keats Pond, on a slope of 2% at an elevation of 245 m.

The site vegetation is dominantly black spruce and balsam fir, with minor white birch.

Horizon	Depth cm	
LF	3-0	Range 1-4 cm; plentiful, fine to coarse, horizontal roots; abrupt, smooth, horizon boundary; extremely acid, pH 3.7.
Ae	0-2	Range 0-5 cm; pinkish gray (5YR 6/2 m), pinkish gray (7.5YR 7/2 d); very fine sandy loam; structureless; few, fine, horizontal roots; 10% by volume of gravelly coarse fragments; wavy, gradual horizon boundary; extremely acid, pH 3.6.
Bhf	2-3	Range 0-2 cm; dusky red (2.5YR 3/2 m), yellowish brown (10YR 5/6 d); very fine sandy loam; few, very fine, oblique roots; 15% by volume of gravelly coarse fragments; clear, smooth, horizon boundary; extremely acid, pH 4.0.
Bf1	3-18	Range 12-25 cm; yellowish red (5YR 5/6 m), reddish yellow (7.5YR 7/6 d); very fine sandy loam; few, very fine, oblique roots; 10% by volume of gravelly coarse fragments; clear, smooth horizon boundary; extremely acid, pH 4.5.

Bf2	18-28	Range 5-15 cm; reddish yellow (7.5YR 6/6 d); very fine sandy loam; angular blocky structure; very few, very fine roots; 10% by volume of gravelly coarse fragments; wavy, gradual horizon boundary; extremely acid, pH 4.5.
C	28 +	Reddish brown (5YR 5/3 m), light brown (7.5YR 6/4 d); very fine sandy loam; fine, faint mottles; platy structure; 10% by volume of gravelly coarse fragments; clear, wavy horizon boundary; extremely acid, pH 4.5.

Range of characteristics. The soils are characterized by a relatively thin LF and Ae horizon. Below the Ae horizon a thin Bhf horizon is generally present. The texture of the B horizons is mainly very fine sandy loam, but in isolated pockets, usually near the toe of the slopes and some large gullies, the texture can range into the loamy sand category. The high sand fraction is probably the result of minor washing during deposition of the till. The subsoils are sometimes dense or compacted but not cemented.

The profile often contains small highly weathered dolomitic stones in which the weathering occurs as a dark gray heavy-textured ring surrounding the the stone. In areas where the soils are very shallow, gleying occurs near the bedrock contact.

Land use. Stoniness, topography, and shallowness to bedrock make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Keats Pond soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al	Available P (µg/g)
								(meq/100 g)				
LF	3-0	3.7						14.7	3.16	0.97	3.66	105.6
Ae	0-2	3.6	0.77	0.03	26	0.04	0.02	0.88	0.22	0.05	0.70	4.5
Bhf	2-3	4.0	5.88	0.27	22	1.23	1.20	1.17	0.22	0.11	3.28	6.0
Bf1	3-18	4.5	1.74	0.08	22	0.20	0.50	0.22	0.03	0.05	0.47	1.5
Bf2	18-28	4.5	1.23	0.06	21	0.32	0.45	0.20	0.04	0.03	0.33	4.5
C	28 +	4.5	0.22	0.01	22	0.07	0.16	0.17	0.03	0.05	0.50	25.0

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-2	15.0	71.3	9.8	15.6	11.4	19.8	14.7	26.3	2.4
Bhf	2-3	12.0	70.6	17.2	18.3	11.1	13.5	10.4	25.0	4.4
Bf1	3-18	10.0	65.2	11.2	14.9	10.1	16.2	12.8	29.4	5.4
Bf2	18-28	10.0	69.6	9.6	14.4	11.2	19.3	15.2	27.1	3.3
C	28 +	10.0	70.9	12.5	15.3	10.8	17.4	15.0	24.7	4.4

LAKELANND MAP UNIT 400 ha

Location. The Lakelannd soils occur on the east side of Deer Lake, north and east of the community of Pasadena.

Parent material. The parent material is a red to reddish brown sandy loam till derived from red micaceous sandstone, red siltstone, and minor granite.

Topography. These soils have developed on level to slightly inclined terrain (see Fig. 18).

Drainage classes. Surface and internal: poorly drained. Ponding of water on the surface is quite common. Seepage water is evident on the toe of the slopes.

Vegetation. The tree vegetation is mainly stunted black spruce and balsam fir. These soils also support large thickets of speckled alder and mountain maple. The ground cover consists of ferns, mosses, and sphagnum moss. Selective cutting of black spruce and balsam fir has taken place.

Soil classification. Orthic Gleysol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located 1.0 km east of Pasadena, on a slope of 2% at an elevation of 50 m.

The site vegetation is mainly dead and stunted black spruce and balsam fir. The soils also support a good growth of large speckled alder. The ground cover consists of ferns and mosses.

Horizon	Depth cm	
LF	20-0	Very dark gray (7.5YR 3/0 m); many, medium, horizontal zones; very strongly acid, pH 5.0.
Bgf	0-30	Dark brown (7.5YR 3/3 m); sandy loam; weak subangular blocky structure; sticky wet consistence; plentiful, medium, horizontal roots; coarse, prominent yellowish brown (10YR 5/6 m) mottles; abrupt, smooth horizon boundary; strongly acid, pH 5.5.
BCg	30 +	

Range of characteristics. The LFH layer is thicker in depressional areas and where the water table is closer to the surface. Mottling occurs throughout the profile.

Land use. Stoniness and wetness severely limit these soils for agricultural use. The CLI class rating for agriculture is 7.

LITTLE NORTH BROOK MAP UNIT 1070 ha

Location. The Little North Brook soils occur on the west side of Deer Lake, mainly in the Midland zone (Fig. 14).

Parent material. The parent material is a reddish to reddish brown loamy till derived from red micaceous sandstone.

Topography. The soils have developed on gently sloping till veneers on inclined sandstone bedrock.

Drainage classes. Surface: moderately well drained. Internal: imperfectly to poorly drained, due to slow permeability caused by a dense or compacted lower horizon.

Vegetation. The dominant tree species on these soils are black spruce, balsam fir, and white birch. Growth of these species is generally good except on wetter areas where it is characterized by stunted black spruce and speckled alder. Scattered Eastern white pine remains in the area but most of it is overmature and dying. Bunchberry is the dominant ground cover.

Soil classification. Gleyed Eluviated Dystric Brunisol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located near the mouth of Little North Brook, on a slope of 2% at an elevation of 45 m.

The site vegetation is mature balsam fir and white birch, with a dominant ground cover of bunchberry.

Horizon	Depth cm	
LF	4-0	Range 1-7 cm; abundant, fine to coarse, horizontal roots; extremely acid, pH 3.4.
H	0-2	Range 0-4 cm; abundant, fine to coarse, horizontal roots; diffuse, horizon boundary; extremely acid, pH 3.5.
Aegj	2-19	Range 10-27 cm; pinkish gray (5YR 6/2 m), white (10YR 8/2 d); loamy sand; common, fine, prominent yellowish red (5YR 5/8 m) mottles; massive structure; friable consistence; fine, oblique roots; 20% by volume of gravelly coarse fragments; very few, micro, discontinuous, tubular pores; extremely acid, pH 3.6.

ABgj	19-29	Range 6-18 cm; reddish brown (5YR 4/3 m), pinkish gray (7.5YR 7/2 d); very fine sandy loam; common, medium, distinct mottles; weak, coarse, angular blocky structure; very friable consistence; 25% by volume of gravelly coarse fragments; clear, wavy horizon boundary; common, very fine, random, discontinuous, tubular pores; extremely acid, pH 3.8.
Bmg	29-41	Range 5-15 cm; dark reddish-brown (5YR 3/3 m), light brown (7.5YR 6/4 d); loamy very fine sand; few, fine, distinct mottles; weak, coarse, angular blocky structure; friable consistence; 25% by volume of gravelly coarse fragments; clear, wavy horizon boundary; common, very fine, tubular pores; extremely acid, pH 4.0.
BCgj	41 +	Reddish brown (5YR 4/4 m), light reddish brown (5 YR 6/4 d); very fine sandy loam; few, fine, faint mottles; weak, coarse, angular blocky structure; slightly sticky consistence; 15% by volume of gravelly coarse fragments; smooth, clear horizon boundary; few, very fine, tubular pores; extremely acid, pH 4.2.

Range of characteristics. The organic surface layer ranges from 6 to 8 cm. Mottling is more evident in the upper 50 cm, especially in the A and AB horizons. Mottling in the lower part of the profile is often difficult to see because of the inherent reddish color of the parent material.

Similar soils. These soils are similar to the Hughes Brooke soils, in that surface stones are generally very few and are rounded to subrounded granites, whereas stones in the profile are small flagstones of red Carboniferous sandstone.

Land use. These soils are imperfectly drained, gently sloping, and have few surface or subsurface stones. The soils have a limited agricultural use because of a high water table during spring and fall, which could delay access to the soils during these periods, and they are susceptible to erosion. The CLI class ratings for agriculture are 4-5.

Chemical and physical analysis of a Little North Brook soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LF	4-0	3.4						14.58	5.82	3.85	-	103.2
H	0-2	3.5	22.5	0.56	40	0.14	0.35	4.56	2.46	0.44	9.21	335.0
Aegj	2-19	3.6	0.28	0.01	28	0.02	0.02	0.10	0.08	0.03	1.86	62.0
ABgj	19-29	3.8	0.32	0.01	32	0.07	0.04	0.13	0.07	0.04	1.63	24.8
Bmg	29-41	4.0	0.55	0.02	27	0.03	0.12	0.13	0.03	0.04	1.18	49.0
BCgj	41 +	4.2	0.11	0.01	11	0.05	0.07	0.14	0.04	0.04	0.67	27.0

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 1-0.05 (mm)	Silt (%)	Clay (%)
Aegj	2-19	15.0	73.1	2.4	6.8	12.6	32.1	19.1	24.5	2.4
ABgj	19-29	20.0	75.4	1.9	5.8	12.0	32.9	22.8	19.6	5.0
Bmg	29-41	20.0	76.6	1.7	6.1	13.5	35.4	19.9	18.6	4.8
BCgj	41 +	15.0	64.0	1.4	5.0	7.4	25.7	24.4	31.8	4.3

LITTLE RAPIDS MAP UNIT 450 ha

Location. The Little Rapids soils occur in the eastern Midland and Highland zones.

Parent material. The parent material is a stony till derived from red sandstone, siltstone, schist, and quartzite.

Topography. These soils have developed on stony till veneers over steeply sloping to inclined bedrock (Fig. 16).

Drainage classses. Surface and internal: poorly drained. These soils are adversely affected by surface and internal (seepage) drainage. Surface runoff often flows on the surface.

Vegetation. The main tree species are black spruce, balsam fir, and minor yellow birch. Large groves or stands of mountain maple and mountain and speckled alder also occur. The ground cover is primarily horsetail, feather moss, and ferns. Selective logging has occurred on these soils.

Soil classification. Orthic Humic Gleysol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located south of Pasadena, on a slope of 10-15% at an elevation of 120 m.

The site vegetation is black spruce and balsam fir, with small thickets of mountain maple and mountain and speckled alder. The ground cover consists mainly of horsetail, feather moss, sphagnum, and ferns.

Horizon	Depth cm	
LFH	7-0	Range 5-10 cm; material composition, 30% leaves, 40% needles, 10% sphagnum, and 20% herbaceous fragments; abundant, fine, horizontal roots; strongly acid, pH 5.2.
Ah	0-14	Range 10-14 cm; very dark gray (10YR 3/1 d); very fine sandy loam; slightly porous; few, medium, oblique roots; irregular, gradual horizon boundary; very strongly acid, pH 4.8.
Bfg	14 +	Dark yellowish brown (10YR 4/4 m), light yellowish brown (10YR 6/4 d); many, coarse, prominent red (2.5YR 5/8 m) mottles; loamy sand; structureless; sticky consistence; 35% by volume of channery coarse fragments; clear, wavy horizon boundary; very strongly acid, pH 4.8.

Range of characteristics. Mottling in these soils occurs throughout the profile. In small depressional areas on the steep slopes the surface organic layer is much thicker.

Land use. Excessive stoniness, wetness, and topography make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Little Rapids soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LFH	7-0	5.2						62.9	7.60	1.84	-	147.0
Ah	0-14	4.8	7.33	0.35	21	0.33	0.88	16.76	1.54	0.16	-	27.0
Bfg	14 +	4.8	0.93	0.04	23	0.35	0.23	1.73	0.17	0.05	-	6.9

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ah	0-14		61.4	8.7	9.1	5.9	16.4	21.3	33.2	5.4
Bfg	14 +	35.0	78.6	17.8	14.9	9.6	21.7	14.5	17.2	4.2

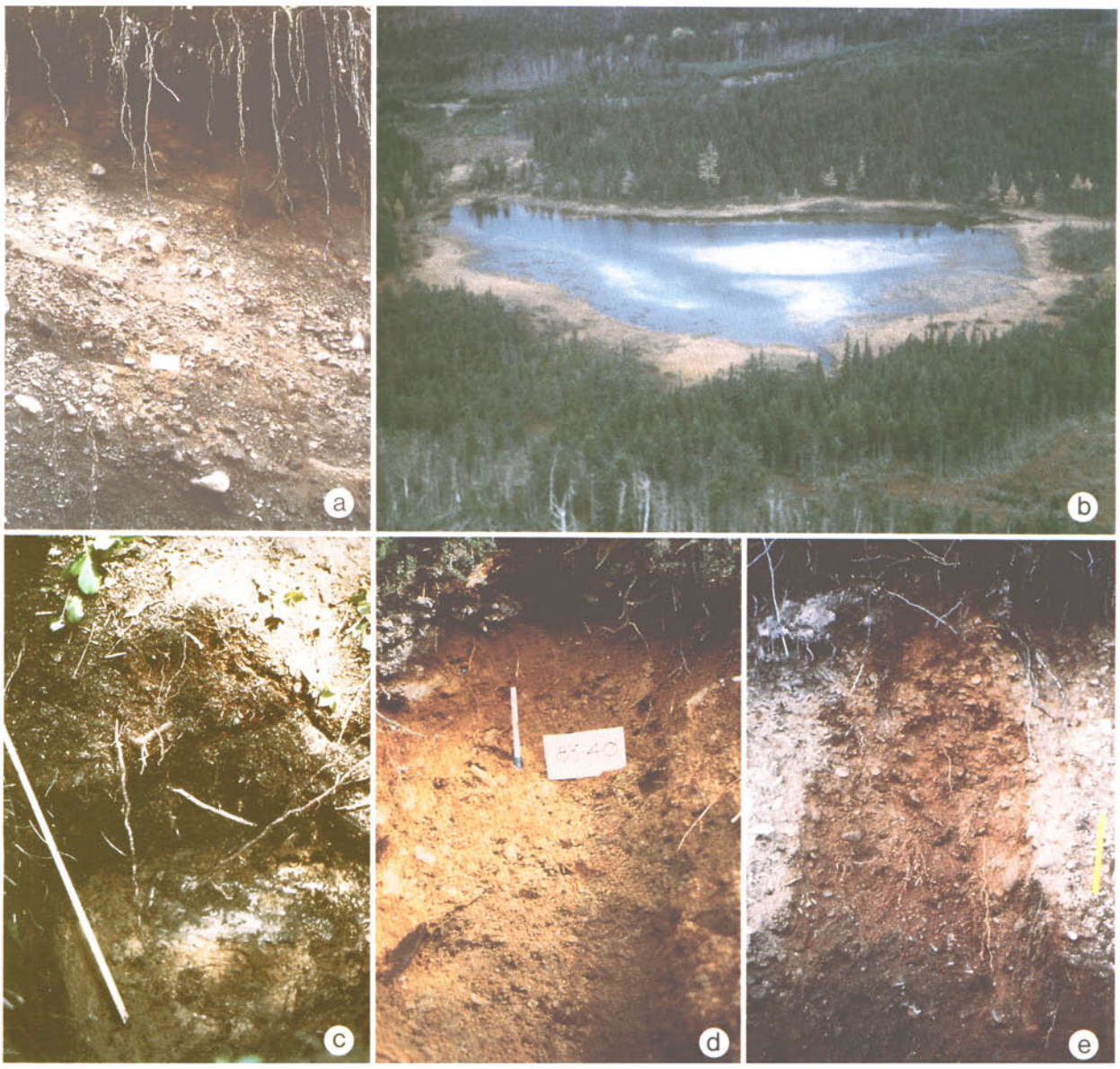

Plate I.

a. Sorting and stratification of fluvial and glaciofluvial deposits (card in lower centre is 7.6 cm x 12.7 cm).
b. Example of infilling of a small pond.
c. Profile of a Gleyed Ferro-Humic Podzol, Beaver Brook soil.
d. Profile of an Orthic Ferro-Humic Podzol, Blue Gulch soil.
e. Profile of an Orthic Humo-Ferric Podzol, Camp Mortley soil.

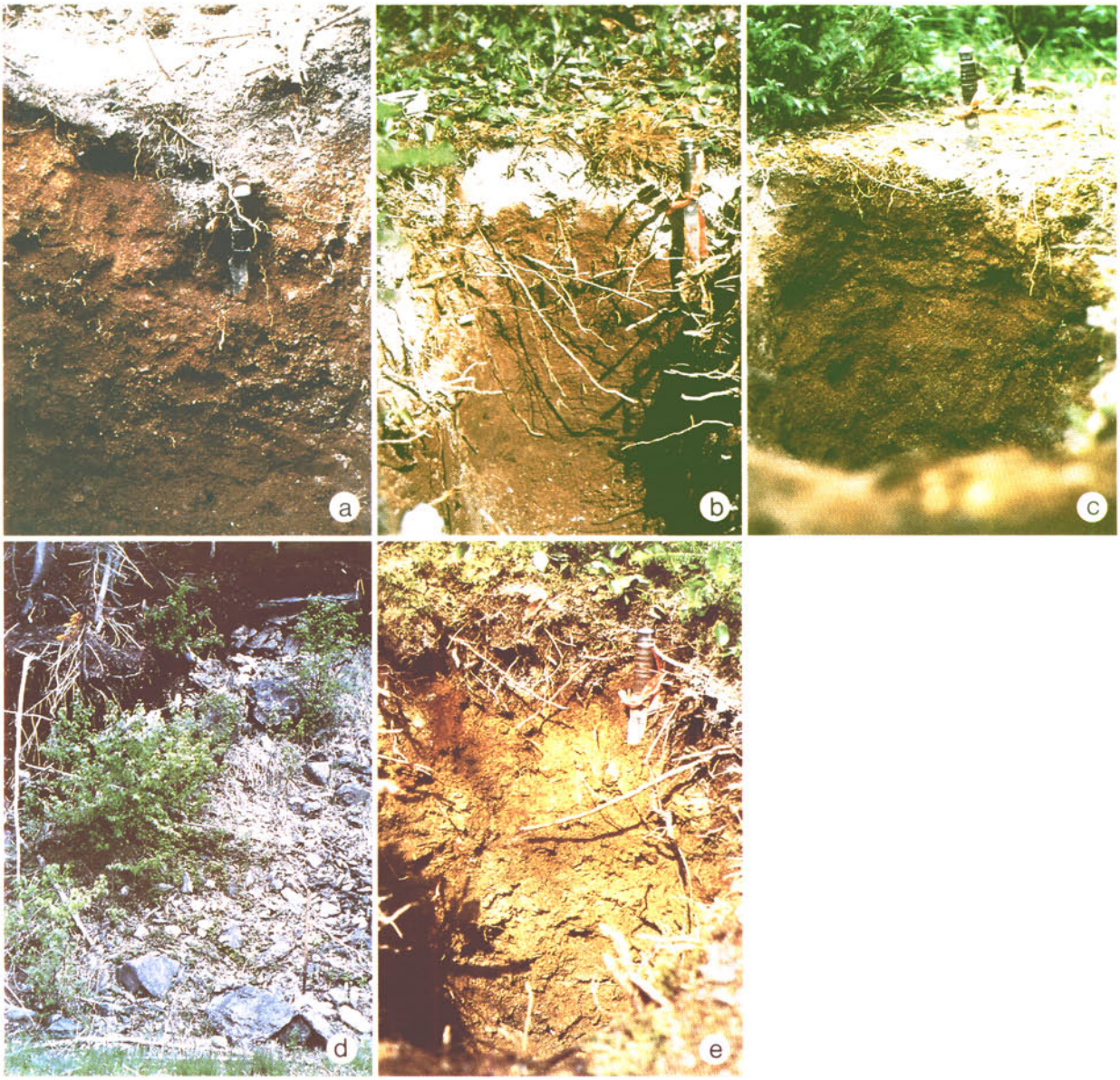

Plate II.

a. Profile of an Ortstein Humo-Ferric Podzol, Coal Brook soil.
b. Profile of an Orthic Humo-Ferric Podzol, Hughes Brooke soil.
c. Profile of an Ortstein Ferro-Humic Podzol, Logger's Cove soil.
d. Example of a Typic Folisol, lithic phase, Ninth Brook soil.
e. Profile of an Orthic Humo-Ferric Podzol, lithic phase, North Pond soil.

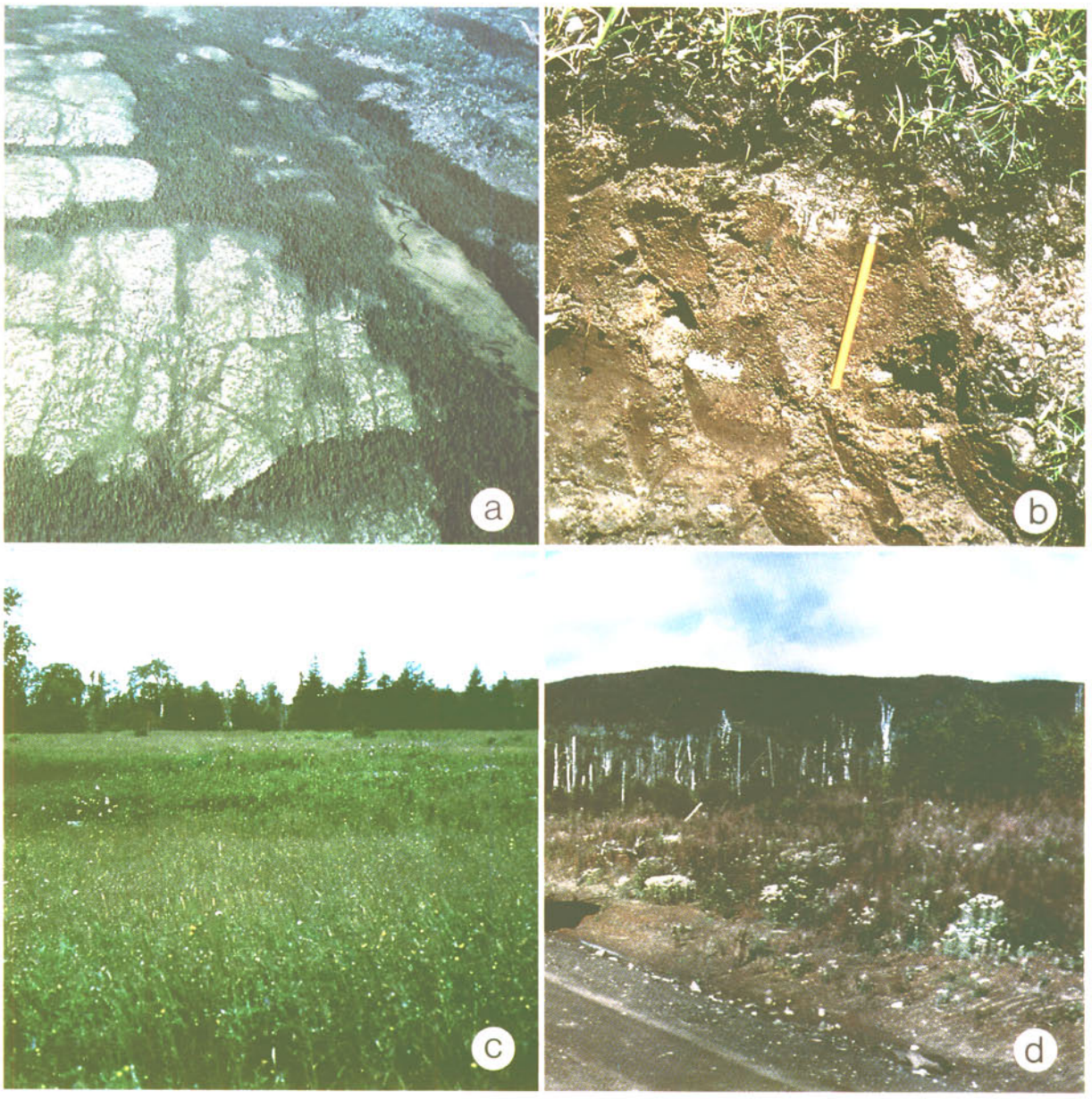

Plate III.

a. Low oblique photograph of Rockland I and II and Organic 3 (stream fen).
b. Profile of an Orthic Gleysol, West Pond soil.
c. Abandoned pasture land on Earle soil.
d. Landscape of Coal Brook soil (foreground), and Keats Pond (background), looking west.

LOGGER'S COVE MAP UNIT 11 ha

Location. The Logger's Cove soils are limited to small areas along the eastern shoreline of North Lake.

Parent material. The parent material is a level gravelly sandy fluvial deposit.

Topography. The soils occur on level to very gently sloping terraces (Fig. 15).

Drainage classes. Surface and internal: well drained.

Vegetation. The major tree species for these soils are balsam fir and larch. Growth of these species tends to be poor. Various smaller plants such as alder, sheep laurel, and Labrador tea form an understory to the tree species. Ground cover consists of clintonia, bunchberry, feather moss, and sphagnum moss.

Soil classification. Ortstein Ferro-Humic Podzol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located near the eastern side of North Lake, on a slope of 1% at an elevation of 182 m.

The site vegetation is primarily black spruce with some balsam fir and larch. The area has an understory of shrubs such as sheep laurel, alder, and Labrador tea, with a ground cover consisting of feather moss, clintonia, bunchberry, and sphagnum.

Horizon	Depth cm	
LF	3-0	Few, fine horizontal roots.
Ae	0-5	Range 2-5 cm; reddish gray (10R 6/1 m); loamy sand; single grain structure; few, fine horizontal roots; abrupt, smooth horizon boundary.
Bhfc	5-23	Range 13-20 cm; dark reddish brown (5YR 3/3 m) and black (2.5Y 2/0 m); loamy coarse sand; massive structure; secondary structure platy; medium, very weak structure; indurated cementation; no roots; 15% by volume of coarse fragments; diffuse, irregular horizon boundary; extremely acid, pH 4.2.

Bfc	23-68	Range 42-48 cm; dark reddish brown (5YR 2.5/2 m); sand; massive, strong structure; cemented, indurated; no roots; 15% by volume of coarse fragments; very firm, moist consistence; diffuse, wavy horizon boundary; extremely acid, pH 4.5.
BCc	68-81	Range 11-15 cm; dark yellow brown (10YR 4/4 m); sand; massive, moderate structure; cemented strongly; no roots; 10% by volume of coarse fragments; firm, moist consistence; diffuse, wavy horizon boundary; very strongly acid, pH 4.9.
BC	81 +	Reddish brown (5YR 4/3 m); coarse sand; single grain structure; no roots; 10% by volume of coarse fragments; loose consistence; very strongly acid, pH 4.7.

Range of characteristic. The LF and Ae horizons range from 3 to 5 cm. The cementation in these soils is extensive and runs from the B to BC horizons, a depth of 76 cm. The cemented horizon is indurated (see Plate IIc).

Land use. Factors that limit the use of these soils for agriculture are climate, undesirable soil structure, and poor water-holding capacity. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Logger's Cove Soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LF	3-0											
Ae	0-5											
Bhfc	5-23	4.2	6.82	0.25	27	0.99	1.98	0.24	0.17	0.05	1.46	
Bfc	23-68	4.5	2.10	0.08	26	0.13	0.67	0.16	0.13	0.04	0.39	
BCc	68-81	4.9	0.34	0.02	17	0.04	0.13	0.12	0.02	0.04	0.06	
BC	81 +	4.7	0.10	0.01	10	0.02	0.03	0.12	0.02	0.05	0.06	

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Bhfc	5-23	87.1	30.0	40.1	11.6	3.7	1.7	7.7	5.7
Bfc	23-68	94.5	29.9	47.7	12.3	3.8	0.9	3.5	2.0
BCc	68-81	96.5	17.3	38.5	23.8	15.0	1.9	1.9	1.6
BC	81 +	97.7	36.1	39.0	14.1	6.8	1.7	1.1	1.2

MAXWELL MAP UNIT 200 ha

Location. The Maxwell soils are found on the eastern side of Deer Lake, near Eastern Brook.

Parent material. The parent material is a gravelly sandy stratified and sorted fluvial deposit of mixed lithology.

Topography. These soils have formed on gently inclined slopes.

Drainage classes. Surface: well drained. Internal: well drained; however, mottling in the Bfcgj horizon could be reflective of a reduced permeability and a minor chemical reduction.

Vegetation. Vegetation cover for these soils generally consists of scrub softwood and hardwood such as black spruce, white birch, and speckled alder. Ground cover consists mostly of sheep laurel.

Soil classification. Ortstein Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located east of Pasadena, near Maxwell's Trailer Park, on a slope of 2% at an elevation of 36 m.

The site vegetation cover consists of scrub softwood and hardwood, mainly stunted black spruce, speckled alder, and white birch, with a ground cover of sheep laurel.

Horizon	Depth cm	
LFH	5-0	Range 2-10 cm; abundant, medium, horizontal roots; smooth, abrupt horizon boundary; extremely acid, pH 3.4.
Ae	0-10	Range 8-17 cm; light gray to gray (5YR 6/1 m), white (10YR 8/2 d); loamy fine sand; single grain structure; loose consistency; few, fine, horizontal roots; 25% by volume of angular gravelly coarse fragments; smooth, abrupt horizon boundary; extremely acid, pH 3.6.
Bfcgj	10-30	Range 17-26 cm; reddish brown (2.5YR 4/4 m), brownish yellow (10YR 6/8 d); gravelly loamy sand; few, medium, faint to distinct mottles; strong, very coarse, platy structure; very firm, extremely hard consistence; humus-aluminum and iron, indurated cementation; common fine, random, tubular pores; 30% by volume of angular gravelly coarse fragments; clear, smooth horizon boundary; extremely acid, pH 4.4.

BC 30-45 Range 15-20 cm; brownish yellow (10YR 6/6 d); gravelly sand; single grain structure; loose consistency; 60% by volume of angular gravelly coarse fragments; wavy, gradual horizon boundary; very strongly acid, pH 4.8.

C 45 + Light brown (7.5YR 6/4 d); coarse sand; single grain structure; loose consistency; 35% by volume of angular gravelly coarse fragments; wavy, clear horizon boundary; very strongly acid, pH 5.0.

Range of characteristics. The organic surface layer is generally thin. Cementation in the B horizon is indurated to strongly cemented.

Similar soils. These soils are similar to the Coal Brook soils. However, the Maxwell soils lack the Bhf horizon and contain more coarse fragments. The Coal Brook soils primarily occur on level slopes.

Land use. The coarse texture and discontinuous impeding layer of Maxwell soils limit their use for agriculture. Hay and forage are the most suitable crops for these soils. In areas where textures are fine and the impeding layer is absent some root crops could be grown. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a Maxwell soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al	Available P (µg/g)
								(meq/100 g)				
LFH	5-0	3.4						6.12	2.10	0.44	1.67	21.5
Ae	0-10	3.6						0.30	0.25	0.04	1.53	4.5
Bfcgj	10-30	4.4	2.49	0.06	42	0.30	0.63	0.31	0.16	0.04	0.59	2.5
BC	30-45	4.8	0.48	0.04	12	0.06	0.06	0.52	1.64	0.06	-	6.9
C	45 +	5.0	0.20	0.01	20	0.06	0.03	0.73	2.16	0.05	-	8.0

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-10	20.0	76.2	15.3	31.1	11.2	8.7	9.9	22.3	1.5
Bfcgj	10-30	25.0	87.6	25.6	43.3	13.2	3.5	1.9	5.9	6.4
BC	30-45	50.0	92.1	44.2	41.1	4.0	1.6	1.1	4.2	3.7
C	45 +	35.0	92.8	23.8	39.8	17.3	8.4	3.5	4.6	2.5

MICROWAVE MAP UNITS 640 ha

Location. The Microwave soils occur on the east side of Deer Lake near the community of Pasadena.

Parent material. The parent material is a loamy till derived from red micaceous sandstone, red siltstone, and minor granite.

Topography. These soils have developed on the crest and upper slopes of hummocky terrain.

Drainage classes. Surface: poorly drained. The water table is directly affected by rainfall and surface ponding.

Vegetation. Major tree species on these soils are balsam fir, black spruce, and minor white birch. Ground cover consists of mainly bunchberry and feather moss.

Soil classification. Gleyed Eluviated Dystric Brunisol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located near Pasadena, on a slope of 3% at an elevation of 60 m.

The site vegetation is primarily balsam fir, black spruce, and white birch, with a ground cover of bunchberry and feather moss.

Horizon	Depth cm	
LFH	5-0	Range 4-9 cm; plentiful roots; extremely acid, pH 3.8.
Aeg	0-9	Range 2-15 cm; pinkish white (7.5YR 8/2 d); very fine sandy loam; few roots; 10% by volume of gravelly coarse fragments; extremely acid, pH 3.5.
Bmg	9-27	Range 15-22 cm; pink (7.5YR 7/4 d); very fine sandy loam; many, medium, distinct mottles; subangular blocky primary and secondary structure; few roots; 10% by volume of gravelly coarse fragments; extremely acid, pH 3.7.
BCgj	27 +	Light brown (7.5YR 6/4 d); gravelly loamy sand; common, fine, distinct mottles; few roots; 10% by volume of gravelly coarse fragments; extremely acid, pH 4.1.
Cg		Gravelly sandy loam; common, fine, distinct mottles; very few roots.

Range of characteristics. The A horizon varies in thickness from 2 to 15 cm. Mottling occurs throughout the B and C horizons. The color of the parent material is red to reddish brown and mottling is often difficult to discern.

Similar soils. The Little North Brook soils are similar to the Microwave soils. However, the Little North Brook soils have more pronounced A and AB horizons, deeper soil development, better surface drainage, and darker horizon colors.

Land use. This soil has a highly fluctuating water table, which is near the surface. These soils have a limited use for agriculture because of poor drainage. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a Microwave soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LFH	5-0	3.8						13.80	3.45	1.14	5.00	165.6
Aeg	0-9	3.5	0.38	0.02	19	0.03	0.04	0.34	0.21	0.05	2.59	23.2
Bmg	9-27	3.7	0.51	0.07	7	0.17	0.10	0.31	0.21	0.07	3.28	13.1
BCgj	27 +	4.1	0.37	0.01	37	0.16	0.20	0.22	0.07	0.06	1.22	20.0
Cg												

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Aeg	0-9	10.0	68.2	7.1	12.9	11.6	19.7	16.8	28.4	3.4
Bmg	9-27	10.0	64.2	7.4	12.4	9.5	18.0	16.9	28.5	7.3
BCgj Cg	27 +	10.0	79.9	15.7	19.2	13.5	18.9	12.7	15.8	4.3

MIDDLAND MAP UNIT 770 ha

Location. The Middland soils occur near the shoreline on both the east and west side of Deer Lake.

Parent material. The parent material is a sandy gravelly fluvial deposit of mixed lithology.

Topography. These soils occur in depressional areas and in former meltwater channels (see Fig. 13).

Drainage classes. Surface and internal: imperfectly to poorly drained. Drainage is influenced by a high water table.

Vegetation. Speckled alder is the dominant tree species on these soils. Black spruce is second in dominance but tends to be scrubby and of little commercial value. Elderberry is a common shrub found on these soils, and ground cover consists of wood fern, mosses, and horsetails.

Soil classification. Orthic Gleysol, peaty phase.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located 1 km east of Snug Harbour, on a slope of 2-5% at an elevation of 50 m.

The site vegetation is primarily alder, with minor black spruce and an understory of elderberry, fern, mosses, and horsetail.

Horizon	Depth cm	
Of	50-35	Black (5YR 2.5/1 m); von Post scale of decomposition classes 3-4.
Om	35-0	Black (5YR 2.5/1 m); von Post scale of decomposition classes 6-7; composition of leaves, mosses, and woody fragments; abrupt, smooth boundary.
Bg	0-20 +	Sandy loam; single grain structure; slightly sticky consistence; 30% by volume of coarse fragments.

Range of characteristics. The organic surface layer is composed of fibric and mesic material about 50 cm in thickness. However, in some areas the organic layer is not as thick and the soil is similar to a Gleyed Humo-Ferric Podzol.

Land use. Poor drainage and a high water table limit these soils for agriculture. The CLI class ratings for agriculture are 5-7.

MISTAKEN POND MAP UNIT 880 ha

Location. The Mistaken Pond soils are found in the southwestern area of the western Highland zones.

Parent material. The parent material is a moderately fine-textured morainal deposit derived from schist, gneiss, and minor granite.

Topography. These soils have developed on till veneers in undulating terrain.

Drainage classes. Surface: moderately to poorly drained. The soils are imperfectly drained and seepage is present at the bottom of long moderately steep slopes.

Vegetation. The main tree vegetation is balsam fir, black spruce, with minor white birch. The softwood trees have been extensively logged for the pulp and paper industry. Regeneration is balsam fir and white birch.

Soil classification. Gleyed Humo-Ferric Podzol.

Pedoclimatic zone. Mountain.

Description of a representative profile. The treed vegetation is primarily balsam fir, black spruce, and white birch, with some scattered pine. The ground cover consists of bunchberry, creeping snowberry, ferns, and feather moss.

Horizon	Depth cm	
LF	10-0	Range 3-15 cm; very dark gray (7.5YR 3/0 m).
Aegj	0-6	Range 0-10 cm; pinkish gray (5YR 6/2 m); loamy fine sand; many, fine, horizontal roots; abrupt, smooth boundary.
Bfgj	6-30	Range 10-40 cm; dark reddish brown (5YR 3.5/4 m); sandy loam; few faint mottles.
BC	30-45	Dark reddish brown (5YR 3/4 m); firm consistence; gravelly sandy loam; dense BC horizon.

Range of characteristics. The organic surface layer ranges from 10 to 15 cm but is generally thicker at the bottom of slopes. Bedrock is generally within 75-100 cm. Seepage is present, especially where the bedrock is close to the surface. The BC and C horizons are dense (usually a firm to very firm consistence) and impede vertical water movement.

Land use. Shallowness to bedrock, poor drainage, and topography limit these soils for agricultural use. The CLI class ratings for agriculture are 5-7.

NINTH BROOK MAP UNIT 690 ha

Location. The Ninth Brook soils are found primarily in the western Highland and Midland zones, with a few isolated locations near the lakeshore.

Parent material. The parent material is composed of organic matter derived mainly from woody material, with varying amounts of sphagnum and mosses.

Topography. These soils have formed on very steep slopes, on the crest and lower slopes of rock ridges, and on boulder talus (see Figs. 14 and 17).

Drainage classes. Internal: moderately to poorly drained. On the crests where the soils are generally the thinnest and where moisture is supplied by rainwater, the drainage is classed as moderate. Most of these soils are only saturated for a few days after a rainfall. The boulder talus is generally moderately drained, but in some areas seepage water from the upper slopes can drip onto the organic mat and keep it saturated for longer than a few days.

Vegetation. The lower slopes of these soils are characterized by scrub black spruce, larch, and a ground cover of Labrador tea and kalmia. Toward the toe of slopes and on the boulder talus tree growth is fair, with black spruce, balsam fir, and white birch being the main tree species. Ground cover under these species are sphagnum and feather moss.

Soil classification. Typic Folisol, lithic phase.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located on the west side of Deer Lake at an elevation of 180 m.

The site vegetation is black spruce, larch, balsam fir, and white birch, with a ground cover of Labrador tea and kalmia.

Horizon	Depth cm	
L	15-13	Accumulation of organic matter derived from Clintonia borealis, Hypnum hylocomium.
F-H	13-0	Moderately decomposed matter; woody fragments mainly consisting of roots, small tree stumps, and branches, with some twigs and leaves.
R		Bedrock and/or boulder talus.

Range of characteristics. The soils are thinnest on the rock crests, generally less than 10 cm, with lichens being a significant part of the ground cover. The soils on the lower slopes are generally thicker (20-30 cm) and are characterized by scrub black spruce, larch, Labrador tea, and kalmia. At the toe of the slopes and on the boulder talus, tree growth is fair, with black spruce, balsam fir, and white birch being the main tree species (see Plate IId).

Land use. Shallowness to bedrock, bedrock exposure, and topography make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

NORTH MAP UNIT 600 ha

Location. The North soils are located on the northern map sheet, primarily east of Indian Dock Pond.

Parent material. The parent material is a medium-textured olive to olive green till derived from phyllite and shale.

Topography. These soils have developed on inclined and gentle slopes (see Fig. 17).

Drainage classes. Surface: well drained. Internal: well drained, but where the bedrock is close to the surface drainage is impeded.

Vegetation. The natural vegetation is primarily black spruce and balsam fir, with minor white birch. Ground cover is mainly bunchberry and feather moss. Where areas have been logged for the pulp and paper industry the ground cover is primarily raspberry, with balsam fir seedlings.

Soil classification. Gleyed Dystric Brunisol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located near the east end of North Lake, on a slope of 12% at an elevation of 200 m.

The site vegetation is balsam fir, black spruce, and white birch, with a ground cover of bunchberry, feather moss, and raspberry.

Horizon	Depth cm	
LF	22-15	Range 8-18 cm; plentiful, medium, horizontal roots; extremely acid, pH 4.0.
H	15-0	Range 3-15 cm; very dark gray (7.5YR 3/0 m); plentiful, medium, horizontal roots; abrupt, smooth horizon boundary; medium acid, pH 5.7.
Bmgj	0-15	Range 5-15 cm; brown to dark brown (7.5YR 4/4 m), light yellowish brown (10YR 6/4 d); very fine sandy loam; weak, medium, angular blocky structure; very friable consistence; moderately porous; very few, fine, horizontal roots; 15% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; medium acid, pH 5.6.
Bmg	15-37	Range 19-35 cm; reddish brown (5YR 5/3 m), pale brown (10YR 6/3 d); gravelly sandy loam; common, medium, distinct mottles; structureless; very friable consistence; common, very fine, tubular pores; 10% by volume of angular gravelly coarse fragments; clear, wavy horizon boundary; medium acid, pH 5.6.

Cg 37 + Reddish brown (5YR 4.5/4 m), light brown (7.5YR 6/4 d); gravelly sandy loam; common, medium, prominent mottles; structureless; friable consistence; few, fine, tubular pores; 25% by volume of angular gravelly coarse fragments; medium acid, pH 5.7.

Range of characteristics. The organic surface layer ranges from 20 to 30 cm. An eluviated horizon is sometimes present, usually as a thin, discontinuous Aegj horizon. Solum textures range from gravelly sandy loam to loam and the coarse fragment content increases with depth. Bedrock is generally within 75 cm. Rounded to subrounded granitic stones and boulders occur on the surface, with very few occurring in the soil profile.

Land use. Topography and shallowness to bedrock make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a North soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LF	22-15	4.0						40.9	8.59	2.09	-	175.0
H	15-0	5.7	23.6	1.14	21	0.52	0.77	65.0	12.63	0.19	-	37.5
Bmgj	0-15	5.6	0.58	0.04	14	0.20	0.10	4.21	0.60	0.04	-	3.5
Bmg	15-37	5.6	0.49	0.03	12	0.15	0.07	5.11	0.84	0.06	-	2.0
Cg	37 +	5.7	0.17	0.01	17	0.02	0.01	3.48	0.70	0.05	-	4.5

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Bmgj	0-15	17.0	65.5	10.2	13.4	12.0	18.1	11.9	27.6	6.9
Bmg	15-37	10.0	59.9	11.2	12.8	9.4	15.0	11.5	31.0	9.1
Cg	37 +	25.0	68.2	10.3	14.5	11.1	18.1	14.3	23.7	8.1

NORTH LAKE MAP UNIT (taxadjunct) 1920 ha

Location. The North Lake soils occur extensively on the northern map sheet.

Parent material. The parent material is reddish brown loamy till derived from granite, red sandstone, and minor shale or phyllite.

Topography. These soils occur on gentle to steep terrain. Bedrock is often close to the surface (see Figs. 13 and 15).

Drainage classes. Surface and internal: well drained.

Vegetation. These soils are characterized by a good growth of balsam fir, black spruce, and minor white birch. This area has been extensively utilized for the pulp and paper industry.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located northeast of the dam on North Lake, on a slope of 2% at an elevation of 183 m.

The site vegetation is dominantly black spruce and balsam fir, with minor white birch.

Horizon	Depth cm	
LF	3-0	Range 1-4 cm; plentiful, fine to coarse, horizontal roots; abrupt, smooth horizon boundary; extremely acid, pH 3.7.
Ae	0-2	Range 0-5 cm; pinkish gray (5YR 6/2 m), pinkish gray (7.5YR 7/2 d); very fine sandy loam; structureless; few, fine, horizontal roots; 10% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; extremely acid, pH 3.6.
Bhf	2-3	Range 0-2 cm; dusky red (2.5YR 3/2 m), yellowish brown (10YR 5/6 d); very fine sandy loam; few, very fine, oblique roots; 15% by volume of gravelly coarse fragments; clear, smooth horizon boundary; extremely acid, pH 4.0.
Bf1	3-18	Range 12-25 cm; yellowish red (5YR 5/6 m), reddish yellow (7.5YR 7/6 d); very fine sandy loam; few, very fine, oblique roots; 10% by volume of gravelly coarse fragments; clear, smooth horizon boundary; extremely acid, pH 4.5.

Bf2	18-28	Range 5-15 cm; reddish yellow (7.5YR 6/6 d); very fine sandy loam; angular blocky structure; very few, very fine roots; 10% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; extremely acid, pH 4.5.
C	28 +	Reddish brown (5YR 5/3 m), light brown (7.5YR 6/4 d); very fine sandy loam; fine, faint mottles; platy structure; 10% by volume of gravelly coarse fragments; clear, wavy horizon boundary; extremely acid, pH 4.5.

Range of characteristics. The soils are characterized by relatively thin LFH and Ae horizons. Below the Ae horizon, a thin Bhf horizon is usually present. The texture of the B horizon is mainly very fine sandy loam, but in isolated pockets it is loamy sand, usually near the toe of the slope and some large gullies. The high sand fraction is probably the result of minor washing during deposition of the parent material.

The subsoils are sometimes dense or compacted but not cemented. The soils are generally shallow, with bedrock exposures common on the hill tops. The profile often contains small, highly weathered dolomitic stones in which weathering occurs as a dark gray heavy-textured ring surrounding the stone. In areas where the soils are shallow gleying occurs near the bedrock contact.

Similar soils. The name North Lake as used in the Cormack-Deer Lake soil survey report (Button 1983) has been used to describe a taxadjunct soil in this report. However, the name only applies to soils that occur in the Humber pedoclimatic zone; an equivalent soil in the Mountain pedoclimatic zone is called Keats Pond.

Land use. Stoniness, topography, and shallowness to bedrock make soils unsuitable for agriculture. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a North Lake soil (taxadjunct)

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca	Mg	K	Al (meq/100 g)	Available P (µg/g)
LF	3-0	3.7						14.7	3.16	0.97	3.66	105.6
Ae	0-2	3.6	0.77	0.03	26	0.04	0.02	0.88	0.22	0.05	0.70	4.5
Bhf	2-3	4.0	5.88	0.27	22	1.23	1.20	1.17	0.22	0.11	3.28	6.0
Bf1	3-18	4.5	1.74	0.08	22	0.20	0.50	0.22	0.03	0.05	0.47	1.5
Bf2	18-28	4.5	1.23	0.06	21	0.32	0.45	0.20	0.04	0.03	0.33	4.5
C	28 +	4.5	0.22	0.01	22	0.07	0.16	0.17	0.03	0.05	0.50	25.0

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae	0-2	15.0	71.3	9.8	15.6	11.4	19.8	14.7	26.3	2.4
Bhf	2-3	12.0	70.6	17.2	18.3	11.1	13.5	10.4	25.0	4.4
Bf1	3-18	10.0	65.2	11.2	14.9	10.1	16.2	12.8	29.4	5.4
Bf2	18-28	10.0	69.6	9.6	14.4	11.2	19.3	15.2	27.1	3.3
C	28 +	10.0	70.9	12.5	15.3	10.8	17.4	15.0	24.7	4.4

NORTH POND MAP UNIT 520 ha

Location. The North Pond soils are located on the northern map sheet, primarily east of Indian Dock Pond.

Parent material. The parent material is a medium-textured till derived from phyllite and shales.

Topography. These soils have developed on inclined and gentle slopes (see Fig. 17).

Drainage classes. Surface: well drained. Internal: well drained, but where the bedrock is close to the surface drainage could be impeded.

Vegetation. The main tree cover is balsam fir, black spruce, and larch. This area was previously selectively cut for the lumber industry but is now being utilized for the pulp and paper industry. Tree growth on these soils is good, especially balsam fir and black spruce. Common ground cover consists of fir seedlings, bunchberry, clintonia, feather moss, and sphagnum moss.

Soil classification. Orthic Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located on the west side of North Lake, on a slope of 12% at an elevation of 175 m.

The site vegetation is balsam fir, black spruce, and larch, with a ground cover of fir seedlings, bunchberry, clintonia, feather moss, and sphagnum.

Horizon	Depth cm	
L	10-8	Range 1-3 cm; extremely acid, pH 4.1.
F	8-0	Range 4-8 cm; dark gray (10YR 4/1 m); medium, horizontal roots; clear, irregular horizon boundary; extremely acid, pH 3.6.
Ae	0-3	Range 1-5 cm; gray (7.5YR 6/0 m); silt loam; medium, horizontal roots; 30% by volume of coarse fragments; clear, broken horizon boundary; extremely acid, pH 4.1.
Ae2	3-7	Range 0-6 cm; dark reddish brown (2.5YR 3/4 m); gravelly fine sandy loam; very weak, subangular blocky structure; few, very fine, random roots; 35% by volume of coarse fragments; loose consistence; clear, broken horizon boundary; neutral, pH 6.7.

Bf1	7-17	Range 4-15 cm; dark yellowish brown (10YR 4/6 m); loam; weak, angular blocky structure; few, very fine, random roots; 30% by volume of coarse fragments; loose moist consistence; diffuse, broken horizon boundary; extremely acid, pH 3.8.
Bf2	17-39	Range 15-30 cm; olive (5Y 4.5/4 m); coarse sandy loam; few, fine, oblique roots; 40% by volume of coarse fragments; very strongly acid, pH 4.6.
R	39 +	Fragmental bedrock, easily split.

Range of characteristics. The organic surface layer ranges from 8 to 10 cm. At the detail profile description site, the chemical data indicate that the soils have two Ae horizons. The first Ae horizon is the usual gray color, but the second Ae horizon has a dark reddish brown (2.5YR 3/4 m), similar to a podzolic B horizon. The chemical data indicate that the horizon does not meet the podzolic B requirements and is, therefore, considered an Ae2 horizon (see Plate IIe).

Land use. Topography and shallowness to bedrock make these soils unsuitable for agriculture. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a North Pond soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)
L	10-8	4.1	48.2	1.10	44			19.9	11.8	2.5	0.40
F	8-0	3.6	43.4	1.09	40			17.9	5.9	2.0	5.97
Ae	0-3	4.1	1.79	0.09	20	0.15	0.11	1.05	1.03	0.15	4.18
Ae2	3-7	6.7	0.19	0.01	19	0.02	0.01	5.22	0.88	0.09	-
Bf1	7-17	3.8	3.66	0.19	19	1.13	0.53	0.43	0.21	0.08	3.05
Bf2	17-39	4.6	3.40	0.13	26	0.24	0.96	0.39	0.16	0.07	0.50
R	39 +										

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Ae2	3-7	55.0	6.4	10.7	8.5	14.6	14.7	37.5	7.5
Bf	7-17	36.4	9.3	8.9	4.4	7.3	6.5	45.0	18.6
Bf2	17-39	60.2	17.5	19.2	6.4	10.7	6.5	29.9	9.8

ORGANIC 1 MAP UNIT 240 ha

Location. The Organic 1 soils are located primarily in the Highland zones.

Parent material. These soils have developed on slightly to moderately decomposed sphagnum.

Topography. The deposits are generally domed or inclined bogs and are characterized by long narrow sinuous ridges running between areas of open water.

Drainage classes. Surface and internal: very poorly drained. The soils exhibit a high water table all year long. Open water or flashets occupy 20-40% of the surface.

Vegetation. The vegetation cover is primarily sphagnum moss, with minor amounts of sedges. On small hummocks, kalmia, leather leaf, and scrub black spruce can be found.

Soil classification. Terric Mesisol.

Pedoclimatic zone. Mountain.

Description of a representative profile.

Horizon	Depth cm	
Of1	0-10	von Post scale of humification 2-3.
Of2	10-30	von Post scale of humification 3-4.
Om	30-40	von Post scale of humification 6-7.
Om-Oh	40-110	von Post scale of humification 6-8; alternating layers of Om and Oh, with the Oh occurring as small thin (less than 7 cm)bands near the lower limit of the horizon.
Cg	110 +	Silty loam, till.

Range of characteristics. The thickness and decomposition of the organic layers or tiers are highly variable (see Plate IIIa).

Similar soils. The Organic 1 soils can occur alone or in association with Organic 3 (stream fen).

Land use. High water table, small surface area, and occurrence of flashets greatly limit this soil for agriculture.

ORGANIC 2 MAP UNIT 220 ha

Location. The Organic 2 soils, which are classified as floating fens, are located on the west side of Deer Lake in the area of Coal Brook.

Parent material. Soils are derived from sedges and grasses in varying stages of decomposition, along with an extensive cover of alder with some larch and stunted black spruce.

Topography. These soils have developed in large shallow depressional areas (see Fig. 13).

Drainage classes. Surface and internal: very poorly drained, with water at or near the surface for most of the year.

Vegetation. These organics are covered by a dense growth of speckled alder. Small larch and black spruce occupy small hummocks. Sedges and grasses cover these organics and are the main components in the deposits.

Soil classification. Hydric Fibrisol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed site location is on the west side of Deer Lake near the Coal Brook area.

Horizon	Depth cm	
Of	0-20	Dark yellowish brown (10YR 4/4 m); von Post scale of humification H5 to H6; many, medium roots.
W	20-95	Water.
Om	95 +	Difficult to obtain adequate sample.

Range of characteristics. The soils have an Of layer that ranges from 25 to 35 cm and overlies an aqueous or W layer. Along the edges of the deposit the water layer is less evident or absent. This type of organic deposit is often referred to as a floating fen.

Land use. Extreme wetness, high water table, and the presence of an aqueous layer make these soils unsuitable for agriculture.

ORGANIC 3 MAP UNIT 790 ha

Location. The Organic 3 soils are located primarily in the Highland zones.

Parent material. The soils have developed on a shallow organic deposit of highly decomposed sedges and grasses.

Topography. These organic soils or stream fens occur in small depressional areas between rock ridges and sometimes till hummocks (see Fig. 17).

Drainage classes. Surface and internal: poorly drained because of a high water table. Small streams are associated with these deposits and are susceptible to flooding during periods of high runoff, especially in spring and fall.

Vegetation. The vegetation is dominantly sedges and grasses with a significant amount of sweet gale, leather leaf, golden rod, and feather moss. The treed vegetation occurs along the edge of the deposit and on small mounds and usually consists of black spruce and larch.

Soil classification. Terric Fibric Humisol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed site location is 1 km east of West Pond.

Horizon	Depth cm	
Of1	0-13	Dark brown (7.5YR 3/2 m); slighly decomposed sedges and grasses; von Post scale of humification 3-4.
C	13-14	Light gray (7.5YR 7/0 m); loamy sand.
Of2	14-37	Dark grayish brown (10YR 4/2 m); slighly decomposed sedges and grasses; von Post scale of humification 4; woody fragments.
C	37-38	Light gray (7.5YR 7/0 m); loamy sand.
Oh	38-113	Very dark grayish brown (10YR 3/2 m); highly decomposed sedges and grasses, von Post scale of humification 7-8.
Cg	113 +	Light gray to gray (7.5YR 6/0 m); silty clay loam.

Range of characteristics. Soil depth ranges from 100 to 150 cm and generally is overlying till, but in some areas the deposits have developed on bedrock. The upper tier from 0 to 40 cm is fibric, with the middle tier abruptly changing to humic. The Organic 3 soils are unique in that the upper tier is characterized by thin layers of alluvium material. These layers have been deposited during periodic flooding or inundation from small streams that flow through the deposits. In some deposits, however, the layers are absent (see Plate IIIa).

Land use. Frequent inundation and high water table make these soils unsuitable for agriculture.

ORGANIC 4 MAP UNIT 235 ha

Location. The Organic 4 soils are located primarily in the Highland zones.

Parent material. The parent material is derived from sedges and sphagnum mosses.

Topography. Level to very gently sloping (see Fig. 15).

Drainage class. Very poorly drained. High water table for most of the year. Nutrient-rich or minerotrophic water is supplied to the deposit from the surrounding slopes.

Vegetation. The treed vegetation usually occurs along the edge of the deposit and consists of stunted black spruce, larch, and white birch. Sedges and sheep laurel form a ground cover.

Soil classification. Terric Mesisol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed site location is 1 km east of the North Lake dam, on a slope of 1% at an elevation of 210 m.

Horizon	Depth cm	
Of	0-20	Yellowish brown (10YR 5/4); slighly decomposed sedges and grasses; von Post scale of humification 4.
Om	20-65	Dark brown (7.5 3/2 m) to black; moderately decomposed; von Post scale of humification 7; woody fragments occur in lower part of horizon (woody fen).
Cg	65 +	Loamy till.

Range of characteristics. Soil depth ranges from 65 to 100 cm with the greatest depths generally occurring near the centre of the deposits. Woody material occurs below the 20-cm depth, with some woody material occurring near the mineral surface horizon.

Land use. Extreme wetness, poor ability to drain, and the presence of woody material make these soils unsuitable for agriculture.

SNUG HARBOUR MAP UNIT 280 ha

Location. The Snug Harbour soils are located around the Coal Brook area.

Parent material. The parent material is a sandy gravelly fluvial deposit of mixed lithology.

Topography. The soils have formed on nearly level to slightly depressional terrain (see Fig. 13).

Drainage classes. Surface: poorly to moderately drained. This wide range of surface drainage is due to the fluctuating water table, which is sometimes at or near the surface, especially in the spring. During the summer months, the water table drops and both surface and internal drainage improve.

Vegetation. The treed vegetation is primarily stunted black spruce, larch, and speckled alder. The ground cover consists of sheep laurel, bunchberry, and feather moss.

Soil classification. Gleyed Humo-Ferric Podzol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located northeast of Bowater's Snug Harbour log boom site, on a slope of 2% at an elevation of 38 m.

The site vegetation is primarily stunted black spruce, larch, and alder. The ground cover consists of sheep laurel, bunchberry, and feather moss.

Horizon	Depth cm	
LFH	9-0	Range 7-10 cm; plentiful, medium, horizontal roots; extremely acid, pH 3.0.
Aeg	0-8	Range 4-14 cm; light brownish gray (10YR 6/2 m), pinkish white (7.5YR 8/2 d); loamy sand; few, fine, faint mottles; common, very dense, fine, tubular pores; few, fine, horizontal roots; 10% by volume of gravelly coarse fragments; abrupt, smooth horizon boundary; extremely acid, pH 3.7.
Bfcjg	8-15	Range 6-14 cm; dark reddish brown (5YR 3/3 m), brown to dark brown (10YR 4/3 d); sandy loam; few, fine, faint mottles; moderate, platy structure; firm consistence; humus-aluminum; weakly to strongly cemented; discontinuous; 20% by volume of gravelly coarse fragments; clear, wavy horizon boundary; extremely acid, pH 3.9.

Bfg	15-33	Range 20-27 cm; yellowish red (5YR 5/6 m), yellow (10YR 7/6 d); coarse sandy loam; common, medium, distinct mottles; very weak, medium, angular blocky structure; sticky consistence; irregular, 15% by volume of gravelly coarse fragments; gradual horizon boundary; extremely acid, pH 4.3.
ICg	33 +	Light brown (7.5YR 6/4 d); gravelly sand; common, medium, distinct mottles; non-sticky consistence; 10% by volume of gravelly coarse fragments; gradual, wavy horizon boundary; extremely acid, pH 4.3.
IICg		Light brown (7.5YR 6/4 d); sand; 10% by volume of gravelly coarse fragments; abrupt, smooth horizon boundary; extremely acid, pH 4.3.

Range of characteristics. The Snug Harbour soils generally have an LFH horizon 7 to 10 cm thick, but in some areas a thin Of or Oh horizon occurs below theLFH horizon. A thick, dense, firm Aeg horizon is characteristic of these soils. The Aeg horizon overlies a weakly cemented Bfcjg horizon, but in scattered local pockets or islands an ortstein (Bfcg) horizon occurs. The Snug Harbour soil has been classified as a Gleyed Humo-Ferric Podzol, but in some areas a peaty phase occurs.

Land use. Wetness due to a highly fluctuating water table makes these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

Chemical and physical analysis of a Snug Harbour soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)	Available P (µg/g)
LFH	9-0	3.0						6.48	6.61	0.98	8.33	90.6
Aeg	0-8	3.7	0.29	0.01	29	0.04	0.03	0.12	0.08	0.03	1.70	3.5
Bfcjg	8-15	3.9	3.62	0.13	28	0.97	0.74	0.51	0.11	0.05	3.81	4.5
Bfg	15-33	4.3	1.31	0.05	26	0.12	0.37	0.07	0.02	0.03	0.81	2.5
ICg & IICg	33 +	4.3	0.27	0.01	27	0.05	0.09	0.10	0.12	0.03	0.67	23.5

Particle size distribution

Horizon	Depth (cm)	Gravel by volume (%)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Aeg	0-8	11.0	75.7	17.6	24.1	9.4	14.0	10.5	21.6	2.8
Bfcjg	8-15	20.0	66.1	12.9	19.7	9.2	13.6	10.6	21.3	12.7
Bfg	15-33	15.0	68.5	15.3	20.6	9.0	13.0	10.6	23.4	8.1
ICg & IICg	33 +	10.0	90.9	14.1	28.1	16.3	25.1	7.3	4.9	4.2

SQUARE POINT MAP UNIT 1110 ha

Location. The Square Point soils are located on the southeast corner of the survey area, near Blue Gulch Pond.

Parent material. The parent material is dark olive gray till derived from gray siltstone and minor gray sandstone.

Topography. These soils have formed in low-lying and depressional areas (see Figs. 16 and 18).

Drainage classes. Surface and internal: poorly drained. The water table is at or near the surface for prolonged periods.

Vegetation. The dominant tree species on these soils is stunted black spruce. Mountain maple forms an understory to the spruce. Ground cover consists of ferns, sphagnum moss, feather moss, and bunchberry. Forest stands on associated soils have been harvested for the pulp and paper industry, whereas tree stands on the Square Point soils have little or no commercial value.

Soil classification. Orthic Gleysol.

Pedoclimatic zone. Mountain.

Description of a representative profile. Detailed soil pit described is located southwest of Square Pond, on a slope of 2-5%, at an elevation of 290 m.

The site vegetation is stunted black spruce and mountain maple, with a ground cover of ferns, feather moss, sphagnum moss, and bunchberry.

Horizon	Depth cm	
L	28-25	Range 2-5 cm.
F	25-0	Range 20-30 cm; black (5YR 2.5/1 m); material composition; 20% needles, 30% sphagnum, 20% herbaceous fragments, and 30% woody fragments.
Bg	25-42	Olive gray (5Y 5/2 m); silt loam; many, medium, distinct mottles; structureless; wet consistence; slightly sticky; flaggy coarse fragments.
BCg	42 +	Olive gray (5Y 5/2 m); silt loam; many, medium, distinct mottles; wet consistence; slightly sticky; flaggy coarse fragments.

Range of characteristics. Distinct mottling occurs throughout the profile, indicative of the high water table that affects the soil. Large siltstone flagstones occur on the surface and throughout the entire profile. These flagstones are in a stacked or layered position, one on top of the other, which makes it difficult for tree roots to adequately penetrate the soil and anchor the trees. This structure, in combination with a high water table, results in very shallow root development, and the area is characterized by many up-rooted trees or windfalls.

Land use. Excessive stoniness, wetness, and climate make these soils unsuitable for agriculture. The CLI class rating for agriculture is 7.

WEST POND MAP UNIT 624 ha

Location. The West Pond soils are located on the west side of Deer Lake and occur primarily close to the shoreline.

Parent material. The parent material is a reddish brown loamy till derived from red micaceous sandstone.

Topography. These soils occur on gentle to gently undulating terrain. They occupy low-lying areas or swales and depressional areas (see Fig. 14).

Drainage classes. Surface and internal: poorly drained.

Vegetation. The dominant tree species on these soils are stunted black spruce, balsam fir, and minor trembling aspen. Ground cover consists of buttercup, blackberry, mountain maple, fern, horsetail, and sphagnum moss.

Soil classification. Orthic Gleysol.

Pedoclimatic zone. Humber.

Description of a representative profile. Detailed soil pit described is located on the west side of Deer Lake between Little North Brook and Big Tenth Brook, on a slope of 3% at an elevation of 45 m.

The site vegetation is stunted black spruce, balsam fir, and minor trembling aspen. Ground cover consists of buttercup, blackberry, mountain maple, fern, horsetail, and sphagnum moss.

Horizon	Depth cm	
Om	20-0	Black (2.5YR 2.5/0 m); moderately decomposed material; von Post scale of decomposition 7-8; abrupt, smooth boundary; few, medium, horizontal roots; very strongly acid, pH 5.0.
Bg	0-30	Dark reddish brown (2.5YR 3/4 m); fine sandy loam; moderate to strong angular blocky structure; 15% by volume of coarse fragments; platy secondary structure; friable moist consistence; few, fine, distinct mottles; strongly acid, pH 5.5.

Range of characteristics. The West Pond soils are affected by lateral seepage, which can be observed at around 30-40 cm. Mottles indicative of reduction, which is caused by high water tables and seepage, are difficult to discern in these soils because of the red color of the parent material (see Plate IIIb).

Land use. Poor drainage limits these soils for agricultural use, but in specific areas they could support rough pasture. The CLI class ratings for agriculture are 5-7.

Chemical and physical analysis of a West Pond soil

Horizon	Depth (cm)	pH 1:2 $CaCl_2$	C (%)	N (%)	C-N ratio	Sodium pyrophosphate Fe (%)	Sodium pyrophosphate Al (%)	Exchangeable cations Ca (meq/100 g)	Exchangeable cations Mg (meq/100 g)	Exchangeable cations K (meq/100 g)	Exchangeable cations Al (meq/100 g)
Om	20-0	5.0	39.9	1.42	28	-	-	90.5	4.54	0.80	-
Bg	0-30	5.5	0.21	0.01	21	0.05	0.02	2.31	0.17	0.06	-

Particle size distribution

Horizon	Depth (cm)	Sand fraction (%) Total sand (%)	VCS 2-1 (mm)	CS 1-0.5 (mm)	MS 0.5-0.25 (mm)	FS 0.25-0.1 (mm)	VFS 0.1-0.05 (mm)	Silt (%)	Clay (%)
Bg	0-30	66.3	6.7	10.3	9.1	22.4	17.7	29.9	3.8

LAND TYPES

ROCKLAND I

The Rockland I land type consists of all areas that have 75% or greater of the surface occurring as bare rock (see Figs. 14 and 17 and Plate IIIa).

ROCKLAND II

The Rockland II land type consists of areas that are covered by an organic mat (<10 cm) and have 50-75% of the surface occurring as exposed bedrock. Both Rockland I and Rockland II land types are found in association with each other and with Ninth Brook soils (see Fig. 17 and Plate IIIa).

LAND USE INTERPRETATIONS

SOIL SUITABILITY FOR AGRICULTURE

A soil's suitability or potential for agriculture depends on the number, type, and severity of the limitations affecting the soil (see Appendix D). Soils with common limitations or groups of limitations are grouped into one of the Canada Land Inventory (CLI) classes for agriculture. The classes range from 1 to 7, with 7 having the most severe limitations.

In Newfoundland there are no Class 1 or Class 2 soils, due to severe climate restrictions, and there are no Class 6 soils, because of the absence of natural grasslands. CLI classes 3, 4, 5, and 7 can be applied to the soils of the Pasadena-Deer Lake area. Subclasses indicating specific limitations are denoted by a letter.

Class 3 soils have moderately severe limitations that either restrict the range of crops or require special conservation practices. Under good management, these soils are fair to moderately high in productivity for crops adaptable to the area. The main limitations are ease of tillage, planting and harvesting, and the maintenance of conservation practices, coupled with adverse climate, topography, and stoniness.

Class 4 soils have severe limitations that either restrict the range of crops or require special conservation practices, or both. They are suitable for fewer crops than Class 3 soils, have relatively lower yields, and have an increased risk of crop failure. Other limitations may affect such farm practices as the timing and ease of tillage, planting and harvesting, and the application and maintenance of conservation practices.

Class 5 soils have severe limitations that restrict their use to producing perennial forage crops, but improvement practices are feasible. The soils in this class have such serious soil, climate, or other limitations that they are unsuitable for sustained production of annual field crops.

Class 7 soils have limitations severe enough to make them unsuitable for arable agriculture or permanent pasture. The main limitations in this class are stoniness, excessive water, flooding, restrictions to rooting by bedrock or soil structure, moisture deficiency, and topography or a combination of one or more of these factors.

Subclasses used to denote limitations for soils in the Pasadena-Deer Lake area are as follows:

(c) adverse climate;
(d) undesireable soil structure, low permeability;
(e) erosion;
(f) low inherent fertility;
(m) moisture deficiency;
(p) stoniness;
(r) bedrock;
(s) combination of two or more of subclasses d, f, and m.
(t) topography;
(w) excess soil moisture.

Soils that have been grouped into a common class are similar on the basis of the agricultural potential, but their specific limitations may be very different. For example, a soil that has been placed in Class 4 may have a stoniness limitation and be assigned a subclass p, whereas another Class 4 soil may have a moisture deficiency problem and be assigned a subclass m. Therefore, to extract the maximum amount of information from the CLI classification, a basic understanding of each soil's characteristics and limitations, which can be obtained from the report, is essential. Capability class and subclasses of the soils for agriculture in the Pasadena-Deer Lake area have been outlined in Table 7. Area estimates for the soils and non-soils mapped in the area are listed in Table 8.

Cation exchange capacity and exchangeable cations

The cation exchange capacity (CEC) is a measure of the storage capacity of the colloidal complex for exchangeable cations or, simply, the amount of nutrients the soil can hold in storage for plant growth. CEC is dependent on factors such as pH, organic matter content, and clay content. The CEC for the soils in the Pasadena-Deer Lake area has been measured at the pH of the soil or permanent CEC charge.

The cation exchange capacities for soils in the Pasadena-Deer Lake area are relatively low. The highest rates occur in the surface organic layer and decrease sharply in the A horizon. Rates in the B horizon are only slightly higher than those in the A horizon. The C horizon in several soils shows higher rates than the B horizon, but this increase can be attributed to the influence of calcareous bedrock and rock fragments in the parent material and their finer texture. The relatively low cation exchange capacity of the soils is related to their low organic content, coarse texture, and low pH.

Table 7. Capability class and subclasses of the soils for agriculture

Class 3	Class 4	Class 5	Class 7	Subclasses
Hughes Brook				e
	Coal Brook			mf
	Earle			mfp
	Big Tenth Brook			mf
	Little North Brook			we
		Camp Mortley		md
		Maxwell		md
		Microwave		we
		Bowater		tp
		Glide Mountain		wd
		Middland		wp
		Mistaken Pond		tr
		North Lake		ptr
		North Pond		tr
		West Pond		we
			Beaver Brook	wtc
			Bingles Pond	wt
			Blue Gulch	rc
			Canal	trw
			Island Pond	trc
			Keats Pond	ptrc
			Lakelannd	w
			Little Rapids	wtp
			Logger's Cove	dc
			Ninth Brook	trc
			North	trw
			Snug Harbour	w
			Square Pond	wp
			Rockland I	rc
			Rockland II	rc

subclasses
c - adverse climate
d - undesirable soil structure, low permeability
e - erosion
f - low inherent fertility
m - moisture deficiency
p - stoniness
r - bedrock
s - combination of two or more of subclasses d, f, and m
t - topography
w - excess soil moisture

Table 8. Area estimates of the soils and non-soils mapped in the Pasadena-Deer Lake survey area map sheets

Soil and non-soil name		Area on northern map (ha)	Area on southern map (ha)	Total for survey area (ha)	Percentage of total map area
Beaver Brook	BB	960	120	1 080	4.5
Big Tenth Brook	BTB		230	230	1.0
Bingles Pond	BP	875	170	1 045	4.4
Blue Gulch	BL		2 060	2 060	8.6
Bowater	BO		530	530	2.2
Camp Mortley	CM		110	110	0.5
Canal	C	210	180	390	1.6
Coal Brook	CB	740	25	765	3.2
Earle	E	15	1 220	1 235	5.2
Glide Mountain	GM		710	710	3.0
Hughes Brooke	HB		630	630	2.6
Island Pond	IP	280	-	280	1.2
Keats Pond	KP	1 880	30	1 910	8.0
Lakelannd	LL		400	400	1.7
Little North Brook	LNB	50	1 020	1 070	4.5
Little Rapids	LR		450	450	1.9
Logger's Cove	LC	11		11	0.1
Maxwell	M		200	200	1.0
Microwave	MW		640	640	2.7
Middland	ML	60	710	770	3.2
Mistaken Pond	MP		880	880	3.7
Ninth Brook	NB	240	450	690	2.9
North	N	430	170	600	2.5
North Lake	NL	1 850	70	1 920	8.0
North Pond	NP	520		520	2.2
Organic 1	O1	160	80	240	1.0
Organic 2	O2	210	10	220	0.9
Organic 3	O3	420	370	790	3.3
Organic 4	O4	75	160	235	1.0
Rockland I	RI	200	560	760	3.2
Rockland II	RII	315	100	415	1.7
Snug Harbour	SH	280		280	1.2
Square Pond	SP		1 110	1 110	4.7
West Pond	WP	34	590	624	2.6
		9 815	13 985	23 800	100%

For agricultural use, all the soils require soil amendments in the form of agricultural limestone, fertilizer, and organic matter. These soil management practices are extremely important in maintaining good crop yields.

Total nitrogen and carbon-to-nitrogen ratio

The nitrogen in soil depends on organic matter content, its rate of decomposition by microbial activity, and the conversion of nitrogen into soluble forms that are retained or lost by the soil. The nitrogen content of a particular soil is directly related to the organic carbon content of the soil and the total nitrogen status of the soil. The carbon-to-nitrogen ratio is used to express the relationship between carbon and nitrogen.

Carbon-to-nitrogen ratios over 30 for mineral horizons usually indicate a relatively inactive condition. Ratios of 15-30 indicate that the microbial activity is normal to above normal and that the organic matter content of the soil is undergoing reduction. Ratios of less than 15 indicate a relatively large supply of organic matter, intense microbial activity, and rapid reduction of the organic matter content.

In general, the carbon-to-nitrogen ratios of the soils in the Pasadena-Deer Lake area decrease with depth, with the large ratios occurring in the organic surface area and in the B horizon. Most of the carbon-to-nitrogen ratios are below 23.

Soil reaction (pH)

Soil reaction is an important chemical characteristic of a given soil. The pH is a method to measure the soil's degree of acidity or alkalinity. The soils of the Pasadena-Deer Lake area have developed under a perhumid environment and with related high precipitation all the soils have become acidic in their reaction. The relatively high rainfall facilitates the leaching of exchangeable bases in the soil profile. The pH measurements in the soils in the survey area range from 2.9 to 5.9. The lower pH readings occur in the L, F, and H layers, with an average pH of 3.6; the A horizons have an average pH of 3.6; the B and BC horizons have an average pH of 4.5, and the C horizons or parent material have an average pH of 4.7. In general, the pH decreases with depth, but the soil reaction classes still fall into the extremely to very strongly acid range.

All the soils with agricultural potential require agricultural limestone to increase their pH, which helps to maintain good crop yields and to control disease.

ORGANIC SOILS: SUITABILITY FOR AGRICULTURE

In the Pasadena-Deer Lake area, organic deposits make up approximately 15% of the surveyed area. Numerous small (less than 10 ha), shallow (less than 2 m) organic deposits occur throughout the area, mainly in the Highland zones. A few large organic deposits occur near the shoreline on relatively flat to depressional land.

Fens and stream-fens are the most common organic deposits in the area. They are usually small and controlled by the surrounding topography and are probably the result of infilling of small ponds or depressional areas. This is especially evident where meandering stream-fens have formed between rock ridges and small valleys. These deposits are influenced by nutrient-rich (mineratrophic) water and have a dominant vegetation cover of sedges and grasses along with an abundance of aster, burnet, goldenrod, sweet gale, and honeysuckle. Toward the edge of these deposits and on small hummocks, shrubs and trees are common, especially kalmia, leather leaf, stunted black spruce, and larch.

The organic deposits in the Pasadena-Deer Lake area are generally small and constrained by local topography. Their depth, decomposition, water regime, and surface expression are highly variable and often single deposits exhibit a wide range of characteristics. These factors in combination with the problem of flashets and woody fragments make standard peatland reclamation practices difficult, if not impossible; therefore, the peatland soils of the area are unsuitable for large-based agricultural development.

SOIL EROSION

The susceptibility of a soil to erosion is primarily a function of its inherent soil properties, rainfall (duration and intensity), and slope (steepness and length). The natural landscape is being eroded by wind, rain, and gravity, but the effects of these elements are generally negligible to slight in the undisturbed landscape. However, the effect of erosion can be more readily seen when activities such as forestry and agriculture accelerate the process. In determining the erodibility for the soils of the Pasadena-Deer Lake area, only erosion by water was considered; the potential erosion by wind was deemed negligible.

Since agriculture is not extensive in the province and no monitoring of on-farm erosion has taken place, no data are available. However, a relatively simple way of estimating the potential rate of soil erosion is by using the K, or soil erodibility, factor as expressed in the Universal Soil Loss Equation (USLE). The equation is as follows:

$$R \times K \times LS \times C \times P = A$$

where: R = rainfall factor
K = soil erodibility factor
LS = length and steepness of slope factor
C = cropping and management factor
P = conservation practices factor
A = computed average annual soil erosion loss in tonnes per hectare.

Except for the K, or soil erodibility, factor,[1] which is dependent on specific inherent soil properties, these factors are directly affected by the locale, crop type, and landscape.

[1] K-factor is defined as the average soil loss per unit EI^2 measured on a 22.14 m, 9% slope, tilled continuous fallow.

To calculate the K-factor, five soil parameters are needed: percentage of silt plus very fine sand; percentage of sand greater than 0.10 mm; organic matter content; structure; and permeability. Because of lack of data on structure and on permeability these two parameters were not considered when determining the K-factor for the soils of the survey area. The remaining three factors were plotted on the soil erodibility nomograph (Wischmeier et al. 1971), to obtain the first approximation of K. Soil horizons meeting the following criteria were considered: the A horizons to a depth greater than 10 cm and the B horizons to a depth of approximately 30 cm, in other words the depth most likely to be influenced by agricultural practices.

The K-factor soil parameters were then further refined by considering the volume percentage of coarse fragments greater than 2 mm (U.S. Dep. Agric. 1983). This parameter was incorporated into the calculations because coarse fragments are a significant soil property. They act as an intercepting or impeding element to the flow of water and the effects of rain over the bare soil.

Table 9 lists the adjusted K-factor soil parameters for major soils and selected horizons. Most of the values are relatively low, with 75% of the horizons having values less than 0.20. The remaining 25% of the horizons have values over 0.20, which include some of the most potentially productive agricultural soils (that is, Hughes Brooke and Little North Brook).

The severity of the erosion is also a function of slope length and steepness, which can vary greatly from field to field or even within a single field. As slopes become steeper and longer the rate of runoff increases and erosion is accelerated. However, if proper management practices are followed the potential for erosion becomes negligible.

Table 9. Adjusted K-factor soil parameters for major soils and selected horizons

Soil name	Horizon	K-factor first approximation	Adjusted K-factor for volume percentage of coarse fragments
Beaver Brook	Bhfg	0.16	0.07
Big Tenth Brook	Bf1	0.05	0.05
Bingles Pond	Bhfg	0.16	0.07
Blue Gulch	Bhf1	0.26	0.13
	Bhf2	0.28	0.17
Bowater	Ae	0.30	0.11
	Bf	0.20	0.08
	Bfgj	0.15	0.05
Camp Mortley	Bf1	0.21	0.04
	Bf2	0.17	0.02
Canal	Bmgj	0.29	0.14
	Bmg	0.29	0.22
Coal Brook	Bhf	0.06	0.06
	Bfc	0.05	0.05
	BCcj	0.07	0.07
Earle	Bf1	0.13	0.10
	Bf2	0.17	0.10
Glide Mountain	Aegj1	0.43	0.33
	Aegj2	0.48	0.26
	Bfgj	0.28	0.17
Hughes Brooke	Ae	0.38	0.28
	Bf	0.22	0.14
Island Pond	Bf1	0.20	0.10
Little North Brook	Aegj	0.37	0.23
	ABgj	0.34	0.20
	Bmg	0.27	0.15
Little Rapids	Bfg	0.22	0.09
Logger's Cove	Bhfc	0.03	0.03
Maxwell	Bfcgj	0.02	0.02
Microwave	Bmg	0.34	0.26
North Lake	Bhf	0.15	0.10
	Bf1	0.24	0.18
	Bf2	0.28	0.22
Snug Harbour	Bfcjg	0.11	0.06
	Bfg	0.19	0.14
West Pond	Bg	0.38	0.25

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APPENDIXES

APPENDIX 1. COMMON AND BOTANICAL NAMES OF PLANTS

Trees growing in survey area

Common name	Botanical name
ash, American mountain	Sorbus americana (Marsh.)
aspen, trembling	Populus tremuloides (Michx.)
birch, white	Betula papyrifera (Marsh.)
birch, yellow	Betula alleghaniensis (Britt.)
cherry, pin	Prunus pensylvanica L.f.
chokecherry	Prunus virginiana L.
fir, balsam	Abies balsamea (L.) Mill.
larch, American	Larix laricina (Du Roi) C. Koch
maple, mountain	Acer spicatum Lam.
pine, Eastern white	Pinus strobus L.
pine, jack	Pinus banksiana Lamb.
pine, red	Pinus resinosa Ait.
poplar, balsam	Populus balsamifera L.
spruce, black	Picea mariana (Mill.) BSP
spruce, white	Picea glauca (Moench) Voss

Shrubs growing in survey area

Common name	Botanical name
alder, mountain	Alnus crispa (Ait.) Pursh
alder, speckled	Alnus rugosa (Du Roi) K. Spreng.
blueberry	Vaccinium angustifolium Ait.
cinquefoil	Potentilla fruticosa L.
crowberry, black	Empetrun nigrum L.
dogwood, red-osier	Cornus stolonifera Michx.
elderberry, red	Sambucus pubens Michx.
hazelnut, beaked	Corylus cornuta (Marsh.)
holly, mountain	Nemopanthus mucronatus (L.) Trel.
honeysuckle, northern	Lonicera villosa (Michx.) R. & S.
juniper, common	Juniperus communis L.
juniper, trailing	Juniperus horizontalis Moench
laurel, bog-	Kalmia polifolia Wangenh.
laurel, sheep	Kalmia angustifolia L.
leatherleaf	Chamaedaphne calyculata (L.) Moench
nannyberry	Viburnum lentago L.
partridgeberry	Vaccinium vitis-idaea L.
raisin, wild	Viburnum cassinoides L.
raspberry	Rubus idaeus L.
rosemary, bog	Andromeda glaucophylla Link
serviceberry	Amelanchier spp.
tea, Labrador	Ledum groenlandicum Oedr.
willow	Salix spp.
yew, Canadian	Taxus canadensis (Marsh.)

Ground covers growing in survey area

Common name	Botanical name
aster, bog	Aster nemoralis Ait.
aster, New York	Aster novi-belgii L.
bunchberry	Cornus canadensis L.
burnet, Canadian	Sanguisorba canadensis L.
cattail, common	Typha latifolia L.
clintonia	Clintonia borealis (Ait.) Raf.
everlasting, pearly	Anaphalis margaritacea (L.) Benth. & Hook.
fern, sweet	Comptonia peregrina (L.) J. Coult.
fern, wood	Dryopteris austriaca var. spinulosa (O.F. Müll.)
fireweed	Epilobium angustifolium L.
gale, sweet	Myrica gale L.
goldenrod	Solidago canadensis L.
horsetail, wood	Equisetum sylvaticum L.
Indian-pipe	Monotropa uniflora L.
lady's-slipper	Cypripedium acaule Ait.
lichen	Lichen spp.
moss, caribou	Cladonia rangiferina (L.) Wigg
moss, feather	Hylocomium spp.
pitcher plant	Sarracenia purpurea L.
sedge	Carex spp.
snowberry, creeping	Gaultheria hispidula (L.) Muhlenb. ex Bigel.
sphagnum	Sphagnum spp.
twinflower	Linnaea borealis L.
yarrow, common	Achillea millefolium L.

APPENDIX 2. QUATERNARY GEOLOGY OF THE PASADENA-DEER LAKE AREA: A REVIEW AND DISCUSSION

M.J. Batterson[1] and G.E. Kirby

Introduction

This area of Newfoundland epitomizes the statement made over 20 years ago by Jenness (1960): "... that glacial studies in the province are still in their infancy." The Deer Lake basin as a whole and, in particular, the study area between Deer Lake and Pasadena have rarely been considered areas for major glacial studies, except in a regional perspective (for example, MacClintock and Twenhofel 1940; Grant 1972). More detailed work in the Upper Humber Basin has, as will be illustrated, been largely speculative or confusing, and as such the regional chronology remains unresolved. Both the topography and the complex flow patterns during the Late Wisconsin glacial stage have led to this dichotomy.

Previous research

Quaternary deposits and features within the study area cannot be viewed in isolation. The primary aim of this section is to provide a background to the Quaternary geology of the Humber Valley, and to attempt an integration of those deposits and features identified in this report, with those described to the northeast and southwest of the area.

Previous workers have concluded that in the Grand Lake - Sandy Lake basin, ice moved northward and exited through White Bay. Northward-trending striae in the White Bay - Sandy Lake area (Lundqvist 1965), and around Sheffield Lake (Alley and Slatt 1976), as well as a series of possible recessional moraines in the Main Brook area (Twenhofel and MacClintock 1940; MacClintock and Twenhofel 1940) have been cited as evidence. This northerly flow was separated from events in the Upper Humber Valley by Birchy Ridge, a north-northeast-trending ridge, rising to an elevation of over 300 m.

In the vicinity of Wigwam Brook, Rogerson (1979) concluded largely on the basis of till fabrics supplemented by analyses of glacial deposits and features that an initial movement from the south-southwest and a later movement from the southeast is evidenced. Tills in the area are probably basal in origin, poorly comminuted, and exhibit weak fabrics. It is likely they are related to thin, local ice masses. The earlier flow is presumably related to ice from Grand Lake, whereas the later flow reflects reorientation of the ice during deglaciation when topography became the major influencing factor. Flow from remnant ice on Birchy Ridge is assumed.

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In the Upper Humber Valley, Quaternary mapping has been undertaken by Vanderveer (1982) and by Vanderveer and Sparkes (1982). On the basis of striae, till fabrics, and topographic evidence a speculative glacial chronology is presented consisting of three separate ice movements, each of which may be correlated with a distinctive till unit. The first event, which is evidenced by the stratigraphic position of the associated till unit, till fabrics, and lithologic analyses and which is considered pre-Late Wisconsin in age, originated from a center to the northeast and deposited a red clay-rich till across the basin. This event overtopped parts of the Long Range Mountains and Birchy Ridge. The second event consisted of an eastwardly directed flow that affected the northeastern part of the area. This event, which presumably originated in the Long Range Mountains, emplaced a light pinkish gray sandy till above the red clay till. These two till units are separated by sand and gravels that have been interpreted as being interglacial-interstadial in age (Vanderveer and Sparkes 1982). A third event, Late Wisconsin in age, advanced from the north or northeast and deposited the most extensive drift unit, which is an immature and poorly comminuted till of local provenance.

The Late Wisconsin advance extended through the Deer Lake basin and is evidenced throughout the study area. However, in the area northeast of the town of Deer Lake, it is possible that ice moving out of Grand Lake diverged (Rogerson 1979), with the strongest portion continuing to flow northward, while another portion overflowed southwest into the topographically lower Deer Lake basin. Retreat of this ice produced a series of recessional moraines northwest of Nicholsville and southwest of Birchy Lake, a proglacial lake around Adies Pond, and a number of meltwater channels and eskers across the area (Vanderveer and Sparkes 1982).

To these reports can be added the generalized regional approaches that suggest (1) ice movement northward from the interior of Newfoundland through the Grand Lake - White Bay basin into White Bay itself (MacClintock and Twenhofel 1940); (2) that striae at Sandy Lake may represent early flow to the northwest from the Topsails, followed by a later flow to the northeast (Lundqvist 1965); and (3) that crag and tail features in the area north of Sandy Lake reveal northward-trending ice (Grant 1972; Prest et al. 1968).

The glacial history of the Upper Humber basin remains unresolved. For instance, what were the individual effects of ice from the Long Range Mountains, Birchy Ridge, and other sources? Were these sources all significant during different stages of the Late Wisconsin? Can we reconcile identified glacial deposits with specific glacial regimes? In terms of the study area, it is probable that Late Wisconsin ice entered the northern part of Deer Lake from a source with a northerly component, and that it was confluent with ice existing in the South Brook valley. Ice subsequently exited into the Bay of Islands, probably through Wild Cove Lake and over the col into Wild Cove, rather than through the narrow Humber gorge, which bears little evidence of glacial erosion and appears to be the result of fluvial-glaciofluvial activity along a pre-existing fault-guided valley. Similar processes led to the development of the major gorges in Corner Brook and Steady Brook after deglaciation (Twenhofel and MacClintock 1940).

In the Lower Humber Valley, previous work has focused on the sequence of events following deglaciation and relative sea level changes in the Bay of Islands. Numerous raised marine features are evident around the Bay of Islands, some of which have been successfully dated. At Lark Harbour, shells from bottomset beds of marine silts and clays have been dated at 12 000 plus or minus 320 years before present (BP) (GSC-Lab No. 1462). The foreset beds attain an elevation of 47.2 m above sea level (a.s.l.). This elevation is similar to a 48.7 m a.s.l. marine limit described at Cox's Cove (Brookes 1974), which has been dated at 12 600 plus or minus 170 years BP (GSC-Lab. No. 868). By inference, the raised marine features at Humbermouth can be assigned a similar age, since they too lie at 48.7 m a.s.l. At that location, bottomset and foreset bed sequences are exposed, the latter interfingering with massive lodgment tills (Brookes 1974). At the proximal edge of these deposits on the north side of the Humber River, Brookes (1974) describes an end moraine overlying ice contact deposits, suggesting that glacier ice stood at the head of the Humber Arm, while a proglacial delta was being constructed at 48.7 m a.s.l.

The dates for deglaciation in the Humber Arm are somewhat later than those recorded in the Bay St. George area, and are probably related to more active ice in the Bay of Islands (Brookes 1974). It is clear that upon deglaciation there was a rapid eustatic rise in sea level, which encroached upon an isostatically depressed land surface. Analyses of postglacial sea level changes on a regional scale suggest that isostatic uplift following deglaciation was probably rapid (Grant 1980), relative to the eustatic rise in sea level. The relationship between the two is not linear with time but rather an initially rapid relative sea level fall immediately following deglaciation compared to further into the Holocene. Indeed, Brookes (1974) suggested that an initial relative sea level fall of 8 m per century is not unreasonable, whereas Andrews (1968) concluded from his work in Arctic Canada that 35% of uplift was accomplished within the first 1000 years following deglaciation, 56% after 2000 years, and 80% after 4000 years until an isostatic balance was achieved after 10 000 years.

What does this mean in terms of deglaciation of the Deer Lake basin? The current elevation of Deer Lake is 5 m a.s.l., whereas the marine limit at 12 600 years BP was 48.7 m a.s.l. The time period for ice to retreat to the area of present-day Deer Lake and, thus, the interim fall in sea level is unknown. Further, the trend of the regional isobases has not been satisfactorily resolved, and fundamental questions concerning the Deer Lake basin remain. For instance, did marine waters affect Deer Lake and cut the prominent terraces that are exhibited around the current lake margin or are the raised "beach" ridges related to a fall in water level within a proglacial lacustrine environment? During soil survey fieldwork extensive silts and clays were found in the Deer Lake basin: are these deposits related to deposition within a marine or a lacustrine environment? The answers to these questions are not immediately forthcoming, but their solution would go a long way to unraveling the complex Quaternary history of this area.

Quaternary deposits in the Pasadena-Deer Lake area

The unconsolidated surface materials in the surveyed area were deposited by glaciers active during the Late Wisconsin period, which reached its maximum in this region 10 000-12 000 BP. Soil survey information indicates till deposits cover over 70% of the survey area (see Fig. 19) and exhibit a wide range of lithologies, textures, colors, and thicknesses. Till thicknesses range from thin veneers of less than 1 m to till hummocks of 2-3 m. Color, texture, and lithology are dependent on a variety of factors, including lithological characters of clasts, distance and mode of glacial transport, and style of deposition.

Examination of till characteristics suggests several points. All the tills in the study area are thin (that is, less than 3 m), locally derived (that is, contain clasts related to underlying bedrock), and immature in their

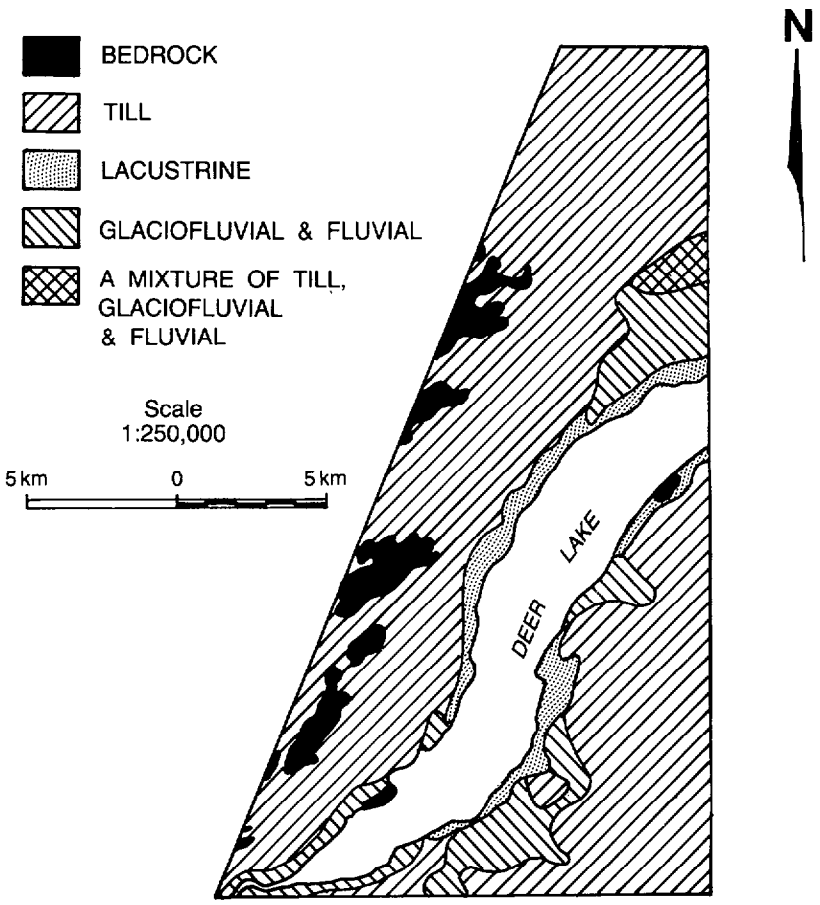

Figure 19. Generalized parent material map.

development. Glacial transport distances are short and, thus, potential for comminution is low. Morphological features and extent of Quaternary deposits suggest formation under thin (less than 500 m) ice conditions. The inclusion of granitic and other clasts of distant provenance does not negate this conclusion, since their numbers are small (less than 5%), and lithologies from the Long Range Mountains are up-glacier along Late-Wisconsin flow lines. Further, most granitic clasts are rounded to subrounded, thus suggesting a considerable period of entrainment within the glacier system either during Late Wisconsin or previous glaciations. Color is a significant characteristic of many of the tills in the area and is related to underlying bedrock.

Fluvial and glaciofluvial deposits cover 15% of the study area and occur along both sides of Deer Lake, being restricted to relatively small, gently inclined, deltaic deposits at the mouths of small streams that flow into Deer Lake. These deposits are composed primarily of sedimentary lithologies, mainly sandstone, siltstone, schist, and minor quartzite, although some deposits exhibit significant amounts of further transported granite. Most deposits are poorly sorted, but some stratified deposits do occur. Particle size is dominantly of the sand and gravel range.

In some instances, the tills are dissected or overlain by glaciofluvial outwash deposits. They occur in two main areas; in the north around Coal Brook and around the town of Pasadena. The latter is related to outflow from a southward-retreating ice mass in South Brook Valley, whereas the former is a dissected outwash plain resultant from outwash from the northeast-retreating ice margin. Outwash deposits in this area are usually 3-5 m thick, stratified, and cross-bedded. Textures vary both horizontally and vertically through the deposit, with individual strata ranging from fine sand to gravelly cobbly sand. The characteristics are consistent with those expected within a valley train - sandur (sandy outwash plain) environment.

In a number of locations, glaciofluvial outwash overlies rhythmic silts and clays, called rhythmites. These rhythmites form part of a suite of deposits, formed in an aqueous environment, that extends up to 30 m above the lake level.

Aqueous deposits related to higher water levels found on both the east and west sides of Deer Lake are gently inclined toward the present lake, bedded to stratified, pebbly to cobbly, or channery material that can be categorized under two headings: nearshore cobbly beach terraces and rhythmic silts and clays.

The nearshore cobbly beach ridges occur primarily on the western shore as distinct ridges that run parallel to the current shoreline. Up to seven of these ridges have been identified as occurring within 1 km of the shoreline, the most conspicuous and highest at an elevation of 30 m a.s.l.

The genesis of these aqueously deposited sequences is enigmatic. The current elevation of Deer Lake is only 5 m a.s.l., whereas the elevation of previously described marine terraces is 50 m. If deglaciation was rapid, then inundation by the sea was possible, and the terraces and deposits could be marine; however, there is as yet no evidence to support this interpretation.

Glacial history: A summary

The sequence of events affecting the study area is still not well understood, although some general observations may be suggested (Fig. 20). The nature and distribution of the tills suggest that Late Wisconsin ice cover was thin and restricted to the main Humber Valley. Tills are characteristically immature and transportation distances are short. Upon deglaciation, which was probably rapid, lake levels rose either from marine incursion or from ponding due to an ice dam in the lower Humber Valley. During this stage, a series of aqueous deposits were laid down, and a number of small deltaic deposits were built up from streams issuing into the lake. Gradual lowering of the water caused the development of a series of small terraces in the unconsolidated material surrounding the lake, although a major standstill can be associated with the 30-m terrace. Fluviatile deposits resultant from the Humber River meandering over an emerging lake floor planed off the subaqueous deposits. Both postglacial modification and erosion were initially rapid, largely resultant from meltwater action, and they are still active.

More detailed research needs to be conducted in this area to resolve the sequence of events during the Pleistocene.

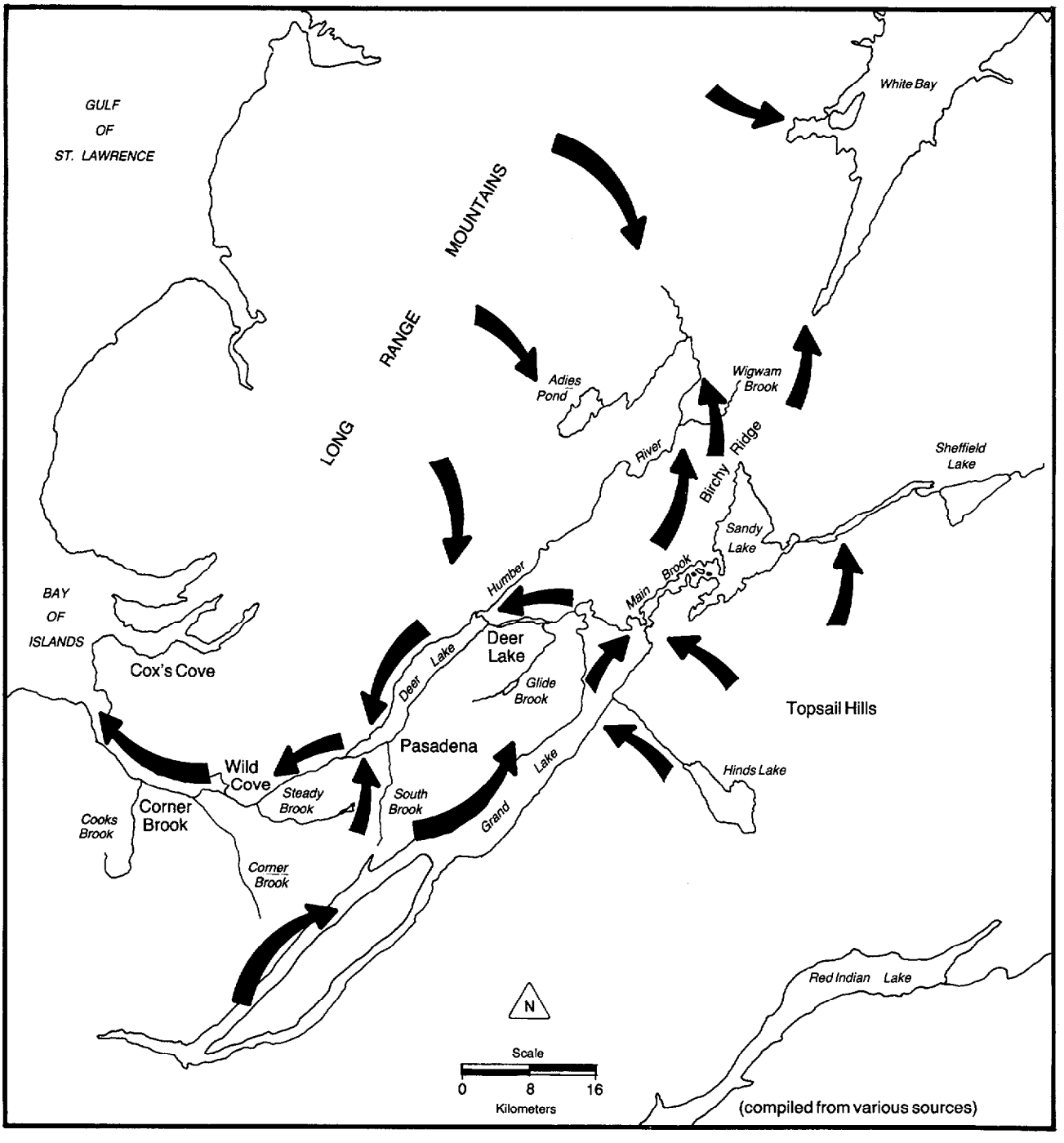

Figure 20. Speculative ice flow directions.

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APPENDIX 3. SOIL LEGEND FOR PASADENA-DEER LAKE AREA

Soil name	Soil symbol	Parent material	Drainage: Water regime	Solum texture	Depth to bedrock (cm)	Soil classification	*Pedoclimatic zone
BEAVER BROOK	BB	Brownish red stony till derived from red sandstone, granite, and minor shale and/or phyllite	Imperfectly; low transmissibility	sandy loam	75-150	Gleyed Ferro-Humic Podzol, peaty phase	Humber
BIG TENTH BROOK	BTB	Reddish brown to brown gravelly sandy fluvial deposit of mixed lithology	Well to rapidly; high transmissibility	loamy sand	100-150	Orthic Humo-Ferric Podzol	Humber
BINGLES POND	BP	Brownish red stony till derived from red sandstone, granite, and minor shale and/or phyllite	Imperfectly; low transmissibility	sandy loam	75-100	Gleyed Ferro-Humic Podzol, peaty phase	Mountain
BLUE GULCH	BL	Greenish gray gravelly stony till derived from gray siltstone, sandstone, and minor granite	Moderately well	loam to loamy sand	50-75	Orthic Ferro-Humic Podzol	Mountain
BOWATER	BO	Gray to light gray stony till derived from gray conglomerate, gray to red sandstone, and minor granite	Moderately well	gravelly sandy loam	75	Orthic Humo-Ferric Podzol	Humber
CAMP MORILEY	CM	Reddish brown to brown gravelly sandy fluvial deposit of mixed lithology	Moderately well; high transmissibility	gravelly sandy loam to gravelly sand	100-150	Orthic Humo-Ferric Podzol	Humber
CANAL	C	Olive to green loamy till derived from phyllite and shale	Imperfectly to poorly; low transmissibility	sandy loam to loam	<75	Gleyed Dystric Brunisol	Mountain

(Continued)

Soil Legend For Pasadena-Deer Lake Area (continued)

Soil name	Soil symbol	Parent material	Drainage: Water regime	Solum texture	Depth to bedrock (cm)	Soil classification	*Pedoclimatic zone
COAL BROOK	CB	Brown to yellowish brown sandy fluvial deposit of mixed lithology	Well to moderately well; high transmissibility	loamy sand	>100	Ortstein Humo-Ferric Podzol	Humber
EARLE	E	Reddish brown to brown gravelly sandy fluvial deposit of mixed lithology	Moderately well to rapidly; high transmissibility	gravelly loamy sand	>100	Orthic Humo-Ferric Podzol	Humber
GLIDE MOUNTAIN	GM	Reddish brown till derived from sandstone and granite	Moderately well to imperfectly	fine sandy loam to gravelly loam	<100	Fragic Humo-Ferric Podzol, gleyed phase	Mountain
HUGHES BROOKE	HB	Dark reddish brown to red sandy loam till derived from red micaceous sandstone	Moderately well; moderate transmissibility	loam to sandy loam	50-100	Orthic Humo-Ferric Podzol	Humber
ISLAND POND	IP	Olive to green loamy till derived from phyllite and shale	Moderately well; moderate transmissibility	loam	<75	Orthic Humo-Ferric Podzol	Mountain
KEATS POND	KP	Brownish red stony till derived from red sandstone, granite, and minor shale and/or phyllite	Moderately well; moderate transmissibility	fine sandy loam	<100	Orthic Humo-Ferric Podzol	Mountain
LAKELANND	LL	Red to reddish brown sandy loam till derived from red micaceous sandstone, red siltstone, and minor granite	Imperfectly to poorly; water table near the surface during spring and fall	sandy loam	<100	Orthic Gleysol	Humber

(Continued)

Soil Legend For Pasadena-Deer Lake Area (continued)

Soil name	Soil symbol	Parent material	Drainage: Water regime	Solum texture	Depth to bedrock (cm)	Soil classification	*Pedoclimatic zone
LITTLE NORTH BROOK	LNB	Dark reddish brown to red sandy loam till derived from red micaceous sandstone	Imperfectly; water table within 50 cm of the surface during spring	fine sandy loam to loamy sand	50-100	Gleyed Eluviated Dystric Brunisol	Humber
LITTLE RAPIDS	LR	Grayish brown loamy till derived from gray schist, gneiss with minor red sandstone, and granite	Imperfectly to poorly drained; poor transmissibility. Surface drainage: well. Seepage present	loamy sand to sandy loam	50-100	Orthic Humic Gleysol	Humber
LOGGER'S COVE	LC	Brown to yellow brown sandy aluvial deposits of mixed lithology	Moderately well	sand	>100	Ortstein Ferro-Humic Podzol	Mountain
MAXWELL	M	Reddish brown to brown gravelly sandy fluvial deposit of mixed lithology	Moderately well	gravelly loamy sand	>100	Ortstein Humo-Ferric Podzol	Humber
MICROWAVE	MW	Red to reddish brown sandy loam till derived from red micaceous sandstone, red siltstone, and minor granite	Imperfectly; water table within 50 cm of the surface during spring and fall	fine sandy loam to loam	<75	Gleyed Eluviated Dystric Brunisol	Humber
MIDDLAND	ML	Brown to yellow brown sandy fluvial deposits of mixed lithology	Imperfectly to poorly	sandy	>100	Orthic Gleysol, peaty phase	Humber
MISTAKEN POND	MP	Grayish brown loamy till derived from gray schist, gneiss with minor red sandstone, and granite	Imperfectly to moderately well	sandy loam	<100	Gleyed Humo-Ferric Podzol	Mountain

(Continued)

Soil Legend For Pasadena-Deer Lake Area (continued)

Soil name	Soil symbol	Parent material	Drainage: Water regime	Solum texture	Depth to bedrock (cm)	Soil classification	*Pedoclimatic zone
NINTH BROOK	NB	Accumulation of organic material, semi-decomposed	Well		10-30	Typic Folisol, lithic phase	Mountain
NORTH	N	Olive to green loamy till derived from phyllite and shale	Imperfectly to poorly; low transmissibility	sandy loam to loam	<75	Gleyed Dystric Brunisol	Humber
NORTH LAKE	NL	Brownish red stony till derived from red sandstone, granite, and minor shale and/or phyllite	Moderately well	fine sandy loam	<100	Orthic Humo-Ferric Podzol	Humber
NORTH POND	NP	Olive to green loamy till derived from phyllite and shale	Moderately well; moderate transmissibility	loam	<75	Orthic Humo-Ferric Podzol	Humber
Organic 1	O1	Composed of fibric material derived from sphagnum mosses	Very poorly; high water table		150-200	Terric Mesisol	Mountain
Organic 2	O2	Organic material derived from sedges and grasses	Very poorly		100-150	Hydric Fibrisol	Humber
Organic 3	O3	Organic material derived from sedges and grasses	Poorly; high water table		100-150	Terric Fibric Humisol	Mountain
Organic 4	O4	Organic material derived from sedges and sphagnum mosses	Poorly; high water all year long		<150	Terric Mesisol	Mountain

(Continued)

Soil Legend For Pasadena-Deer Lake Area (concluded)

Soil name	Soil symbol	Parent material	Drainage: Water regime	Solum texture	Depth to bedrock (cm)	Soil classification	*Pedoclimatic zone
SNUG HARBOUR	SH	Reddish brown to yellowish brown gravelly sandy fluvial deposit of mixed lithology	Imperfectly to poorly; low transmissibility. Water table near surface most of the year	sandy loam	>100	Gleyed Humo-Ferric Podzol	Humber
SQUARE POINT	SP	Greenish gray gravelly stony till derived from gray siltstone, sandstone, and minor granite	Poorly drained; high water table	loam to silt loam	<75	Orthic Gleysol	Mountain
WEST POND	WP	Dark reddish brown to red sandy loam till derived from red micaceous sandstone	Poorly drained; water near surface most of year. Some seepage	sandy loam	<100	Orthic Gleysol	Humber

LAND TYPES

RI	ROCKLAND I	Areas having >75% of the surface occurring as bare rock
RII	ROCKLAND II	Areas having 50-75% of the surface occurring as bare rock

*Some criteria for defining pedoclimatic zones

Pedo-climatic zone	Days with min. temps. 0°C	Days with min. temps. 5°C	Degree-days 0°C	Degree-days 5°C	Vegetation season mean temp. 6.1°C	Days with max. temp 20°C	Last spring frost	First fall frost	Annual precipitation (mm) Total	Annual precipitation (mm) as snow	Mean annual potential evaporation (mm)	Growing Season moisture deficit (mm)
Mountain	120-300	260	700-900	<1000	120-160	up to 50	June 15 or later	before Sept. 5	1200-2000	>300	300-350	<50
Humber	170-190	240-260	<600	>1200	>160	50-70	before June 10-15	early to mid-Sept.	1200	<300	>350	<100

APPENDIX 4. SOIL SUITABILITY FOR SELECTED CROPS

This appendix contains soil suitability ratings for the different locally adapted crops in the Pasadena-Deer Lake area based on the inherent physical properties of each soil (Sudom and van de Hulst 1985). Each soil has been rated for its suitability for forage crops and root crops. These generalized ratings only apply to mineral soils; no rating of organic soils was done. These ratings relate to each soil's ability to produce crop yields on a commercial basis and do not take into account garden plots.

The criteria used for each crop suitability rating are outlined in the first five tables, the remaining five tables contain the rating for each soil and its limitation(s). Four suitability ratings were used for each crop: good, fair, poor, and unsuitable. If two ratings were listed, the dominant or most likely occurring rating is placed first and the least likely occurring rating is placed second (for example, fair-poor).

Soil suitability for forage crops

Major soil properties influencing uses	Degree of suitability		
	Good	Fair	Poor
Depth to compact or cemented layer	>50 cm	20-50 cm	<20 cm
Transmissibility	>0.5 cm/h	0.1-0.5 cm/h	<0.1 cm/h
Available moisture	not affected by droughtiness	drought occurs in some years	drought occurs almost every year
Drainage	Well and moderately well drained	imperfectly drained	poorly drained
Surface rock fragments: stones	S0, S1, S2	S3	S4
Depth to bedrock	more than 100 cm	50-100 cm	20-50 cm
Topography (percentage of slope)	0-9%	9-15%	>15%

Soil suitability for potatoes

Major soil properties influencing uses	Degree of suitability		
	Good	Fair	Poor
Depth to compact or cemented layer	>50 cm	30-50 cm	<30 cm
Transmissibility	>0.5 cm/h	0.1-0.5 cm/h	<0.1 cm/h
Solum texture	loam, sandy loam	loamy sand, sand	other
Available moisture	not affected by droughtiness	drought occurs in some years	drought occurs almost every year
Drainage	Well and moderately well drained	imperfectly drained	poorly drained
Surface rock fragments:			
cobbles	<3%	3-15%	>15%
stones	S0, S1	S2	S3
Depth to bedrock	>100 cm	50-100 cm	20-50 cm
Topography	0-5%	5-9%	9-15%

Soil suitability for cole crops (cabbage, cauliflower, broccoli, brussels sprouts)

Major soil properties influencing uses	Degree of suitability		
	Good	Fair	Poor
Depth to compact or cemented layer	>50 cm	20-50 cm	<20 cm
Transmissibility	>0.5 cm/h	0.1-0.5 cm/h	<0.1 cm/h
Available moisture	not affected by droughtiness	drought occurs in some years	drought occurs almost every year
Drainage	Well and moderately well drained	rapidly and imperfectly drained	poorly drained
Surface rock fragments:			
cobbles	<15%	15-50%	>50%
stones	S0, S1	S2, S3	S4
Depth to bedrock	>100 cm	50-100 cm	20-50 cm
Topography	0-5%	5-9%	9-15%

Soil suitability for carrots and parsnips

Major soil properties influencing uses	Degree of suitability		
	Good	Fair	Poor
Depth to compact or cemented layer	>50 cm	30-50 cm	<30 cm
Transmissibility	>0.5 cm/h	0.1-0.5 cm/h	<0.1 cm/h
Solum texture:			
carrots	loamy sand sandy loam	loam, sands	other
parsnips	sandy loam, loam	loamy sand, sand	other
Available moisture	not affected by droughtiness	drought occurs in some years	drought occurs almost every year
Drainage	Well and moderately well drained	rapidly and imperfectly drained	poorly drained
Surface rock fragments:			
cobbles	<3%	3-15%	15-30%
stones	S0, S1	S2	S3
Gravel content of upper 30 cm	>20% by volume	20-50% by volume	>50% by volume
Topography	0-5%	5-9%	9-15%

Soil suitability for rutabagas

Major soil properties influencing uses	Degree of suitability		
	Good	Fair	Poor
Depth to compact or cemented layer	>50 cm	30-50 cm	<30 cm
Transmissibility	>0.5 cm/h	0.1-0.5 cm/h	<0.1 cm/h
Solum texture	loam, clay loam	sandy loam, loamy sand	other
Available moisture	not affected by droughtiness	drought occurs in some years	drought occurs almost every year
Drainage	Well and moderately well drained	rapidly and imperfectly drained	poorly drained
Surface rock fragments:			
cobbles	<3%	3-15%	15-30%
stones	S0, S1	S2	S3
Depth to bedrock	>100 cm	50-100 cm	20-50 cm
Topography	0-5%	5-9%	9-15%

Soil suitability for forage crops

Soil name	Rating	Limitation(s)
Beaver Brook	unsuitable	drainage; compact or impeding layer; stoniness and slope
Big Tenth Brook	fair-good	gravel content; low moisture-holding capacity
Bingles Pond	unsuitable	drainage; compact or impeding layer; stoniness; slope
Blue Gulch	poor-unsuitable	shallowness to bedrock; stoniness; rockiness
Bowater	fair-poor	slope; stoniness and in some areas shallowness to bedrock
Camp Mortley	good-fair	gravel content; low moisture-holding capacity
Canal	unsuitable	drainage; slope; rockiness
Coal Brook	fair-good	low moisture-holding capacity
Earle	fair-good	low moisture-holding capacity
Glide Mountain	poor-fair	drainage; stoniness; compact or impeding layer
Hughes Brooke	good	
Island Pond	unsuitable	shallowness to bedrock; slope, stoniness
Keats Pond	fair-poor	slope; stoniness; compact or impeding layer
Lakelannd	unsuitable	drainage
Little North Brook	fair-good	drainage; compact or impeding layer
Little Rapids	unsuitable	slope; drainage; stoniness
Logger's Cove	fair	compact or impeding layer
Maxwell	fair-good	low moisture-holding capacity; gravel content

(Continued)

Soil suitability for forage crops (concluded)

Soil name	Rating	Limitation(s)
Microwave	fair	drainage
Middland	poor-fair	drainage
Mistaken Pond	unsuitable	drainage; slope; stoniness; compact or impeding layer
North	unsuitable	drainage; slope; rockiness
North Lake	poor-fair	slope; stoniness and compact or impeding layer
Snug Harbour	unsuitable	drainage; compact or impeding layer
Square Point	unsuitable	drainage; stoniness
West Pond	unsuitable	drainage

Soil suitability for carrots and parsnips

Soil name	Rating	Limitation(s)
Beaver Brook	unsuitable	stoniness; slope; drainage; gravel content and compact or impeding layer
Big Tenth Brook	unsuitable	gravel content; low moisture-holding capacity; texture
Bingles Pond	unsuitable	stoniness; slope; drainage; gravel content and compact or impeding layer
Blue Gulch	unsuitable	shallowness to bedrock; stoniness; rockiness
Bowater	poor-unsuitable	gravel content; stoniness; shallowness to bedrock
Camp Mortley	unsuitable	gravel content
Canal	unsuitable	drainage; stoniness; gravel content
Coal Brook	fair	low moisture-holding capacity
Earle	fair-poor	gravel content
Glide Mountain	poor	drainage; texture; compact or impeding layer
Hughes Brooke	good-fair	compact or impeding layer
Island pond	unsuitable	stoniness; gravel content; slope; shallowness to bedrock
Keats pond	unsuitable	stoniness; slope; compact or impeding layer
Lakelannd	unsuitable	drainage
Little North Brook	poor-unsuitable	drainage; compact or impeding layer
Little Rapids	unsuitable	drainage; stoniness; slope
Logger's Cove	unsuitable	compact or impeding layer
Maxwell	fair	low moisture-holding capacity; compact or impeding layer
Microwave	poor-unsuitable	drainage; texture

(Continued)

Soil suitability for carrots and parsnips (concluded)

Soil name	Rating	Limitation(s)
Middland	unsuitable	drainage
Mistaken Pond	unsuitable	drainage; stoniness; slope; compact or impeding layer
North	unsuitable	drainage; stoniness; slope; gravel content
North Pond	unsuitable	stoniness; gravel content; slope; shallowness to bedrock
Snug Harbour	unsuitable	drainage; compact or impeding layer
Square Point	unsuitable	drainage; stoniness
West Pond	unsuitable	drainage

Soil suitability for turnips and rutabagas

Soil name	Rating	Limitation(s)
Beaver Brook	unsuitable	drainage; stoniness
Big Tenth Brook	unsuitable	gravel content; low moisture-holding capacity
Bingles Pond	unsuitable	drainage; stoniness
Blue Gulch	unsuitable	shallowness to bedrock; stoniness; rockiness
Bowater	poor-unsuitable	stoniness; gravel content
Camp Mortley	unsuitable	gravel content; low moisture-holding capacity
Canal	unsuitable	drainage; shallowness to bedrock
Coal Brook	fair	low moisture-holding capacity; compact or impeding layer
Earle	fair-poor	gravel content; low moisture-holding capacity
Glide Mountain	poor	drainage; stoniness
Hughes Brooke	good-fair	
Island Pond	unsuitable	stoniness; gravel content; slope; shallowness to bedrock
Keats Pond	unsuitable	stoniness; slope; compact or impeding layer
Lakelannd	unsuitable	drainage
Little North Brook	poor-unsuitable	drainage; compact or impeding layer
Little Rapids	unsuitable	drainage; stoniness; slope
Logger's Cove	unsuitable	compact or impeding layer
Maxwell	fair	low moisture-holding capacity; compact or impeding layer
Microwave	poor-unsuitable	drainage; texture

(Continued)

Soil suitability for turnips and rutabagas (concluded)

Soil name	Rating	Limitation(s)
Middland	unsuitable	drainage
Mistaken Pond	poor-unsuitable	drainage; stoniness; slope; compact or impeding layer
North	fair-poor	drainage; shallowness to bedrock
North Lake	fair	stoniness; compact or impeding layer
North Pond	fair-poor	stoniness; shallowness to bedrock
Snug Harbour	unsuitable	drainage
Square Point	unsuitable	drainage
West Pond	unsuitable	drainage

Soil suitability for potatoes

Soil name	Rating	Limitation(s)
Beaver Brook	unsuitable	drainage; stoniness; slope
Big Tenth Brook	fair	low moisture-holding capacity; gravel content
Bingles Pond	unsuitable	drainage; stoniness; slope
Blue Gulch	fair	depth to bedrock; stoniness
Bowater	fair	stoniness; slope
Camp Mortley	poor-unsuitable	gravel content; low moisture-holding capacity
Canal	unsuitable-poor	drainage; slope; stoniness
Coal Brook	fair	low moisture-holding capacity; compact or impeding layer
Earle	fair	low moisture-holding capacity; gravel content
Glide Mountain	poor	drainage; compact or impeding layer; stoniness
Hughes Brooke	good	
Island Pond	fair	stoniness; slope
Keats Pond	fair-poor	stoniness; slope; compact or impeding layer
Lakelannd	unsuitable	drainage; stoniness
Little North Brook	fair-poor	drainage; compact or impeding layer
Little Rapids	unsuitable	drainage; stoniness; slope
Logger's Cove	poor-unsuitable	low moisture-holding capacity; compact or impeding layer
Maxwell	fair	low moisture-holding capacity
Microwave	unsuitable	drainage
Middland	unsuitable	drainage

(Continued)

Soil suitability for potatoes (concluded)

Soil name	Rating	Limitation(s)
Mistaken Pond	poor-unsuitable	drainage; stoniness; slope, compact or impeding layer
North	unsuitable-poor	drainage; slope; stoniness
North Lake	fair-poor	stoniness; slope; compact or impeding layer
North Pond	fair	stoniness; slope
Snug Harbour	unsuitable	drainage
Square Point	unsuitable	drainage
West Pond	unsuitable	drainage

Soil suitability for cabbage

Soil name	Rating	Limitation(s)
Beaver Brook	unsuitable	drainage; slope
Big Tenth Brook	fair	low moisture-holding capacity; gravel content
Bingles Pond	unsuitable	drainage; slope
Blue Gulch	fair-poor	depth to bedrock
Bowater	fair	gravel content
Camp Mortley	poor-fair	low moisture-holding capacity; gravel content
Canal	poor	drainage; depth to bedrock
Coal Brook	fair	low moisture-holding capacity; compact or impeding layer
Earle	fair	low moisture-holding capacity; gravel content
Glide Mountain	poor	drainage; compact or impeding layer; stoniness
Hughes Brooke	good	
Island Pond	fair	stoniness; slope; depth to bedrock
Keats Pond	fair	stoniness; slope
Lakelannd	unsuitable	drainage
Little North Brook	fair	drainage
Little Rapids	unsuitable	drainage; slope; stoniness
Logger's Cove	poor	compact or impeding layer; low moisture-holding capacity
Maxwell	fair	low moisture-holding capacity
Microwave	poor	drainage
Middland	unsuitable	drainage
Mistaken Pond	poor	drainage, slope; stoniness

(Continued)

Soil suitability for cabbage (concluded)

Soil name	Rating	Limitation(s)
North	poor	drainage; depth to bedrock
North Lake	fair	stoniness; slope
North Pond	fair	stoniness; slope; depth to bedrock
Snug Harbour	unsuitable	drainage
Square Point	unsuitable	drainage
West Pond	unsuitable	drainage

APPENDIX 5. GLOSSARY

cation exchange capacity: The total amount of exchangeable cations that a soil can absorb. It is expressed in milliequivalents per 100 g of soil (meq/100 g).

cemented-indurated: Having a hard, brittle consistence; the particles are held together by cementing substances such as humus or oxides of silicon, iron, and aluminum. The hardness, brittleness persists even when the soil is wet.

channery: A descriptive term used for thin, flat limestone, sandstone, or schist fragments up to 15 cm in length.

consistence: The degree of cohesion or adhesion of the soil mass.

flagstone: A thin fragment of sandstone, limestone, slate, shale, or rarely of schist 15-37 cm in length.

fluvial deposit: All sediments, past and present, deposited by flowing water.

fragic: A Bx or BCx horizon of high bulk density and consistence that is firm and brittle when moist and hard to extremely hard when dry.

fragipan: A layer low in organic matter, mottled, and slowly or very slowly permeable to water.

glaciofluvial deposits: Material moved by glaciers and subsequently sorted and deposited by streams flowing from melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers, and kame terraces.

gravelly: Contains appreciable or significant amounts of gravel (2 mm-7.5 cm in diameter).

Lacustrine deposits: Material deposited in lake water and later exposed either by a lowering of the water level or by an uplifting of the land. These sediments range in texture from sands to clays.

Ortstein: An indurated layer in the B horizon of Podzols in which cementing material consists of illuviated sesquioxides and organic matter.

parent material: The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil has developed by pedogenic processes.

pH (soil): The negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity or alkalinity of a soil is expressed as a number in the pH scale. The scale is from 1 to 14 (<7.0 being acid and >7.0 being alkaline, a pH of 7.0 is neutral).

texture: The physical nature of the soil according to the relative proportions of elements of various composition and their particle size (for example, sand, silt, and clay and their various mixtures).

till (morainal): Unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel, and boulders intermingled in any proportion.