THE SOILS OF THE VILLE-MARIE MAP SHEET

(Ontario Section)

O.I.P. PUBLICATION 90-2

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by

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

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INTRODUCTION

During the early 1950's, Soil Survey of the New Liskeard-Englehart Area, Report No. 21 of the Ontario Soil Survey (1), was published. It contained a soil map of 26 townships of the Timiskaming District, at a scale of 1 inch = 1 mile. This report and map are now out of print.

Soil mapping of the Ville-Marie map sheet area was completed during the 1960's, for the ARDA, Canada Land Inventory program, at scales of 1:50000 and 1:250000 (2). These maps incorporated soil information from the soil map of Report No. 21. They have been issued, on request, as blueprint copies with a separate extended legend. They will still be available from the Ontario Institute of Pedology, but have been amalgamated into fewer and larger maps, with attached, extended legends.

The information from the original soil survey report of the New Liskeard-Englehart area has been incorporated into this report on the Ontario portion of N.T.S. 31M, entitled "Soils of the Ville-Marie Map Sheet". The original draft was prepared by the late John Gillespie. The chapter on soil management, and assistance with soil interpretations, were provided by John Rowsell of the New Liskeard College of Agricultural Technology.

GENERAL DESCRIPTION OF THE AREA

Location and Extent

The general location of the map area is shown in Figure 1. The Ville-Marie map area, in Ontario, is bounded on the east by the province of Quebec, Lake Timiskaming and the Ottawa River. It extends from north latitude 47°00' to 48°00' and from 79°30' to 80°00' east longitude. It includes most of the Timiskaming District and a northern portion of the Nipissing District.

Principal Towns

The principal towns, highways and railways are shown on Figure 2. Haileybury, with a population of 4820 (3), located on the shores of Lake Timiskaming, became a supply centre for the Cobalt silver boom of the early twentieth century. It is the judicial centre for the District of Timiskaming.

New Liskeard (population 5286) is located on Wabi Bay at the head of Lake Timiskaming, and is an important service centre for the farming community. The research farm and the College of Agricultural Technology of the Ontario Ministry of Agriculture and Food are located here, as well as the office of the agricultural representative for the region.

Cobalt (population 1640) was once a booming silver mining town, but has had a very significant drop in population since that time, due to mine closures.

Englehart (population 1740) is located near the northern limits of the map sheet, and is an important service centre for the farming community in the area.

Table 1. Trends in population of the Timiskaming District (1, 3)

Year	Total	Rural
1931	25,417	8,382
1951	50,016	8,000
1986	40,307	2,186

A large area of the Timiskaming District lies outside of this map sheet area, including a small extension of the clay belt. Thus, the census data quoted in this report applies to the political boundaries of the Timiskaming District. However, most of the population and farmland are within the boundaries of the Ville-Marie map sheet.

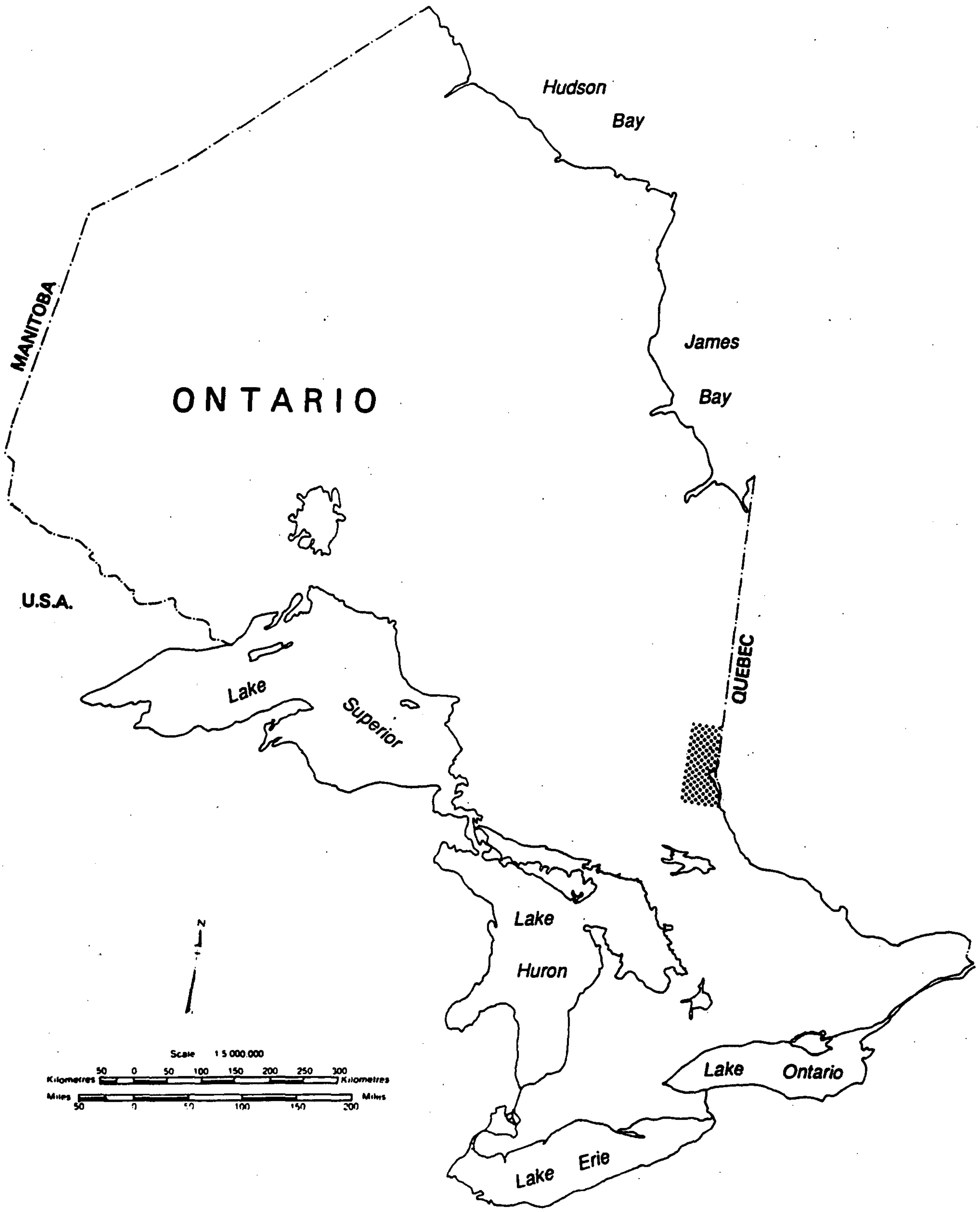

Figure 1. Outline map of Ontario showing location of the Ville-Marie (Ontario section) map sheet area

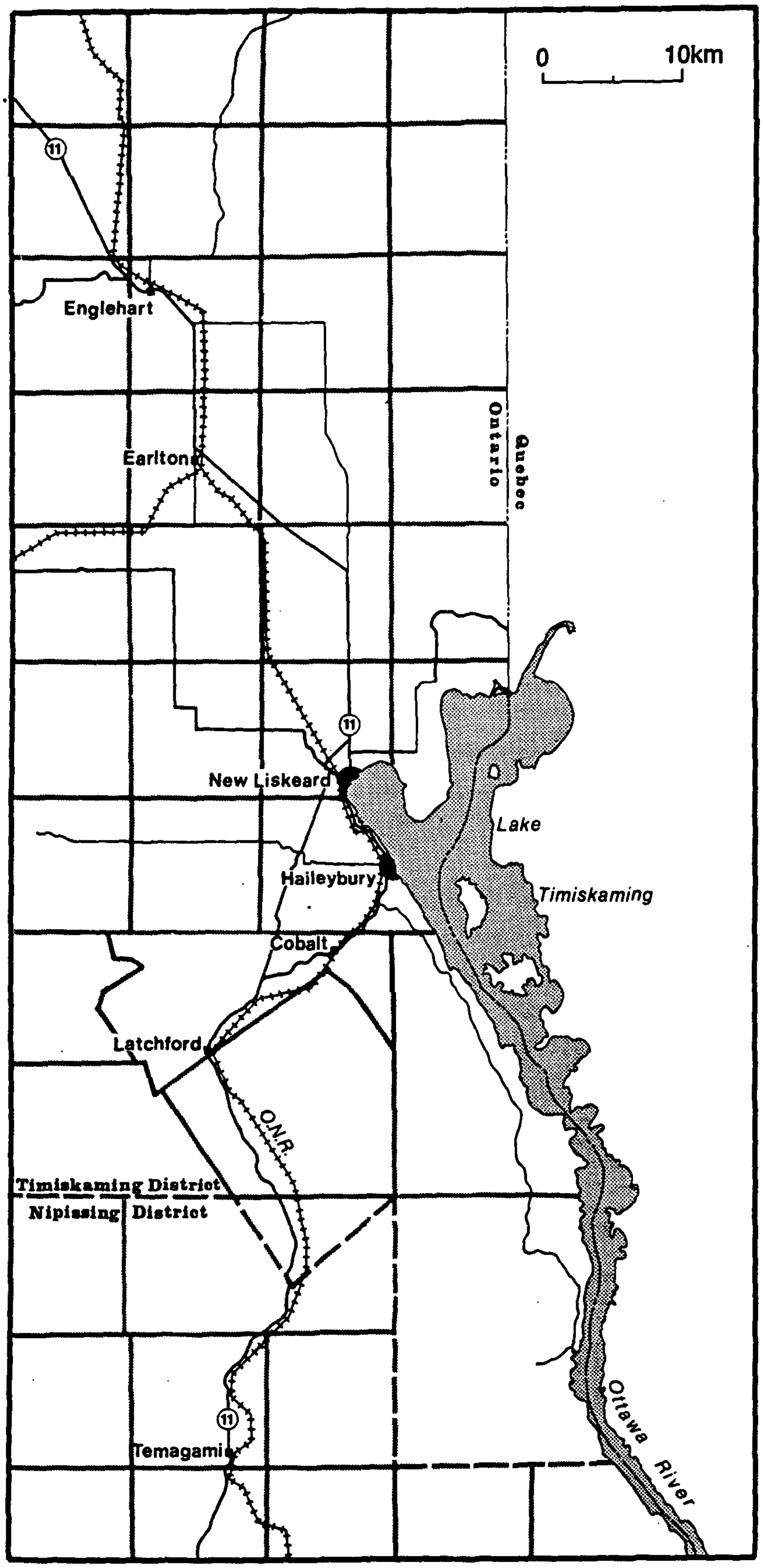

Figure 2. Outline map showing the principal towns, highways and railways

Historical Development

Mr. C.C. Farr, a former factor of the Hudson Bay Company, settled on the shore of Lake Timiskaming in about 1888, becoming an independent fur trader and farmer. Some six years later, he had been joined by several other families and had named the hamlet Haileybury. He discovered that the soil was very fertile over a large area, and urged the government to extend the railroad from North Bay and open up the country to settlement.

The government signed a contract in 1902 for the building of the Timiskaming and Northern Ontario Railway. The Cobalt silver strike a year later likely hastened the completion of the railroad and the settlement of the agricultural land of this district.

The town of Haileybury was virtually destroyed by a forest fire in 1922, with over 600 of 800 homes burned. Its first citizen was a casualty of this fire. The town was later rebuilt with the help of government grants.

Agricultural Land Use Statistics

There are a total of 571 farms (4) in the Timiskaming District, with most of them concentrated in the Englehart-New Liskeard agricultural area.

The total land area of the District is 203,675 acres (82,427 hectares) of which 127,226 acres (51,488 hectares) were reported as improved land in 1988 (4).

Table 2. Area and average yields of crops grown in the Timiskaming District in 1988 (4)

Crop	Acres	Hectares	Average Yields
Oats	6,400	2,590	59 bu/ac
Barley	16,400	6,637	55 bu/ac
Mixed Grain	8,500	3,440	55 bu/ac
Hay	61,000	24,687	3.3 ton/ac
Totals	92,300	37,354	--

The crops grown in the region are used to support a livestock industry which includes both dairy and beef farming enterprises. The yields are highest in northern Ontario, and compare favourably to those reported for many counties in southern Ontario.

Table 3. Area and number of farms in 1951 and 1988 (1, 4)

Area of Farms		Number of Farms	
Acres	Hectares	1951	1988
1 - 69	0.4 - 28	34	39
70 - 129	28 - 52	335	69
30 - 179	52 - 72	645	110
80 - 239	72 - 97	73	31
40 - 399	97 - 161	315	117
400 - 559	161 - 226	73	91
560 and over	226 and over	29	114
Total		1504	571

The number of farms in the district has decreased by some 62% between the years 1951 and 1988 (Table 3). The decline in number of farm operators is most evident in the farm sizes between 70 and 179 acres. These farms have possibly become nonviable units for full-time livestock operations. Larger farm units, greater than 400 acres, have more than doubled in number during the same period, but there has been a reduction of improved cropland over that time period.

Bedrock Geology

The bedrock geology of the Ville-Marie map sheet area is shown in Figure 3. The bedrock is chiefly Precambrian, but sediments of Ordivician and Silurian age occur at the northern end of Lake Timiskaming, in an area about 33 miles long and 8 miles wide extending from North Cobalt to Englehart (5).

The oldest Precambrian rocks consist chiefly of metavolcanic basalts and rhyolites and intrusive granodiorites, found mainly in the northern and southeastern portions of the map sheet.

Most of the remaining map sheet is occupied by younger Precambrian rocks of the Huronian and Cobalt Groups, consisting of conglomerate, greywacke, orthoquartzite, siltstone and argillite, with some diabase, gabbro and diorite intrusions.

The Paleozoic rocks that occur in the fault block north of Lake Timiskaming consist of Silurian and Ordivician limestone, dolomite, sandstone and shale.

Surface Deposits

This region, like all of Ontario, was covered by massive glaciers during the late Wisconsin glacial period. The grinding action of moving ice masses produced considerable amounts of rock material, ranging in size from boulders to rock flour, and distributed it over the landscape. Glacial streams flowing within the ice, tumbled stones into smooth, rounded gravel, and as the ice receded, these were deposited as long, snake-like ridges, called eskers. Conical sandy hills (kames), were deposited at the melting front of retreating glaciers. Sand and gravel outwash plains were left by the large glacial streams that were spawned by melting ice.

A large glacial lake known as Lake Barlow-Ojibway covered the Englehart-New Liskeard land area, and deposited a thick bed of lacustrine clay (5). The lake is believed to have formed approximately 11,000 years ago and ended about 8000 years ago when the ice readvanced.

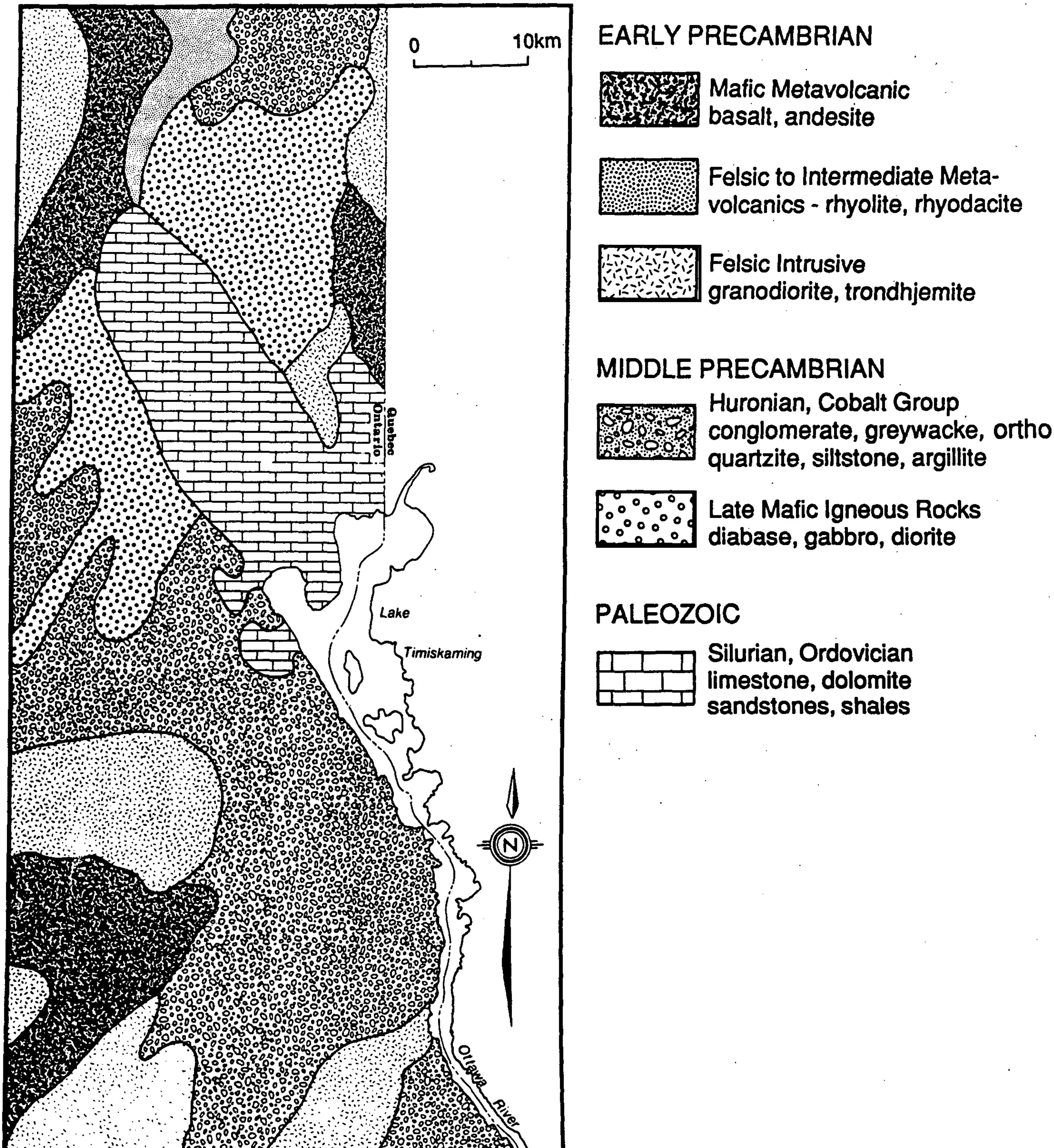

Figure 3. Outline map showing the bedrock geology

The Precambrian bedrock resisted the scouring action of ice, and the upland areas are bare to thinly covered by till material.

The distribution of surficial geological materials is shown in Figure 4. The glacial till, sand, gravel and clay that make up these surficial deposits, are the parent materials in which the present-day mineral soils developed.

At the end of the glacial period, depressional areas became vegetated with mosses, sedges, and/or trees, and under wet conditions, accumulated deep deposits of organic material in which organic soils developed.

The soil materials derived from Precambrian rock, and those derived from organic materials, are acid in reaction; while those derived from lacustrine or lacustrine-modified till are neutral to alkaline. This has contributed to important differences in the resultant soils which have developed since deposition of the parent material.

Climate

Table 4 shows some climatic data for the Timiskaming District (6), that is applicable to the Ville-Marie map sheet.

The factors controlling the temperature of this area are latitude, altitude, relief, and proximity to the Great Lakes, and to a lesser degree to Hudson Bay. Thus, those land areas adjacent to Lake Huron and Lake Superior have the mildest climates.

The more rugged area of the north, with deep valleys and high uplands, have wide variations in climate. Weather stations are generally located in the valleys in these areas, so the data will be largely applicable to the valleys. The data for the Clay Belt, and other level areas of low relief, will be applicable to most areas within such a physiographic region.

According to climatic data, the New Liskeard-Englehart region has a longer, warmer growing season than the northern Clay Belt, but a cooler and shorter growing season than those regions that are closer to the moderating effects of Lakes Huron and Superior, such as the Sault Ste. Marie-Sudbury area, or the Rainy River-Thunder Bay area.

Table 4. Climatic data from the Timiskaming District (6)

Climatic Parameter	Timiskaming
Mean date of last frost in spring	June 10
Mean date of first frost in fall	Sept. 13
Mean annual frostfree period-days	96
Mean annual length of growing season	172
Mean annual precipitation - mm	813
Mean May to September precipitation - mm	406

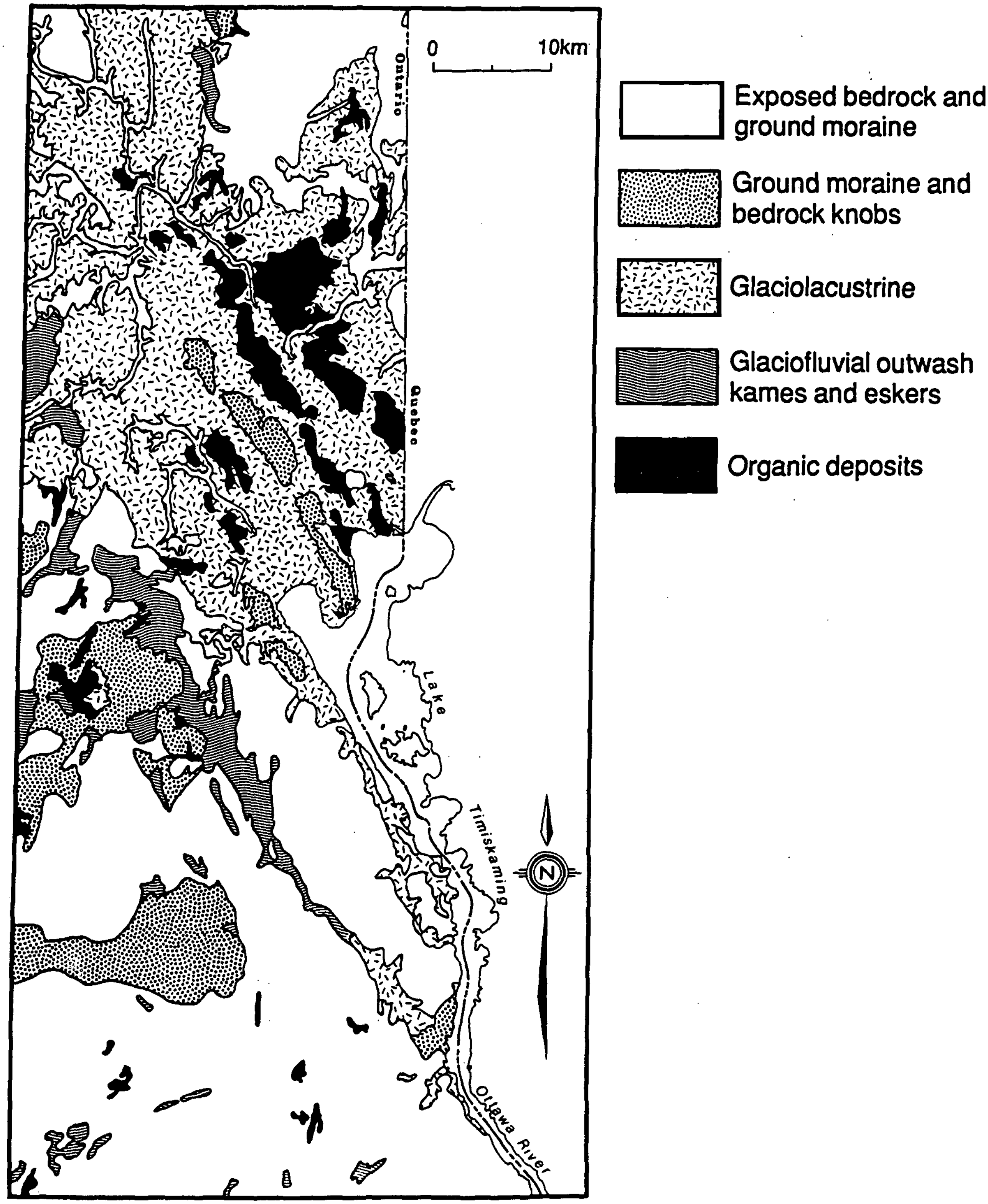

Figure 4. Outline map showing distribution of surficial geological materials

Vegetation

Black spruce, balsam fir, white birch and trembling aspen are commonly found on the glaciolacustrine flats. Balsam poplar and eastern white cedar occur on moist flats and riverbanks. White spruce and eastern white pine are found sporadically along rivers, lake shores and well-drained slopes. One of the last stands of old-growth eastern white pine and red pine occur in the vicinity of Lake Temagami. Yellow birch, sugar maple, red oak and red maple are mainly found near the head of Lake Timiskaming. Hardwoods such as basswood, white elm and black ash are sometimes found along rivers.

SOIL CLASSIFICATION

The soils described in this report have evolved over thousands of years from the interplay of the soil-forming processes of climate, vegetation, parent materials and time.

Soil Horizons

Under cool, humid climate, and forest vegetation, soils in this region tend to acidify. The acidity is the result of the removal of bases, particularly calcium, from the surface layers of the soil, by acidic percolating water. The products of weathering include iron, aluminum and humic acids, and may be transported through the soil either in solution or suspension. These may be deposited in lower layers, leading to the development of soil horizons that may differ from one another in thickness, colour, structure, texture and composition.

The vertical sequence of horizons in a soil is known as a soil profile and includes the surface A horizon, the subsoil B horizon and the underlying C (parent material) horizon.

These major horizons can be subdivided by the use of subscript letters into Ah, Ae, Bt, Ck, etc. These terms and symbols are used in the detailed soil descriptions in the Appendix of this report. Definitions of horizon terminology may be found in the Canadian System of Soil Classification (7).

The A horizon is the horizon of maximum weathering and in most cases is subdivided into surficial Ah or Ap horizons and underlying Ae horizons. The Ah horizon is a dark coloured organic-enriched surface horizon, often underlain by a light coloured eluvial Ae horizon. Some of the constituents such as clay, iron and organic matter that are leached from the A horizon, accumulate in the B horizon, causing the B horizons to become finer in texture than other horizons in the profile. They are then referred to as Bf, Bm or Bt horizons. The C horizon, generally referred to as the parent material, may be slightly altered, or unaltered, by the soil forming processes. These are typical horizons of well-drained soil profiles, as shown in the first three profiles in Figure 5.

Imperfectly drained soils have the same type and sequence of horizons as well-drained soils, but because they are wetter for longer periods of time, 'gley' conditions develop. These conditions are mainly caused by the reduction of iron compounds, and are usually indicated by yellowish-brown mottling in the Ae and B horizons. These horizons are then designated as Aegj, Bmgj, Btgj or Bfgj horizons.

Most poorly drained soils have horizon sequences similar to those shown in the Gleysols in Figure 5. These soils are wet for long periods of time, providing conditions especially favourable for 'gley' formation. These 'gley' horizons are usually grayish in colour, and often have yellowish-brown mottles. The B and C horizons of these poorly drained soils are usually designated as Bg and Ckg horizons.

Soil Taxonomy

Five distinct kinds of soil profiles occur in the map area, each representative of a soil order in the Canadian Soil Classification System (7). These are the Luvisols, Podzols, Brunisols, Gleysols and Organic soils.

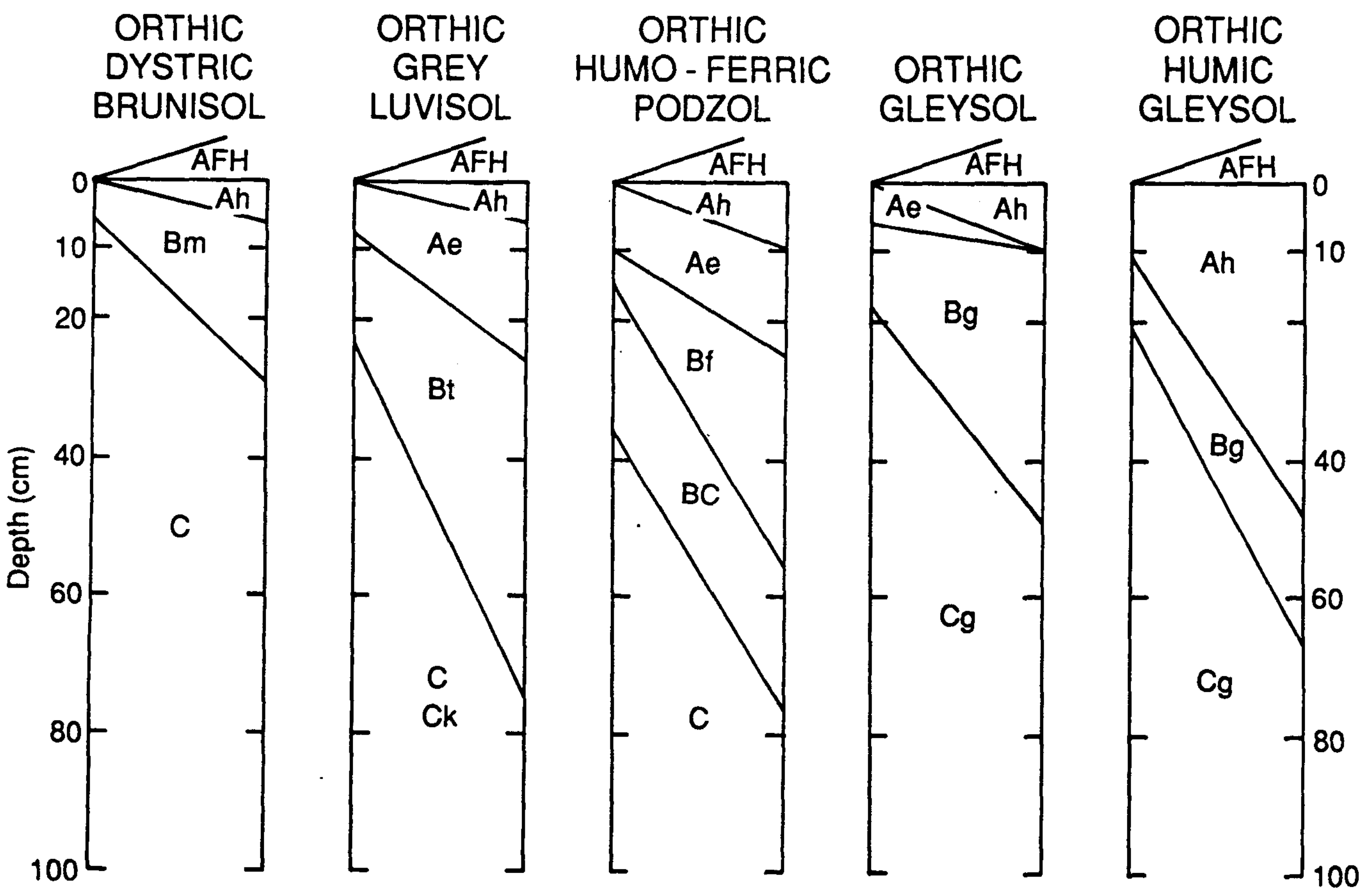

Figure 5. Diagrammatic soil horizons and depths of five subgroups typical of the area

Diagrammatic horizon patterns for five typical subgroups of these soils are shown in Figure 5.

The principal unit of classification is the soil series, which may be subdivided into soil phases, based on differences in the texture of the surface horizon. Each soil series is defined in terms of the kind and texture of the parent material, and the characteristics of the soil horizons. The soils occurring within the limits of a soil series must have similar horizon development. Since soil is a three-dimensional continuum, the features of each horizon vary both laterally and vertically.

The principal soils occurring in the region are named and described in this report, but minor soils of limited occurrence may not be discussed. The profile descriptions in the Appendix, present a central concept of each principal soil. The name given to a soil is usually a geographical name, referring to an area where it was first established, e.g., New Liskeard soil, a name given to a soil first mapped in the New Liskeard area.

Soil Map Units

Different soils may occur in such close proximity in a landscape, that they cannot be separated at a particular scale of mapping. Complex map units are established, which recognize this fact. Map units are named after the dominant soils which are present. Simple map units occur where one soil is dominant, and there are only minor inclusions of other soils. Complex map units, on the other hand, occur where two or more soils are present in significant amounts in the landscape, but which cannot be separated at that mapping scale. These map units may also contain minor inclusions of other soils, as well. Most map units in the Precambrian shield regions of Ontario are of this second type, consisting of the principal soil series plus, in many cases, rock outcrop.

It is usual practice to expect at least 20 percent of unnamed inclusions in any map unit. There may be instances where the proportions of unnamed inclusions exceed the 20 percent level, particularly in areas of poor accessibility.

Soil Phases

A soil phase is a unit of soil outside the system of soil taxonomy. It is a functional unit that may be used to recognize and to name soil and landscape properties that are not used as criteria in soil taxonomy, e.g., stony phase, but which are important in land management.

In Table 5, the drainage conditions of the soils, that are mapped in the Ville-Marie map sheet area, are indicated. Soils are listed alphabetically in the same line with similar soils that occur on the same parent materials, but have different drainage conditions.

Table 5. Soils mapped in the Ville-Marie map sheet area and their drainage relationships

Soil Name	Well-drained	Imperfectly Drained	Poorly Drained	Very Poorly Drained
Abitibi	Abitibi			
Blanche	Blanche	Pense	Falardeau	
Brentha	Brentha			
Brethour	Thwaites	Casey	Brethour	
Bucke	Bucke	Otterskin	Englehart	
Burt				Burt
Cane	Evanturel	Earlton	Cane	
Casey	Thwaites	Casey	Brethour	
Chamberlain				Chamberlain
Coutts	Wabi	Coutts	Moose	
Couttsville				
Dack	Dack	McCool	Thornloe	
Dawson	Dawson	Dymond	Sutton Bay	
Dymond	Dawson	Dymond	Sutton Bay	
Earlton	Evanturel	Earlton	Cane	
Ecclestone		Ecclestone		
Elk Pit	Elk Pit			
Englehart	Bucke	Otterskin	Englehart	
Evanturel	Evanturel	Earlton	Cane	
Falardeau	Blanche	Pense	Falardeau	
Fleck				Fleck
Frere Lake				Frere Lake
Gaffney			Gaffney	
Haileybury	Haileybury	Hanbury	New Liskeard	Milberta
Hanbury	Haileybury	Hanbury	New Liskeard	Milberta
Heaslip				Heaslip
Henwood	Henwood			
Hilliard				Hilliard
Ingram				Ingram
Kanimiwiskia	Wendigo	Mallard	Kenabeek	Kanimiwiskia
Kenabeek	Wendigo	Mallard	Kenabeek	Kanimiwiskia
Kerns				Kerns
Makobe		Makobe		
Mallard	Wendigo	Mallard	Kenabeek	Kanimiwiskia
Maybrook				Maybrook
McCool	Dack	McCool	Thornloe	
Milberta	Haileybury	Hanbury	New Liskeard	Milberta
Misema River				Misema River
Moose	Wabi	Coutts	Moose	
Mud Lake				Mud Lake
New Liskeard	Haileybury	Hanbury	New Liskeard	Milberta
Otterskin	Bucke	Otterskin	Englehart	
Pense	Blanche	Pense	Falardeau	
Pyne		Pyne		
Solvan			Solvan	
Sturgeon River				Sturgeon River

Table 5. Soils mapped in the Ville-Marie map sheet area and their drainage relationships (continued)

Soil Name	Well-drained	Imperfectly Drained	Poorly Drained	Very Poorly Drained
Sutton Bay	Dawson	Dymond	Sutton Bay	
Thornloe	Dack	McCool	Thornloe	
Thwaites	Thwaites	Casey	Brethour	
Timiskaming		Variable		
Twin Falls				Twin Falls
Wabi	Wabi	Coutts	Moose	
Wendigo	Wendigo	Mallard	Kenabeek	
Withington			Withington	

GENERAL DESCRIPTION OF THE SOILS

Soil Key

A. Soils Developed on Glacial Till

1. Loam-textured noncalcareous till
   - (a) Good drainage
     1. Wabi loam (Wbl)
     2. Wabi sandy loam (Wbs)
   - (b) Imperfect drainage
     1. Coutts loam (Ctl)
     2. Coutts sandy loam (Cts)
   - (c) Poor drainage
     1. Moose loam (Msl)
     2. Moose sandy loam (Mss)
2. Loam-textured calcareous till
   - (a) Good drainage
     1. Dawson loam (Dwl)
     2. Dawson sandy loam (Dws)
   - (b) Imperfect drainage
     1. Dymond loam (Dyl)
     2. Dymond sandy loam (Dys)
   - (c) Poor drainage
     1. Sutton Bay loam (Sbl)
     2. Sutton Bay sandy loam (Sbs)
3. Acidic medium to coarse sandy till
   - (a) Imperfect drainage
     1. Makobe sandy loam (Mksl)

B. Soils Developed on Kame Moraine Materials

1. Gravelly materials
   - (a) Good drainage
     1. Elk Pit sand (Eps)
2. Sandy materials
   - (a) Good drainage
     1. Henwood sand (Hs)

C. Soils Developed on Outwash Materials

- (a) Rapid drainage
  1. Abitibi sandy loam (Absl)
- (b) Good drainage
  1. Wendigo sand (Wds)
  2. Wendigo sandy loam (Wdl)
  3. Wendigo gravelly sand (Wdg)
- (c) Imperfect drainage
  1. Mallard sand (Ms)
  2. Mallard sandy loam (Msl)
  3. Mallard gravelly sand (Mgs)
  4. Pyne sandy loam (Pysl)
  5. Withington sandy loam (Wnsl)
- (d) Poor drainage
  1. Kenabeek sand (Ks)
  2. Kenabeek sandy loam (Ksl)
  3. Gaffney sandy loam (Gasl)
- (e) Very poor drainage
  1. Twin Falls peaty phase (TF)

D. Soils Developed on Outwash Materials Underlain by Clay

- (a) Good drainage
  1. Bucke sand (Bus)
  2. Bucke sandy loam (Bul)
- (b) Imperfect drainage
  1. Otterskin sandy loam (Ots)
- (c) Poor drainage
  1. Englehart sandy loam (Ens)

E. Soils Developed on Lacustrine Deposits

1. Silt loam weakly calcareous over clay
   - (a) Good drainage
     1. Thwaites silt loam (Ths)
   - (b) Imperfect drainage
     1. Casey silt loam (Cys)
   - (c) Poor drainage
     1. Brethour silt loam (Bts)
2. Silt loam weakly calcareous
   - (a) Good drainage
     1. Blanche silt loam (Bls)
   - (b) Imperfect drainage
     1. Pense silt loam (Pes)
     2. Pense silty clay loam (Pec)
   - (c) Poor drainage
     1. Falardeau silty clay loam (Fac)
     2. Falardeau silt loam (Fas)

3. Calcareous silt loam
   (a) Good drainage
      1. Evanturel silt loam (Evs)
      2. Evanturel silty clay loam (Evc)
   (b) Imperfect drainage
      1. Earlton silt loam (Eas)
      2. Earlton silty clay loam (Eac)
      3. Ecclestone loam (El)
   (c) Poor drainage
      1. Cane silt loam (Cns)
      2. Cane silty clay loam (Cnc)
      3. Solvan silt loam (Sosil)

4. Varved calcareous clay
   (a) Good drainage
      1. Haileybury silty clay (Hasc)
      2. Haileybury clay (Hac)
      3. Haileybury silty clay loam (Has)
   (b) Imperfect drainage
      1. Hanbury clay (Hnc)
      2. Hanbury silty clay (Hnsc)
      3. Hanbury silty clay loam (Hns)
      4. Hanbury clay-stony phase (Hnc-s)
   (c) Poor drainage
      1. New Liskeard clay (Nlc)
      2. New Liskeard silty clay loam (Nls)
      3. New Liskeard clay-stony phase (Nlc-s)
   (d) Very poor drainage
      1. Milberta clay (Mc or Mm)

5. Calcareous clay
   (a) Good drainage
      1. Dack clay (Dac)
   (b) Imperfect drainage
      1. McCool clay (Mcc)
   (c) Poor drainage
      1. Thornloe clay (Toc)

F. Miscellaneous Land Types

1. Timiskaming Complex (T)
2. Rock (R)

G. Soils Developed in Organic Material

1. Organic soils developed in relatively undecomposed organic material derived dominantly from sphagnum and other mosses
   (a) Very poor drainage
      1. Fleck (F)
      2. Frere Lake (FL)
      3. Ingram (In)
      4. Kanimiwiskia (Kw)
      5. Twin Falls (TF)

2. Organic soils developed in moderately decomposed organic material derived from sedges, mosses, etc.
   (a) Very poor drainage
      1. Burt (By)
      2. Chamberlain (Cha)
      3. Couttsville (Cv)
      4. Hilliard (Hr)
      5. Kerns (Kn)
      6. Maybrook (Mb)
      7. Misema River (MR)
      8. Mud Lake (Mud)

3. Organic soils developed in well decomposed organic material derived from sedges, rushes, shrubs, grasses and trees.
   (a) Very poor drainage
      1. Heaslip (Hl)
      2. Sturgeon River (Stu)

H. Soils Developed on Shallow Till over Bedrock

(a) Good drainage
   1. Brentha loam (Bnl)
   2. Brentha sandy loam (Bns)

Soil Descriptions

Abitibi soils

Abitibi soils are mapped near the northern boundary of the Ville-Marie sheet. They are rapidly drained soils developed on outwash sediments dominantly composed of acidic medium and coarse sandy loam. The topography is mostly gently sloping. They are usually classified as Orthic Humo-Ferric Podzols.

Blanche soils

The Blanche soils consist of well-drained lacustrine silt loams. They are found on steeply rolling topography that usually occurs near stream courses. Runoff is rapid and they are very susceptible to erosion. They are usually classified as Orthic Gray Luvisols. Podzol profiles sometimes form in the upper part of the soil profile, in uncultivated Blanche soils.

Brentha soils

The Brentha soils have developed in a thin layer of glacial till, less than thirty centimeters thick, overlying limestone bedrock. They consist of well-drained loam and sandy loam textures. They usually occur on gently sloping topography. They are classified as Dystric Brunisols.

Brethour soils

Brethour silt loam is found in Brethour township on very gently undulating topography. This poorly drained soil has a silt overburden overlying fine-textured, calcareous lacustrine clay. The clay usually occurs at depths between 60 and 120 cm, and is the main cause for high water tables of long duration. Brethour soils are usually classified as Orthic Gleysols.

Bucke soils

The Bucke soils are well-drained soils that occupy small tracts of land scattered throughout the surveyed area. The sand and sandy loam from which the soil has developed rests on clay at depths ranging from a few centimeters to one meter. The sand is deep on the knolls and shallow in the depressions. The topography is gently to moderately rolling. Large stones are sometimes found on the surface. They are usually classified as Orthic Humo-Ferric Podzols.

Burt soils

The Burt soils are very poorly drained. The organic layers are partially decomposed and range from 40-160 cm deep over clayey mineral subsoil. They are usually classified as Terric Mesisols.

Cane soils

Cane soils are poorly drained soils that occur in Cane, Robillard, Savard, Sharpe and Evanturel Townships. Soil textures are mainly silt loam or silty clay loam. The flat topography, combined with low soil permeability and very high silt contents, results in serious drainage problems. Cane soils are usually classified as Orthic Humic Gleysols.

Casey soils

Casey soils are imperfectly drained soils, developed in lacustrine sediments, consisting of variable thicknesses of silt loam over clay. They occupy gently undulating terrain, and are classified as Gleyed Humo-Ferric Podzols.

Chamberlain soils

Chamberlain soils are very poorly drained organic soils. They are mapped at several locations north of New Liskeard. They are composed of partially decomposed organic soil greater than 160 cm deep. They are classified as Typic Mesisols.

Coutts soils

Coutts soils are imperfectly drained soils developed on stony, loamy glacial till. The topography is gently rolling, and the surface soil is strewn with stones and boulders of granitic origin. Soil textures are usually loam, with occasional sandy loam horizons. Soil classification is usually Gleyed Humo-Ferric Podzol.

Couttsville soils

The Couttsville soils are very poorly drained organic soils. The organic materials are moderately decomposed, and overlie a mineral soil contact that is usually within 90 cm They are usually classified as Terric Mesisols.

Dack soils

Dack soils are developed in well-drained lacustrine clays that most commonly occur in the northern part of the surveyed area. The parent materials consist of calcareous, dark yellowish brown clay that generally has a clay content of about 90 per cent. They usually occur on severely dissected, steeply rolling topography. Soil classification is Orthic Melanic Brunisol.

Dawson soils

The Dawson soils are well-drained soils developed on calcareous, stony loam till. They are found on ridges and hills in the Townships of Dymond, Harris and Harley. The land has a moderately rolling topography. They are usually classified as Orthic Melanic Brunisols.

Dymond soils

The Dymond soils are imperfectly drained soils developed on calcareous, stony loam till. They occur on gently rolling topography. Dymond soils are usually classified as Gleyed Melanic Brunisols.

Earlton soils

Earlton soils are imperfectly drained soils developed in calcareous, lacustrine silt loam and silty clay loam. The land is gently sloping, with the largest area occurring just south of Earlton. Because of their high silt contents, they are highly erodible. Earlton soils are usually classified as Gleyed Gray Luvisols.

Ecclestone soils

Only one area of Ecclestone soils is mapped along the northern boundary of the Ville-Marie sheet. They are imperfectly drained soils developed on calcareous, lacustrine silt loam sediments. Topography is gently sloping and the usual soil classification is Gleyed Gray Luvisol.

Elk Pit soils

Elk Pit soils are well-drained soils that occur on strongly rolling kame and kettle topography in the Townships of Beauchamp and Henwood. In some locations, cobbles and large stones are scattered over the surface. Elk Pit soils are usually classified as Orthic Humo-Ferric Podzols.

Englehart soils

The Englehart soils are poorly drained soils, developed on variable depths of sandy loam over lacustrine clay. The total sand depth is usually about 60 cm. The topography ranges from level to gently undulating. Englehart soils are classified as Orthic Humic Gleysols.

Evanturel soils

The Evanturel soils are well-drained lacustrine silt loams and silty clay loams found along Evanturel Creek and the Englehart River. These materials are comparatively deep and are underlain by dark brown or pale brown varved clay deposits. The topography ranges from moderately to steeply sloping, and surface erosion is a serious problem. Evanturel soils are usually classified as Orthic Gray Luvisols.

Falardeau soils

The Falardeau soils are poorly drained lacustrine silt loam and silty clay loam soils. They occur on very gently undulating land in the Blanche River valley. They are difficult to drain because of their high contents of varved silts. The Falardeau soils are usually classified as Orthic Humic Gleysols.

Fleck soils

Fleck soils are very poorly drained organic soils. They are mapped in only one small area, along the western boundary of the Ville-Marie sheet, in a complex with Gaffney soils. They occur on level to very gently sloping terrain. They are classified as Typic Fibrisols.

Frere Lake soils

Frere Lake soils are very poorly drained organic soils, located to the north and west of the town of New Liskeard. They overlie mineral subsoil, usually at a depth of 90-130 cm. They are classified as Terric Fibrisols.

Gaffney soils

The Gaffney soils are poorly drained soils that have developed on acidic fine sandy materials of outwash or deltaic origin. They occur in depressional locations and are usually classified as Orthic Humic Gleysols.

Haileybury soils

Haileybury soils are well-drained soils developed on varved lacustrine clays. The clay content of these soils is often higher than 60 per cent. Because they occur on steeply rolling terrain, they are highly susceptible to erosion. They are classified as Orthic Gray Luvisols.

Hanbury soils

The Hanbury soils are imperfectly drained soils developed on gently rolling, dissected, varved clays. Textures range from silty clay loam to heavy clay. In some places, where stones and boulders occur, a Hanbury clay-stony phase has been mapped. Hanbury soils are susceptible to erosion damage and may suffer from poor surface physical condition. Care must be taken to maintain surface cover and organic matter contents. They are classified as Gleyed Gray Luvisols.

Heaslip soils

The Heaslip soils are very poorly drained organic soils that have developed mainly in black, well-decomposed organic material. They are classified as Typic Humisols.

Henwood soils

The Henwood soils are well-drained soils developed on kame moraines, and occur chiefly in the Townships of Henwood and Beauchamp. The soil material is dominantly sand although a few stones and boulders are present. Henwood soils are usually classified as Orthic Humo-Ferric Podzols.

Hilliard soils

Hilliard soils are very poorly drained organic soils that have developed in moderately decomposed organic materials, that range in thickness from 40-160 cm over mineral subsoil. They are most commonly 90-130 cm thick. Hilliard soils are classified as Terric Mesisols.

Ingram soils

Ingram soils are very poorly drained organic soils that have developed in relatively undecomposed organic material, derived from sphagnum and other bog-loving plants. They have organic material greater than 160 cm in thickness, and are classified as Typic Fibrisols.

Kanimiwiskia soils

The Kanimiwiskia soils are very poorly drained organic soils that have developed in slightly decomposed organic materials, derived chiefly from sphagnum mosses. Kanimiwiskia soils are greater than 160 cm thick, and are classified as Typic Fibrisols.

Kenabeek soils

The Kenabeek soils are poorly drained soils that have developed on noncalcareous stratified outwash sand, occupying the level to depressional portions of the landscape. Textures are sand and sandy loam. They are classified as Orthic Humic Gleysols.

Kerns soils

The Kerns soils are very poorly drained organic soils that have developed on moderately decomposed organic materials. The thickness of organic soil ranges between 40 and 160 cm over sandy clay mineral subsoil. They occur in complexes with the Maybrook organic soils, and are mapped in a number of areas northwest of New Liskeard. They are classified as Terric Mesisols.

Makobe soils

Makobe soils are only mapped at one location on the Ville-Marie sheet, along the western boundary. They are imperfectly drained and have developed on acidic, medium to coarse sandy till. The topography of the Makobe area, on the Ville-Marie sheet, ranges from level to gently sloping. They are classified as Gleyed Humo-Ferric Podzols.

Mallard soils

Mallard soils are imperfectly drained soils that have developed on outwash sands, that often contain gravelly layers. Sand, sandy loam and gravelly sand phases have been mapped. A cemented or 'ortstein' layer sometimes occurs in the B horizon. Mallard soils occur on level to very gently rolling topography. They are relatively acidic, and are classified as Gleyed Humo-Ferric Podzols.

Maybrook soils

The Maybrook soils are very poorly drained organic soils that have developed in slightly to moderately decomposed organic materials. Surface materials are mainly derived from sphagnum moss. Thickness of the organic layers ranges between 40 and 160 cm over clayey mineral subsoil. They are classified as Terric Fibric Mesisols.

McCool soils

McCool soils are imperfectly drained soils developed in calcareous, lacustrine clays, mostly in the vicinity of Krugersdorf. They are usually classified as Gleyed Melanic Brunisols.

Milberta soils

The Milberta soils are very poorly drained soils that have developed in calcareous, varved, lacustrine clay. There is usually an organic matter accumulation on the surface, of less than thirty centimeters. These soils occur in association with the New Liskeard soils, or on the periphery of deep organic deposits. They are usually classified as Orthic Humic Gleysols.

Misema River soils

Misema River soils are very poorly drained organic soils, developed on moderately decomposed organic materials, underlain by mineral clay-textured subsoil. The clay subsoil is lacustrine in origin, and occurs at depths ranging between 40 and 160 cm below the surface. They are classified as Terric Mesisols.

Moose soils

Moose soils are poorly drained soils developed on noncalcareous, stony loam till. Both loamy and sandy loam phases are mapped. They occur in depressional topography, and are usually classified as Orthic Humic Gleysols.

Mud Lake soils

The Mud Lake soils are very poorly drained organic soils that have developed on moderately decomposed organic materials greater than 160 cm thick. They are classified as Typic Mesisols.

New Liskeard soils

New Liskeard soils are poorly drained soils developed on varved, calcareous, lacustrine clay. They occupy extensive areas of flat terrain in the vicinity of New Liskeard. Clay, silty clay loam, and clay-stony phases have been mapped. They are classified as Orthic Humic Gleysols.

Otterskin soils

Otterskin soils are imperfectly drained, developed on variable depths of shallow outwash sand over clay. They occur on gently undulating to hummocky terrain consisting of slight depressions and gentle knolls. Surface sands are strongly acidic. They are usually classified as Gleyed Humo-Ferric Podzols.

Pense soils

The Pense soils are imperfectly drained soils, developed on silty lacustrine soil materials. Silt loam and silty clay loam phases are mapped. Pense soils occur on gently undulating topography. They can have serious erosion problems, because of their high silt contents. They are usually classified as Gleyed Gray Luvisols.

Pyne soils

Pyne soils are only mapped in one small area along the western boundary of the Ville-Marie sheet. They have developed on acidic, medium sand outwash, on level to very gently sloping topography. They are usually classified as Gleyed Humo-Ferric Podzols.

Rock

Exposed bedrock, mainly of Precambrian age, is found throughout the map sheet area, but most extensively in the southern portion. Here, it is usually mapped as a complex association with the Moose and Hanbury soils. Rock areas also contain many small, unmappable pockets of mineral and organic soils, as well as stones and boulders.

Solvan soils

Solvan soils are only mapped at one location on the Ville-Marie sheet, along the northern boundary near the northeastern corner of the sheet. They are poorly drained, and developed from calcareous lacustrine silt loam materials. They occur on level to very gently sloping terrain on the Ville-Marie sheet. The high silt contents guarantee serious drainage problems. They are usually classified as Orthic Humic Gleysols.

Sturgeon River soils

Sturgeon River soils are very poorly drained organic soils, developed on slightly to moderately decomposed organic materials, greater than 160 cm thick. They are underlain at depth by clayey, mineral lacustrine subsoil. They are classified as Typic Humisols.

Sutton Bay soils

Sutton Bay soils are poorly drained soils developed in stony loam till. They occur on level to very gently rolling topography. Both loam and sandy loam phases are mapped. Sutton Bay soils are usually classified as Orthic Humic Gleysols.

Thornloe soils

Thornloe soils are poorly drained soils developed on calcareous, lacustrine clay. They occur on the very gently sloping topography. They are usually classified as Orthic Humic Gleysols.

Thwaites soils

Thwaites soils are well-drained soils developed in variable depths of silt loam over calcareous, lacustrine clay. They occur chiefly in Brethour and Pense Townships, along the edge of the Blanche River valley. The topography is moderately sloping, except for some steep slopes along dissected stream valleys. Thwaites soils, when uncultivated, are classified as Podzolic Gray Luvisols. However, when cultivated, they are usually Orthic Gray Luvisols.

Timiskaming Complex

The Timiskaming Complex is composed of Haileybury, Hanbury, New Liskeard and Milberta mineral soils, as well as organic soils and rock outcrop. Drainage is variable and the topography is mainly moderately to steeply rolling.

Twin Falls soils

Twin Falls soils are very limited in extent on the Ville-Marie sheet, occurring at only one location along the western boundary of the sheet. They are very poorly drained soils that have developed on fibric organic materials, up to 40 cm thick, over mineral soil composed of fine sandy outwash. Topography is level to depressional. They are classified as Orthic Humic Gleysols.

Wabi soils

Wabi soils are well-drained soils, developed on noncalcareous, stony loam till. They occur on moderately rolling ridges in Harley and Armstrong Townships. Surface textures may be loam or sandy loam, and surface stones and boulders are common. Wabi soils are usually classified as Orthic Humo-Ferric Podzols.

Wendigo soils

Wendigo soils are well-drained soils developed from water-worked, stratified, medium to fine sands, which occasionally contain lenses or layers of fine to medium gravel. They occur on gently rolling terrain. Three phases have been mapped; Wendigo sand, Wendigo sandy loam and Wendigo gravelly sand. They are classified as Orthic Humo-Ferric Podzols.

Withington soils

Two small areas of Withington soils have been mapped along the western boundary of the Ville-Marie sheet. They are imperfectly drained soils, developed over acidic, fine sand outwash materials. They occur on topography ranging from level to gently sloping. They are usually classified as Gleyed Ferro-Humic Podzols.

SOIL MANAGEMENT*

History and Agriculture

The area surrounding Haileybury was first promoted for agricultural settlement in 1891 by Charles Cobbald Farr. Some settlement did occur over the following 20 years. Land was sold at $0.50 per acre with the conditions "one half of the amount must be paid in cash, the balance to be paid in two yearly installments with interest, actual residence upon the land for four years from the date of purchase, clearing and having under cultivation and crop at least 10 acres for every 100 acres, and a habitable house at least sixteen by twenty feet, such conditions to be fulfilled before issue of patent" (8).

The agriculture of the 'Little Clay Belt' grew rapidly from the home gardens of the miners and timbermen who came to extract the rich mineral resources near Cobalt and the coniferous forests immediately to the north. Isolation forced near self-sufficiency.

Trends in agricultural growth followed much the same pattern as the rest of the province, with the profound variations in agricultural production resulting from the great depression and the two world wars (9). The surrounding forests and rugged topography lessened the magnitude of these fluctuations by maintaining a near self-sufficient atmosphere. The isolation also offered an almost disease-free environment for the production of high quality timothy seed, which reached European markets in the 1940's, but it slowed development of the agricultural base of the area by increasing transportation costs to and from markets.

Rapid growth in the agricultural sector has occurred since the early 1960's. Farming enterprises are primarily livestock-based (dairy and beef, with lesser amounts of sheep, swine, poultry), with associated feed-cropping programs. Barley, oats, alfalfa, clover, bird's-foot trefoil, timothy and brome grass are the most popular feed crops. Production of high quality oat, barley, bird's-foot trefoil and timothy seed continues to supplement the income of many farms. Cash cropping of hard red spring wheat, canola and field peas are also carried out when prices of these commodities are favourable.

Climate

The New Liskeard-Englehart area lies within plant hardiness Zones 3a and 2b with the warmer areas associated with the northern end of Lake Timiskaming. On average, there are between 95 and 110 frost free days, 2250 and 2500 growing degree days (temperature greater than 5.6° C), and 1700 to 2200 corn heat units (average 1900) available for growing and ripening of crops (10, 11). The years 1987, 1988 and 1989 all had heat unit accumulations above 2300 corn heat units.

A total of 760 to 810 mm of precipitation falls on the area each year, with about 380 mm falling between May and September. The rainfall distribution tends to be skewed to times of field operations (plowing, seeding, harvesting, etc.); therefore, cropping systems with minimal dependence upon favourable weather should be adopted.

The probability of spring and fall frosts are presented in Figures 6 and 7.

* By J.G. Rowsell, Lecturer, New Liskeard College of Agricultural Technology.

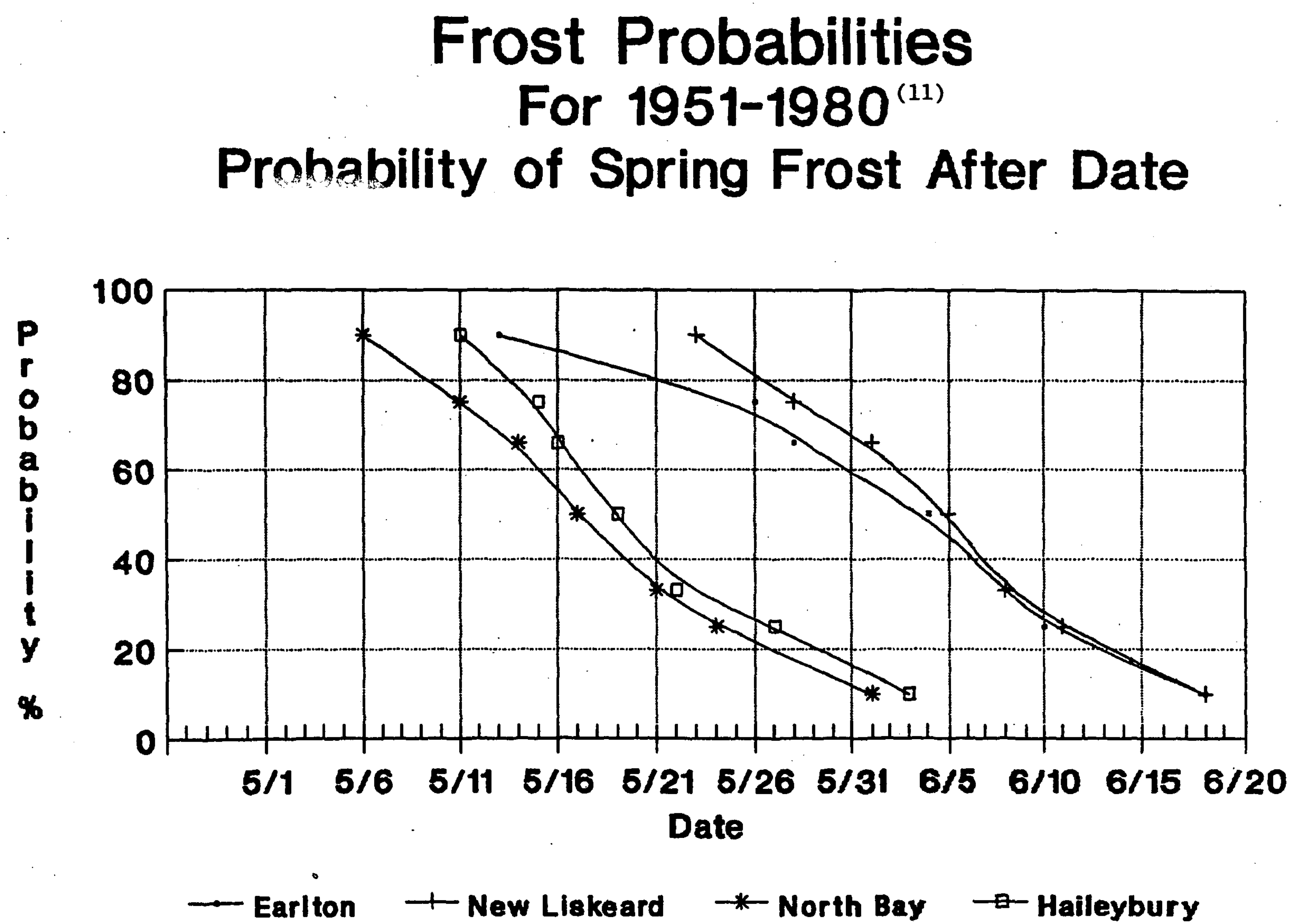

Figure 6. Frost probabilities for 1951-1980 – probabilities of frost after dates

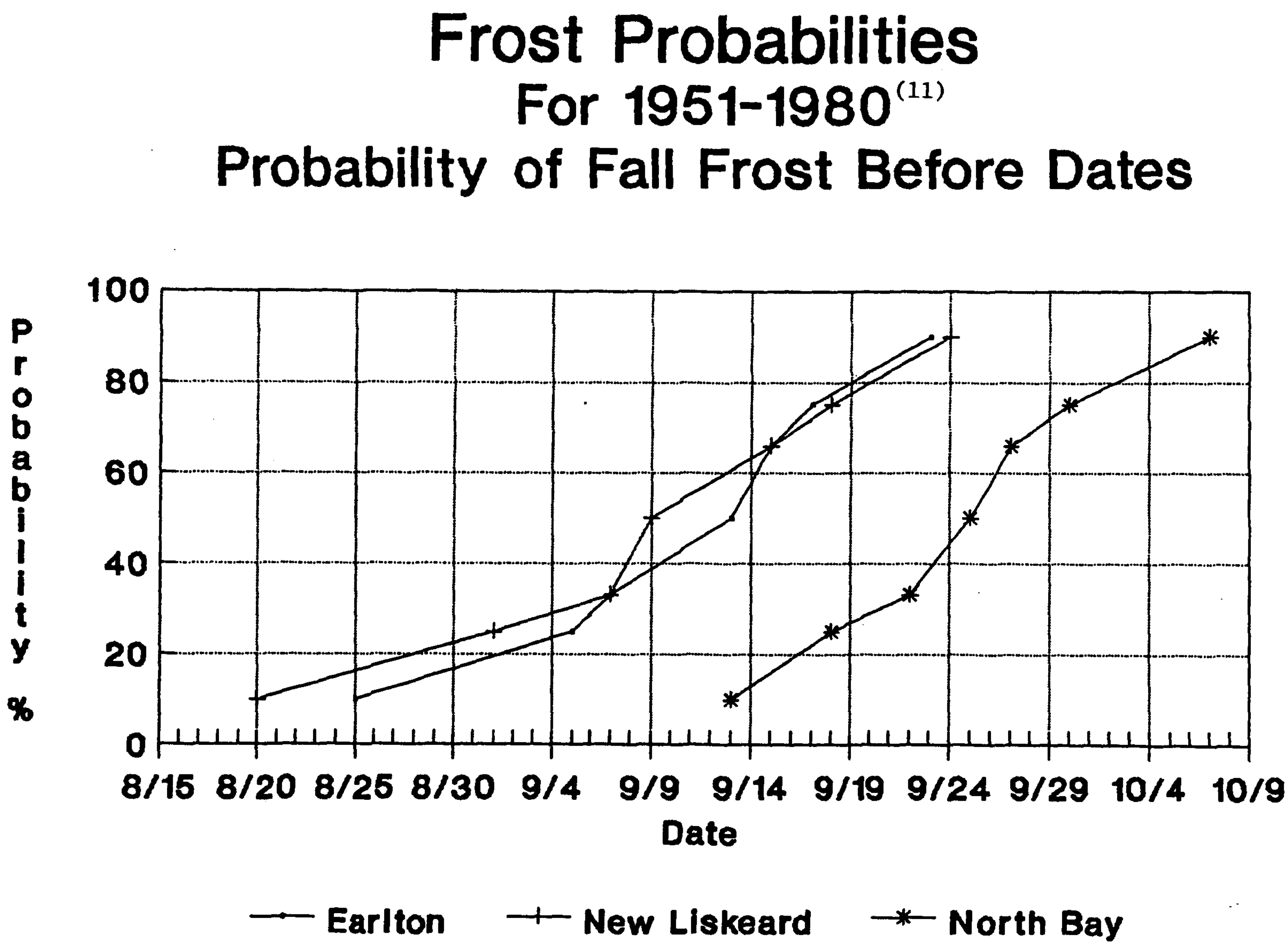

Figure 7. Frost probabilities for 1951-1980 – probabilities of frost before dates

Crops

Adapted field crops and associated yields are given in Table 6.

Table 6. Adapted field crops and associated yields

Crop	Yield (kg/ha) On Farm*	Yield (kg/ha) Possible**	Hectares 1975	Hectares 1986****
Barley	2904	5400	1500	9534
Oats	2200	4180	7273	2425
Hay-(Legume-Grass)***	7300	9900	27273	21314
Seed-Trefoil	150	300	N.D.	N.D.
-Timothy	300	400	N.D.	N.D.
Canola (Rape)	1875	4200	N.D.	1165
Hard Red Spring Wheat	N.D.	4900	N.D.	1550
Field Peas	N.D.	3700	N.D.	73

* From 1988 Agricultural Statistics for Ontario. OMAF Pub 20. or local agronomist.
** Based on New Liskeard College of Agricultural Technology plot data assuming above average management.
*** Two-cut system.
**** From 1986 Census of Agriculture Profile, 1986 Agricultural Statistics for Ontario. OMAF Pub. 20.
N.D. No Data.

Seeding is usually completed by late May with early seeding often possible in late April. Frost seeding of cereals (seeding before subsoil thaws) produces highest yield potential.

Two cuts of forage are taken each year with the critical dates for last cut falling between August 20th and October 1st. Dry hay and silage systems for handling forages are well-represented. Pastures also play a significant role in the production and handling of livestock feeds.

Harvest of cereals starts in late August and continues well into September. Many farmers swath grain prior to combining to facilitate uniform drying. Several farmers are decreasing the weather dependence of small grain harvest by the use of grain drying or high moisture storage.

There is a limited number of market garden and pick-your-own operations in the area. The climate in the area is well suited to the production of cool weather crops such as broccoli, brussels sprouts, cabbage, cauliflower and parsnips.

Soil Fertility

Mineral soils

The most limiting plant nutrient on all of the soils of the area is phosphorous (P). Soil test ratings of 2 to 5 on virgin soils are common.* Farm soils that have been amended with manure or inorganic P fertilizers obviously have higher phosphorous soil test levels. Proper placement with the seed at 2-3 cm below the seed for all adapted crops, along with maintenance of organic matter and proper pH, will maximize the efficiency of P uptake and minimize P fixation.

The lacustrine clay and silty clay soils generally have medium to high ratings for potassium (K). Soil test results may call for low rates of K to be applied to ensure adequate K nutrition of the crop grown. Soils with very high silt contents generally have low K contents.

Profitable responses to higher rates of nitrogen (N) applications may be obtained from forage grasses (up to 200 kg N/ha) and small grains (up to 70 kg/ha) than may be obtained in more southerly parts of the province. This is attributed to the adaptation of these crops to the climate and soils, and to the low incidence of leaf diseases. These higher rates of application only apply to early seeding (prior to May 15) of small grains, and when P and K are applied to meet soil test recommendations.

More-than-adequate levels of calcium and magnesium are found in most soils, with the exception of the acid sands associated with the surrounding Precambrian shield, and soils with high silt contents (silt loam phases of Blanche, Pense, Falardeau, Evanturel, Earlton and Cane soils). Sulfur is found at levels that are at least adequate for crop production.

Manganese may be deficient on drained, fine-textured soils, particularly in years in which June and July are relatively dry.

Many of the mineral soils have medium to slightly acid surface horizons, regardless of calcareous parent materials. Calcitic and dolomitic agricultural limestone is available in the immediate area.

Soils with surface pH values above 7 are not uncommon. Iron deficiency was found in raspberries grown on clay soil having a pH in the plow layer of 7.6. It is not economical to lower soil pH values.

Organic Soils

Barley, oats, timothy for seed, and alfalfa, have all grown successfully on organic soils in Timiskaming. There is little information available on the use of organic soils for the production of field crops; therefore, farmers rely upon soil tests for mineral soils and their own experiences to determine the proper rates of fertilization on these soils.

Nitrogen requirements for organic soils appear to be quite variable and difficult to predict. Trials conducted on farms by New Liskeard College of Agricultural Technology, in the early 1980's, showed no yield response by barley to nitrogen. Along with N, micronutrient availability may vary significantly from area to area. Manganese deficiency has been frequently observed.

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* Sodium bicarbonate phosphorous soil test (ppm).

Soil Physical Properties and Tillage

Mineral soils

The inclusion of hay and pasture in crop rotations has resulted in far less deterioration of soil physical properties in Timiskaming than in more southerly parts of the province, where corn is continuously grown. Shrinkage and swelling is pronounced during drying and wetting of most soils. Tilth is also improved by the action of frost.

Soils containing high silt contents (silt loam phase of Blanche, Pense, Falardeau, Evanturel, Earlton and Cane soils) are subject to rapid deterioration of structure when subjected to rotations that contain less than three years of perennial forage in a six-year rotation (remaining years in canola, barley, oats or wheat, in succession).

Primary tillage operations are normally carried out in the fall due to the reduced yield potential if seeding is delayed beyond mid-May. Moldboard plows are the most popular primary tillage implements for use on the soils of the Haileybury, Hanbury and New Liskeard soils. Chisel plows and stubble-mulch tillers are being used, as well as moldboard plows, on the remainder of the soils. Chisel plows and stubble-mulch tillers are the implements of choice for soils with high silt contents.

Secondary tillage may be performed in mid-to-late April in most years. Offset discs are still the most popular secondary tillage implements, with a minimum of two passes over the field usually required to obtain a suitable seed bed. Spring-toothed cultivator-basket harrow combinations are gaining popularity for use on virtually all soil types as a once-over in the spring type of secondary tillage.

'No-till' systems of cereal production on fine-textured soils have been attempted in Timiskaming as part of the 'Tillage 2000' demonstration program. Results to 1990 have been rather dismal, with barley yields ranging from 260 to 1850 kg/ha.

Organic Soils

These soils should be worked as little as possible. Problems with seed placement and moisture retention occur if these soils are subjected to conventional tillage systems.

Many sticks and roots may be found in the organic soils. Farmers prefer to use heavy disc-harrows to cut up and push under sticks during the first few years of cultivation.

Large-scale commercial extraction and sale of organic soils has not yet occurred in the area.

Drainage

Level-to-depressional topography, fine-textured soils and the distribution of rainfall have made drainage of much of the area a necessity, if barley or alfalfa are to be grown.

Surface levelling and drainage are required on gently undulating topography. Poor drainage, due to inadequate surface drainage, is often mistakenly attributed to failures of underdrainage systems.

Prior to 1960, tile drainage was not readily available, and farmers resorted to changing surface configurations by 'Richard' plowing (turning furrows in the same direction each year, leaving dead furrows in the same place). There is currently (1990) a drainage contractor and a plastic tile manufacturing facility operating in the area. Approximately 737,000 m of drainage tile had been installed by the end of 1980. There is an extensive network of municipal drains, both open and buried, through the area.

Popular drain spacings on mineral soils are 50 ft (15 m) and 100 ft (30 m), with economics at the time of installation playing a more significant role in determining spacings than soil type. Drain spacings calculated from hydraulic conductivities, estimated from in-situ measurements on 2 fields of Earlton silty clay and New Liskeard clay, were between 12 and 23 m (12). The intuitive drainage spacings appear to be close to those calculated using current methodologies, such as the Hooghoudt method.

Consideration must be given to the difference between the vertical and horizontal hydraulic conductivities of the varved clays. Horizontal hydraulic conductivities may be 2 to 3 times or more greater than those in the vertical.

Lenses of silt and sand are common in the soils that lie close to the Blanche River. Woven envelopes have been installed as a precautionary measure on these soils.

Special drainage problems have been noted on the Cane series. Sufficient silt has moved into drains to block them. The surface above the drains has actually subsided. A trial of different installation techniques did not provide a solution. A wheel trencher was compared to a plow for installation of the drains with no effect on silting. Woven envelope materials had no effect either. Surrounding the drain with sawdust, to reduce inflow velocities, reduced silting for 2 years; but the drains eventually filled with silt.

Erosion

Streambank and gully erosion, and landslides adjacent to water courses, are striking evidence of erosion problems. Lake Timiskaming and its contributing streams are heavily laden with sediments throughout the year. This may be attributed, in part, to the high silt content of many of the soils found in the area and the ease of movement of silt by water. The landslides have been called 'rotational slumps'. Their cause may be partially attributed to the fluid nature of the clay subsoils (see section on engineering) and to lateral seepage.

Landslides of up to 2 ha are not uncommon during spring. Maintenance of cover on streambanks, stilling structures and maintenance of buffer strips, as well as many other methods of erosion control, must be practiced.

Engineering

The first vertical silo that was constructed in the area (circa 1965) promptly fell over after filling. An overpass of Hwy 11 over the CNR tracks near New Liskeard was never completed because it kept sinking during construction (13).

The varved cla· and silty clay soils deform easily under pressure. Limitations have been placed on silo height. Special footings for silos and floating slab foundations have been designed to deal with the fluid nature of the subsoil.

Infrastructure

Equipment sales and service, seed, feed, agrochemical, accounting and other agricultural services are available in the immediate area. There are also many custom farm services available. Shopping and banking facilities are above the average of most rural southern areas.

The New Liskeard College of Agricultural Technology, located at New Liskeard, is engaged in many research activities geared at improving the profitability of agriculture in all of northern Ontario. Staff also carry on extension activities.

SOIL INTERPRETATIONS FOR AGRICULTURE

Agricultural Capability Classification for Common Field Crops

(1) Capability classification for mineral soils

The Canada Land Inventory classification system of land capability for agriculture is described in CLI Report No. 2 (14). It groups mineral soils into seven classes according to their potential and limitation for agricultural use for common field crops. Common field crops include corn, oats, wheat, barley and perennial forage crops such as alfalfa, grasses and birdsfoot trefoil. Crops such as canola, potatoes, fruits and vegetables are not covered by this classification.

The best soils, with no significant limitations for crop use, are designated Class 1. Soils designated Classes 2 to 6 have decreasing capability for agriculture, and Class 7 soils have no agricultural potential. A brief outline of each agricultural capability class follows.

Soil Capability Classes

Class 1 – Soils in this class have no significant limitations in use for crops. These soils are level to very gently sloping, deep, well- to imperfectly drained, and hold moisture and plant nutrients well. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for common field crops.

Class 2 – Soils in this class have moderate limitations that restrict the range of crops, or require moderate conservation practices. These soils are deep, and may not hold moisture and nutrients as well as Class 1 soils. The limitations are moderate, and the soils can be managed and cropped with little difficulty. Under good management, they are moderately high to high in productivity for common field crops.

Class 3 – Soils in this class have moderately severe limitations that restrict the range of crops, or require special conservation practices. The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. Under good management, they are fair to moderately high in productivity for common field crops.

Class 4 – Soils in this class have severe limitations that restrict the range of crops or require special conservation measures, or both. The limitations seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. The soils are low to fair in productivity for common field crops, but may have higher productivity for a specially adapted crop.

Class 5 – Soils in this class have very severe limitations that restrict their capability to produce perennial forage crops, and improvement practices are feasible. The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants, and may be improved by use of farm machinery. The improvement practices may include clearing brush, cultivating, seeding, fertilizing or water control.

Class 6 – Soils in this class are only capable of producing perennial forage crops, and improvement practices are not feasible. These soils provide some sustained grazing for farm animals, but the limitations are so severe, that improvements by use of farm machinery are impractical. The terrain may be unsuitable for use of farm machinery, or the soils may not respond to improvement or the grazing season may be very short.

Class 7 – Soils in this class have no capability for arable culture, or permanent pasture. This class includes marsh, rockland and soil on very steep slopes.

Soil Capability Subclasses

Subclasses are divisions, within classes, that have the same kind of limitations for agricultural use as a result of soil and climate. Thirteen different kinds of limitations have been recognized, at the subclass level, and are described in CLI Report No. 2 (14). Only those subclasses used to classify the soils of the Ville-Marie area are described.

Subclass C — Adverse climate caused by low temperatures.

Subclass D — Undesirable soil structure and/or permeability.

Subclass F — Low natural fertility, which may or may not be possible to correct by additions of fertilizers or manure.

Subclass I — Inundation by flooding of streams or lakes limits agricultural use.

Subclass M — Moisture limitations due to low moisture-holding capacities, cause droughtiness that limits agricultural use.

Subclass P — Stoniness. Stones interfere with tillage, planting and harvesting.

Subclass R — Shallowness to bedrock, which is less than one metre from the soil surface.

Subclass S — Adverse soil characteristics. Used when two or more of the limitations represented by Subclasses D, F or M are present, or when two of the limitations represented by Subclasses D, F or M are present and some additional limitation occurs, e.g. T.

Subclass T — Adverse topography due to steepness, or complexity of slopes, limits agricultural use, by increasing the cost of farming over that on level land, by decreasing the uniformity of growth and maturity of crops, and by increasing the hazard of erosion damage by water.

Subclass W — Excess water, other than from flooding, limits use for agriculture. The excess water may be due to poor drainage, a high water table, seepage, or runoff from surrounding areas.

Assumptions

Before using the soil capability tables, it is important that the user have an understanding of the following assumptions, upon which the classification is based:

(a) The soils will be well-managed and cropped under a largely mechanized system.

(b) Land requiring improvements, e.g. drainage, that can be done economically by the farmer himself, is classed according to its limitations or hazards, in use, after the improvements have been made.

(c) The following are not considered: distances to market, kind of roads, location or size of farms, type of ownership, cultural patterns, skills or resources of individual operators, and hazard of crop damage by storm.

(d) The classification includes capabilities of soils for common field crops such as forage crops and small grains. It does not include capabilities for other special crops, such as canola or potatoes, or for horticultural crops.

(e) Capability classes are subject to change, as new information on the properties, behaviour and responses of soils becomes available. In some cases, technological advances may also necessitate changes.

(2) Capability classification for organic soils

The previous discussion on soil capability classification applies only to mineral soils, and cannot be used for organic soils. A separate capability system has been devised for organic soils, using seven capability classes that are determined according to the following soil characteristics: stage of decomposition (K), reaction (F), climate (C), substratum texture, wood content (L) and depth of organic soil (H). Definitions of these soil characteristics, and how they are used to determine organic soil capability classes, are discussed by Hoffman and Acton (15). In this classification system, intensive horticultural use is assumed, e.g. vegetable production.

Capability Classes

Class 1 – Organic soils of this class have no water, topographical or pH limitations, and are deep and level.

Class 2 – Organic soils in Class 2 have one limitation that restricts their use in a minor way. The limitation may be woodiness, reaction, flooding, topography, depth or climate.

Class 3 – Organic soils in this class have moderately severe limitations that restrict the range of crops, or that require special management practices.

Class 4 – Soils in this class have limitations that severely restrict the range of crops, or require special development and management practices. Reclamation and management costs will be high.

Class 5 – Soils of this class have such severe limitations that they are restricted to the production of perennial forage or other specially adapted crops. Large scale reclamation is not feasible.

Class 6 – Class 6 organic soils are capable of producing only indigenous crops, and improvement practices are not feasible.

Class 7 – Organic soils of this class have no capability for agriculture.

Development of organic soils for agricultural use also depends on the feasibility of clearing vegetation, drainage and water level control (15). These are site-specific factors that are not considered for the general organic soil capabilities.

The agricultural capability of soils of the Ville-Marie map sheet area, is shown in Table 7.

Table 7. Agricultural capability ratings in the Ville-Marie map sheet area*

Soil	Soil Capability Rating	Soil	Soil Capability Rating
Abitibi	3MF	Ingram	6HFL
Blanche	3D	Kanimiwiskia	6F
Brentha	5R	Kenabeek	5S
Brethour	2CW	Kerns	3H
Bucke	4FM	Makobe	5P
Burt	4HF	Mallard	4F
Cane	4DW	Maybrook	3H
Casey	3F	McCool	3WD
Chamberlain	4HFL	Milberta	4W
Coutts	5P	Misema River	3HF
Couttsville	5HL	Moose	5PW
Dack	3D	Mud Lake	3F
Dawson	4P	New Liskeard	2CW
Dymond	4P	Otterskin	4F
Earlton	3D	Pense	3DW
Ecclestone	2C	Pyne	3F
Elk Pit	5FM	Rock	7R
Englehart	4W	Solvan	4DW
Evanturel	3D	Sturgeon River	3F
Falardeau	3DW	Sutton Bay	6P
Fleck	6HFL	Thornloe	3DW
Frere Lake	6HL	Thwaites	2C
Gaffney	4W	Timiskaming	7PR
Haileybury	2C	Twin Falls	4W
Hanbury	2C	Wabi	5P
Hanbury-st phase	5P	Wendigo	4FM
Heaslip	4KHF	Wendigo gr. sand	4FM
Henwood	5S	Withington	4F
Hilliard	4HF		

* Ratings for mineral soils are based on their use for common field crops, whereas ratings for organic soils are based on intensive use such as vegetable production.

Subclass T (Topography) Ratings

In Table 7, no Subclass T ratings occur because level topography is assumed. However, on sloping topography, Subclass T must be taken into account, and can be approximately determined from Tables 8 and 9, which have been adapted from O.I.P. Publication No. 89-2 (16).

Soil Erosion Interpretations

Soil erosion by water can be a serious problem on many soils of the Ville-Marie map area, particularly on slopes of the varved, glacio-lacustrine silts and clays.

Attempts were made to determine the erodibility (K) and potential soil erosion loss (RKLS) of soils on the Ville-Marie map sheet, using the Universal Soil Loss Equation (USLE). This equation uses a widely accepted water erosion relationship, A = RKLSCP, to predict average annual soil loss through sheet and rill erosion, where:

- A is the average annual soil loss;
- R is the rainfall erosivity factor;
- K is the soil erodibility factor;
- L is the slope length factor;
- S is the slope gradient factor;
- C is the crop cover factor;
- P is the management practice factor.

The average annual soil loss 'A' is calculated in tons/acre/year and converted to tonnes/hectare/year by multiplying 'A' by 2.24. K-values were computed by the method outlined by Wischmeier and Smith (17). To compute these K-values, available data on surface textures and organic matter content, was used from Table 16. Unfortunately, this data was quite limited, so derived K-values are usually only based on 1 or 2 samples. Also, there was no data for many soils, so that estimations of K had to be done by extrapolating from similar soils on the Ville-Marie sheet or elsewhere. Derived and estimated K-values are shown in Table 10. No K-values are shown for organic soils.

In Table 10, a representative slope class has been assigned to all mineral soils, based on published slope information. Slope classes are described in Table 11. Also, in Table 11, the average slope gradients and estimated average slope lengths, have been determined for each slope class, and used to calculate LS-values.

In Table 10, the most typical slope class was determined for each soil, and assigned the appropriate LS-value from Table 11. Then potential soil loss (RKLS) values for bare soil, were determined, by multiplying R, K and LS-values together, The R (rainfall erosivity) value for the Ville-Marie area was estimated to be 80 (18).

Potential soil erosion loss values for K-values and slope groups other than those shown in Table 10, can be determined from Table 12. Potential soil erosion loss classes, descriptions and ranges are shown in Table 13. The potential soil loss class for each soil, and its typical slope class, is shown in Table 10.

Table 11 shows the LS-values derived for the Ville-Marie map sheet area, and the slope groups, mean slope gradients and mean slope lengths used in their derivation.

Table 12 shows potential soil erosion (RKLS) losses for given K-values and various slope conditions in the Ville-Marie area.

Table 8. Determination of Subclass T (Topography) - gravelly and sandy* soils

SLOPE %	0-2		3-6		7-12		13-20		21-30		30-60		>60	
SLOPE TYPE	S	C	S	C	S	C	S	C	S	C	S	C	S	C
CLASS				2T	2T	3T	3T	4T	5T	5T	6T	6T	7T	7T

Table 9. Determination of Subclass T (Topography) - loamy, silty or clayey soils

SLOPE %	0-2		3-6		7-12		13-20		21-30		30-60		>60	
SLOPE TYPE	S	C	S	C	S	C	S	C	S	C	S	C	S	C
CLASS				2T	3T	3T	4T	4T	5T	5T	6T	6T	7T	7T

S = Simple slopes >50 m in length
C = Complex slopes <50 m in length

* Sandy textures include: sands, loamy sands, and sandy loams except for very fine sandy loam.

Table 10. Universal Soil Loss Equation values and potential loss of bare soil by water erosion estimated for the Ville-Marie area

SOIL	K -value	TYPICAL SLOPE CLASS	LS -value	R -value	RKLS (t/ha/y)	SOIL LOSS POTENTIAL CLASS
Abitibi	0.10*	B	1.29	80	23.12	4
Blanche	0.35	e	5.30	80	332.42	5
Brentha	0.17	B	1.29	80	39.30	5
Brethour	0.41*	a	0.15	80	11.02	3
Bucke	0.06	d	2.60	80	27.96	4
Burt	-			80		
Cane	0.42	a	0.15	80	11.29	3
Casey	0.41*	b	0.56	80	41.14	5
Chamberlain	-			80		
Coutts	0.30*	c	1.75	80	94.08	5
Couttsville	-			80		
Dack	-			80		
Dawson	0.10	e	5.30	80	94.98	5
Dymond	0.11	c	1.75	80	34.50	5
Earlton	0.40	B	1.29	80	92.47	5
Ecclestone	0.38*	B	1.29	80	87.84	5
Elk Pit	0.03*	d	2.60	80	13.98	3
Englehart	0.30	a	0.15	80	8.06	2
Evanturel	0.52	d	2.60	80	242.28	5
Falardeau	0.34	a	0.15	80	9.14	2
Fleck	-			80		
Frere Lake	-			80		
Gaffney	0.17*	a	0.15	80	4.57	1
Haileybury	0.34	e	5.30	80	322.92	5
Hanbury clay loam	0.19	c	1.75	80	59.58	5
Hanbury silt loam	0.28	c	1.75	80	87.81	5
Heaslip	-			80		
Henwood	0.02*	e	5.30	80	19.00	3
Hilliard	-			80		
Ingram	-			80		
Kanimiwiskia	-			80		
Kenabeek	0.12*	a	0.15	80	3.23	1
Kerns	-			80		
Makobe	0.02*	A	0.35	80	1.25	1
Mallard	0.15*	a	0.15	80	4.03	1
Maybrook	-			80		
McCool	0.21*	a	0.15	80	5.64	1
Milberta	0.24*	a	0.15	80	6.45	2
Misema River	-			80		
Moose	0.29*	a	0.15	80	7.80	2
Mud Lake	-			80		
New Liskeard	0.21*	A	0.35	80	13.17	3
Otterskin	0.15*	c	1.75	80	47.04	5
Pense	0.45	b	0.56	80	45.16	5
Pyne	0.02*	A	0.35	80	1.25	1
Rock	-			80		
Solvan	0.41*	A	0.35	80	25.72	4
Sturgeon River	-			80		

Table 10. Universal Soil Loss Equation values and potential loss of bare soil by water erosion estimated for the Ville-Marie area (continued)

SOIL	K -value	TYPICAL SLOPE CLASS	LS -value	R -value	RKLS (t/ha/y)	SOIL LOSS POTENTIAL CLASS
Sutton Bay	0.12*	A	0.35	80	7.53	2
Thornloe	0.21*	A	0.35	80	13.17	3
Thwaites	0.41*	C	4.30	80	315.93	5
Twin Falls	-			80		
Wabi	0.29*	d	2.60	80	135.12	5
Wendigo	0.05	c	1.75	80	15.68	3
Withington	0.02*	A	0.35	80	1.25	1

* Estimated K-value

R VALUE = 80 (includes adjustment to account for snowmelt)

K values were not calculated for organic soils or rock areas (indicated by a "-" in the table).

LS values were calculated for each slope class, based on the average percent slope and a representative slope length assigned to each class (see Table 11).

Table 11. Slope class descriptions and L and S-values in the Ville-Marie area

SLOPE CLASS	DESCRIPTION	SLOPE CLASS RANGES %	AVERAGE SLOPE GRADIENT (S)	ESTIMATED AVERAGE SLOPE LENGTH (L) metres	LS-VALUES
	Simple Slopes				
A	level to very gentle slope	0-2	1	800	0.35
B	gentle	3-6	4.5	400	1.29
C	moderate to strong	7-12	10	300	4.30
D	strong to very steep	13-20	16	200	7.30
E	very steep	21-30	25	100	11.50
	Complex Slopes				
a	nearly level to gently undulating	0-2	1	50	0.15
b	undulating	3-6	4.5	50	0.56
c	gently to moderately rolling	7-12	10	50	1.75
d	moderately rolling to hilly	13-20	16	25	2.60
e	very hilly	21-30	25	25	5.30

Table 12. Potential soil erosion (RKLS) losses for given K-values and slope conditions in the Ville-Marie area

	SLOPE GROUPS									
K-VALUES	A	a	B	b	C	c	D	d	E	e
0.02	1.25	0.54	4.62	2.01	15.41	6.27	26.16	9.32	41.22	19.00
0.04	2.51	1.08	9.25	4.01	30.82	12.54	52.33	18.64	82.43	37.99
0.06	3.76	1.61	13.87	6.02	46.23	18.82	78.49	27.96	123.65	56.99
0.08	5.02	2.15	18.49	8.03	61.64	25.09	104.65	37.27	164.86	75.98
0.10	6.27	2.69	23.12	10.04	77.06	31.36	130.82	46.59	206.08	94.98
0.12	7.53	3.23	27.74	12.04	92.47	37.63	156.98	55.91	247.30	113.97
0.14	8.78	3.76	32.36	14.05	107.88	43.90	183.14	65.23	288.51	132.97
0.16	10.04	4.30	36.99	16.06	123.29	50.18	209.31	74.55	329.73	151.96
0.18	11.29	4.84	41.61	18.06	138.70	56.45	235.47	83.87	370.94	170.96
0.20	12.54	5.38	46.23	20.07	154.11	62.72	261.63	93.18	412.16	189.95
0.22	13.80	5.91	50.86	22.08	169.52	68.99	287.80	102.50	453.38	208.95
0.24	15.05	6.45	55.48	24.08	184.93	75.26	313.96	111.82	494.59	227.94
0.26	16.31	6.99	60.10	26.09	200.35	81.54	340.12	121.14	535.81	246.94
0.28	17.56	7.53	64.73	28.10	215.76	87.81	366.28	130.46	577.02	265.93
0.30	18.82	8.06	69.35	30.11	231.17	94.08	392.45	139.78	618.24	284.93
0.32	20.07	8.60	73.97	32.11	246.58	100.35	418.61	149.09	659.46	303.92
0.34	21.32	9.14	78.60	34.12	261.99	106.62	444.77	158.41	700.67	322.92
0.36	22.58	9.68	83.22	36.13	277.40	112.90	470.94	167.73	741.89	341.91
0.38	23.83	10.21	87.84	38.13	292.81	119.17	497.10	177.05	783.10	360.91
0.40	25.09	10.75	92.47	40.14	308.22	125.44	523.26	186.37	824.32	379.90
0.42	26.34	11.29	97.09	42.15	323.64	131.71	549.43	195.69	865.54	398.90
0.44	27.60	11.83	101.71	44.15	339.05	137.98	575.59	205.00	906.75	417.89
0.46	28.85	12.36	106.34	46.16	354.46	144.26	601.75	214.32	947.97	436.89
0.48	30.11	12.90	110.96	48.17	369.87	150.53	627.92	223.64	989.18	455.88
0.50	31.36	13.44	115.58	50.18	385.28	156.80	654.08	232.96	1030.40	474.88
0.52	32.61	13.98	120.21	52.18	400.69	163.07	680.24	242.28	1071.62	493.88
0.54	33.87	14.52	124.83	54.19	416.10	169.34	706.41	251.60	1112.83	512.87
0.56	35.12	15.05	129.45	56.20	431.51	175.62	732.57	260.92	1154.05	531.87
0.58	36.38	15.59	134.08	58.20	446.92	181.89	758.73	270.23	1195.26	550.86
0.60	37.63	16.13	138.70	60.21	462.34	188.16	784.90	279.55	1236.48	569.86

In Table 13, soil erosion potential classes are shown in a five-class system ranging from Class 1 - very slight potential for soil loss, i.e. <6 t/ha/y, to very severe potential for soil loss, i.e. >33 t/ha/y.

It should be emphasized that the potential soil loss values shown in Tables 10, 11 and 13, were calculated for bare soil. Values for vegetated soils, in the Ville-Marie area, would be reduced considerably, by incorporation of the crop cover factor (C) and the management practice factor (P) in the USLE equation, A = RKLSCP.

Table 14 contains some C-values of typical crops and vegetative cover commonly found on cultivated soils of the Ville-Marie map sheet. P-values for some management practices are found in Table 15.

How to determine potential erosion from the soil map or for field sites

Site or field-specific interpretations are utilized for on-farm or resource management purposes, by providing farm managers or extension personnel with a general indication of the potential soil loss and the erosion-reducing effectiveness of various crop and management systems. In order to estimate these values for a field, follow the procedure outlined below.

1. Determine the site conditions and associated U.S.L.E. factor values for the field.

   e.g. R-value for the Ville-Marie area = 80

   Soil type - Cane (K = 0.40; Table 10)

   Slope class - 'c'; 7-12% slope, 300 m (LS = 1.75; Table 11)

   Crop/vegetation cover - cereal grains (C = 0.27; Table 14)

   Conservation practices - none (P = 1.0; Table 15)

2. Calculate the average annual soil loss (A)

$$\begin{aligned} A &= RKLSCP \\ &= 80 \times .4 \times 1.75 \times .27 \times 1 \\ &= 15.1 \text{ t/ac/y } (33.9 \text{ t/ha/y}) \end{aligned}$$

   According to Table 13, 33.9 t/ha/y (15.1 t/ac/y) potential soil loss would be considered very severe, and remedial measures should be considered.

3. A tolerable 'A' value for deep agricultural soils is 11 t/ha/y (4.9 t/ac/y) or less. A crop or vegetation cover with a lower C value than that used for cereal grains in the above example (e.g. C = 0.06 for hay and pasture in rotation; Table 14), would reduce erosion on this site to a tolerable level of 7.5 t/ha/y (3.4 t/ac/y).

Table 13. Potential soil erosion loss classes

	DESCRIPTION	POTENTIAL SOIL LOSS (t/ha/y)
1	Very slight	<6
2	Slight	6-11
3	Moderate	11-22
4	Severe	22-33
5	Very severe	>33

Table 14. Values of cover factor (C) for common Ontario field crops

CROP	C-VALUE
Bare soil	1.00
Cereal grains (including canola)	0.27
Hay, pasture in rotations	0.06
Permanent pasture	0.03
Undisturbed forest land	0.002

Table 15. Conservation or management practice factor (P) values for common Ontario practices

PRACTICE	P-VALUE
Up and down slope farming (cultivation and planting)	1.00
Cross-slope farming	0.75
Contour farming (2-7 percent slopes)	0.50
Strip-cropping, cross slope	0.37
Strip-cropping, on contour	0.25

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APPENDIX

A. Chemical and Physical Analyses

Table 16 presents analyses of soils that were collected for Report No. 21 (1). In order to eliminate, as far as possible, variations due to cultural and management practices, surface soil samples were taken from old pastures where fertilizer applications had not been recently made.

The methods used for analysis were as follows: mechanical analysis by the hydrometer method (19); pH by the glass electrode in water; base exchange capacity and exchangeable bases by the Schollenberger method (20); organic matter by the Allison method (21).

Table 17 presents analyses of soils that were collected for a study of soils in the vicinity of Lake Temagami (22). The analytical methods are outlined in the Manual on Soil Sampling and Methods of Analysis (23). The appropriate section numbers in that manual are indicated in brackets after the soil analyses, as follows: particle size analysis by pipette method, after pre-treatment with hydrogen peroxide and calgon (2.11); pH $CaCl_2$ (3.11); pH water (3.13); organic matter by wet oxidation, using ortho-phenanthraline-ferrous sulfate as indicator (3.613); exchangeable P (4.42); exchangeable Ca, Mg and K (4.51); Fe and Al extract by oxalate (3.52).

Table 16. Chemical and physical analyses of soils from the New Liskeard-Englehart area

Soil Name	Township	Con.	Lot	Horizon	Depth cm	% sand 1-.05 mm	% silt .05-.002 mm	% clay <.002 mm	pH (H_2O)	% org. matter	Cation exchange capacity me/100 g	Exchangeable me/100 g Ca	Mg	K	% $CaCO_3$
Blanche	Chamberlain	5	2	Ap		19	64	17	5.2	2.5	9	3.8	1.2	0.1	
	Evanturel	3	2	Ap		20	62	18	5.5	6.4	12	3.8	1.5	0.3	
	Evanturel	3	2	Ah	0-8	20	59	21	5.4	3.1	11	4.5	1.1	0.2	0.0
				Bm	8-15	15	63	22	5.4	0.9	8	2.1	0.4	0.2	0.0
				Ae	15-41	15	64	21	5.6	0.2	6	2.0	0.5	0.1	0.0
				Bt1	41-66	12	62	26	6.2	0.0	15	8.1	3.5	0.2	0.1
				Bt2	66-86	11	53	36	6.5	0.0	14	8.7	4.6	0.2	0.1
				C1	86-102	17	56	27	6.7	0.0	13	7.8	4.6	0.3	0.2
				C2	102-127	15	52	33	7.4	0.0	12	8.6	5.6	0.2	0.7
Brentha	Harris	3	2	Ap		48	40	12	6.7	6.2	21	15.2	4.8	0.1	
	Bucke	5	6	Ap		44	36	20	5.8	5.5	15	7.7	1.6	0.2	
Bucke	Ingram	5	2	Ap		75	14	11	5.8	2.2	9	5.1	1.2	0.1	
	Evanturel	4	2	Ap		76	19	5	5.5	2.0	8	4.0	1.1	0.1	
	Evanturel	5	6	Ap		81	14	5	5.7	2.6	9	4.1	1.6	0.1	
Cane	Cane	4	2	Ap		8	68	24	7.2	4.7	19	19.2	3.6	0.1	
	Cane	5	7	Ap		8	77	15	7.4	5.0	18	17.8	3.2	0.1	
	Robillard	4	6	Ap		8	73	19	7.2	5.2	17	16.4	3.0	0.2	
	Dack	3	11	Ap		7	70	23	7.3	5.0	20	19.1	3.7	0.1	
Dack	Dack	3	7	Ah	0-10	8	33	59	6.3	6.4	23	18.9	3.5	0.5	0.1
				Bm	10-23	5	17	78	5.5	2.0	28	18.0	4.2	0.7	0.2
				Bt	23-41	8	7	85	7.1	1.1	29	24.0	5.2	0.4	0.2
				Ck1	41-53	4	8	88	7.8	0.7	28	36.6	5.5	0.4	13.2
				Ck2	53-69	3	8	89	7.9	0.0	29	37.6	5.8	0.4	15.8
				Ck3	69-84	8	3	89	8.0	0.0	26	36.8	4.4	0.4	16.8
				Ck4	84-102	5	32	63	8.0	0.0	23	23.7	5.4	0.4	6.7
Dawson	Dymond	6	11	Ap		52	30	18	6.5	5.9	16	10.9	2.8	0.1	
Dymond	Harris	5	1	Ap		54	29	17	6.0	2.8	11	7.1	1.2	0.1	
Earlton	Armstrong	1	8	Ap		10	68	22	7.2	4.9	20	19.2	3.7	0.2	
	Armstrong	2	9	Ap		12	71	17	6.7	3.6	19	14.7	4.0	0.2	
	Chamberlain	2	4	Ap		9	73	18	6.9	4.1	20	17.3	3.2	0.1	
	Evanturel	5	6	Ap		7	72	21	6.2	3.9	20	13.6	3.8	0.2	
	Dack	4	12	Ap		7	66	27	7.3	4.3	19	18.3	3.5	0.1	
Englehart	Evanturel	5	9	Ap		67	20	13	5.2	3.0	10	2.5	1.0	0.1	
	Ingram	5	4	Ap		81	14	5	5.9	4.2	14	5.8	1.5	0.1	
Evanturel	Evanturel	1	10	Ap		8	80	12	6.2	3.1	14	7.6	1.6	0.2	
	Dack	5	12	Ap		8	77	15	6.7	2.2	12	10.8	2.0	0.2	
	Robillard	4	2	Ap		20	63	17	5.3	3.6	15	5.6	1.1	0.1	

Table 16. Chemical and physical analyses of soils from the New Liskeard-Englehart area (continued)

Soil Name	Township	Con.	Lot	Horizon	Depth cm	% sand 1-.05 mm	% silt .05-.002 mm	% clay <.002 mm	pH (H_2O)	% org. matter	Cation exchange capacity me/100 g	Exchangeable me/100 g Ca	Mg	K	% $CaCO_3$
	Evanturel	4	9	Ap	0-18	16	70	14	5.8	1.0	6	1.7	0.7	0.2	0.1
				Bm	18-33	11	76	14	5.5	0.2	4	1.5	0.9	0.1	0.0
				Bt1	33-51	12	60	28	6.2	0.2	10	5.9	3.9	0.2	0.0
				Bt2	51-64	7	69	24	7.4	0.4	10	6.8	3.8	0.1	0.2
				Ck1	64-81	8	71	21	8.0	0.3	6	7.2	3.6	0.1	10.7
				Ck2	81-102	11	64	25	8.3	0.3	6	14.2	3.1	0.1	13.4
Falardeau	Hilliard	6	7	Ah		15	58	27	5.9	8.3	21	18.2	4.4	0.1	
	Casey	6	1	Ap		14	62	24	5.7	3.9	16	11.8	4.0	0.2	
	Casey	3	6	Ap		12	60	28	6.1	3.5	15	10.9	3.1	0.2	
Haileybury	Armstrong	6	10	Ap		9	59	32	6.2	2.4	15	9.6	2.5	0.3	
	Hudson	6	1	Ap		8	57	35	5.5	2.3	15	6.9	1.8	0.3	
	Armstrong	4	10	Ap		10	56	34	6.3	2.0	15	8.7	2.4	0.3	
	Hilliard	1	7	Ap		8	57	35	6.5	2.6	16	10.0	2.1	0.2	
	Kerns	4	7	Ah	0-5	9	48	43	5.8	6.4	25	16.9	3.2	0.5	0.1
				Ae	5-13	7	52	41	6.0	1.6	12	7.0	1.2	0.3	0.0
				Bt1	13-23	6	36	58	5.9	0.7	22	12.5	4.6	0.4	0.0
				Bt2	23-51	12	20	68	5.8	0.4	28	16.1	7.2	0.5	0.0
				BC	51-74	11	30	59	5.9	0.4	29	16.1	7.3	0.5	2.1
				Ck1	74-102	8	22	70	7.5	0.4	22	19.0	7.1	0.4	11.8
				Ck2	102-117	5	63	32	7.9	0.3	21	28.7	4.7	0.4	5.2
				Ck3	117-127	3	34	63	8.0	0.2	22	28.7	4.9	0.4	14.3
Hanbury clay	Dymond	6	10	Ah		18	31	51	6.8	10.7	37	41.8	7.0	0.3	
	Bucke	6	5	Ap		18	30	52	6.5	6.3	31	16.8	5.6	0.3	
	Harris	6	2	Ap		22	32	46	6.2	6.7	32	16.6	6.4	0.4	
Hanbury silty clay	Evanturel	2	3	Ap		10	50	40	5.7	5.9	19	9.4	1.2	0.5	
	Chamberlain	2	9	Ap		6	52	42	6.3	5.4	22	10.7	3.6	0.3	
	Armstrong	5	11	Ap		9	54	37	5.8	2.6	19	10.4	2.5	0.2	
	Harley	2	6	Ap		7	51	42	6.5	5.5	25	11.0	4.3	0.3	
	Casey	1	6	Ap		7	56	37	6.6	4.9	24	10.7	3.9	0.4	
New Liskeard	Kerns	2	8	Ah		32	30	38	7.0	10.9	44	37.8	6.9	0.3	
	Henwood	2	6	Ah		22	40	38	6.6	9.6	40	33.5	6.3	0.3	
	Beauchamp	1	2	Ah		28	35	37	6.9	8.9	36	29.6	5.1	0.3	
	Harley	2	5	Ah		25	37	38	6.8	12.4	43	36.4	6.7	0.3	
Pense	Evanturel	4	10	Ap		30	61	9	5.3	3.1	12	1.9	0.4	0.0	
	Robillard	5	1	Ap		26	65	9	5.1	2.9	11	1.7	0.3	0.0	
Thornloe	Harley	6	1	Ah		35	30	35	6.5	10.5	42	37.1	7.4	0.3	
	Kerns	6	1	Ah		23	30	47	6.3	8.0	40	31.9	8.4	0.3	
Wendigo	Ingram	4	8	Ap		8	78	14	5.7	2.0	6	2.2	0.6	0.1	
	Ingram	4	10	Ap		75	18	7	5.3	2.6	8	2.9	0.8	0.1	
	Marter	6	2	Ap		81	14	5	5.1	2.1	7	2.1	0.6	0.1	

Table 17. Chemical and physical properties of selected soils from the Temagami area

Soil Name	Horizon	Depth cm	% gravel >2 mm	% sand 2-.05 mm	% silt .05-.002 mm	% clay <.002 mm	Exchangeable bases me/100 g Ca	Mg	K	lbs/ac P	pH H_2O	$CaCl_2$	% oxalate extractable Fe	Al	% organic matter
Elk Pit	L-H	0-3													
	AB	3-10	39	71	23	6	20.0	2.8	0.4	3	4.3	3.6	0.3	0.2	2.4
	Bm1	10-35	59	74	20	6	12.5	2.4	0.3	1	4.7	4.0	0.3	0.4	2.6
	Bm2	35-58	71	76	22	2	7.5	1.6	0.2	2	5.3	4.5	0.2	0.7	1.0
	C1	58-77	88	84	13	3	35.0	8.4	0.3	2	5.6	4.9	0.2	0.2	0.4
	C2	77-95	79	69	27	4	37.5	14.4	0.2	4	5.5	4.7	0.2	0.1	0.3
	C3	95+	76	87	10	3	32.5	18.2	0.2	2	6.0	5.1	0.1	0.1	0.3
Bucke	L-H	0-5													
	Ae	5-7	3	40	54	6	25.0	3.6	0.4	3	3.9	3.2	0.1	0.1	1.9
	Bf	7-27	24	39	55	6	35.0	2.4	0.4	3	5.5	4.8	0.4	0.9	2.2
	Bm	27-40	32	77	21	2	20.0	2.0	0.3	4	6.0	5.3	0.2	0.4	0.5
	C1	40-65	28	81	17	2	12.0	2.0	0.4	5	6.0	5.5	0.1	0.2	0.1
	C2	65-78	25	56	42	2	25.0	3.6	0.2	4	6.0	5.5	0.1	0.1	0.1
	2C	78-85	8	83	14	3	55.0	21.2	0.2	3	6.2	5.4	0.2	0.1	0.1
	3C	85+	2	25	70	5	25.0	2.8	0.6	6	5.9	5.6	0.1	0.2	0.3
Thwaites	L-F	0-5													
	Ae	5-11	22	66	29	5	10.0	3.6	0.4	10	3.7	3.3	0.2	0.1	2.6
	Bf1	11-28	25	65	32	3	5.0	1.6	0.6	7	5.0	4.6	0.4	0.9	1.9
	Bf2	28-47	49	80	18	2	12.5	1.6	0.3	5	5.5	5.3	0.2	0.8	1.0
	BC	47-75	3	89	9	2	5.0	1.2	0.2	4	5.7	5.3	0.1	0.4	0.6
	2C1	75-113	1	85	14	1	7.5	2.0	0.2	5	6.1	5.7	0.1	0.2	0.5
	2C2	113-140	1	95	3	2	22.5	7.0	0.2	3	6.2	6.6	0.1	0.0	0.4
	2C3	140-150	1	97	2	1	7.5	2.0	0.2	3	6.6	5.8	0.0	0.1	0.1
	3C	150+	84	89	8	3	52.5	7.4	0.2	4	6.7	7.0	0.1	0.1	0.4
Moose	L-H	0-3													
	Ae	3-5	10	21	69	10	7.5	2.4	0.4	6	4.2	3.8	0.4	0.3	3.4
	Bf	5-13	7	21	72	7	5.0	1.2	0.3	5	5.1	4.3	0.4	1.0	2.8
	Bfg	13-35	5	20	74	6	5.0	1.2	0.2	5	5.1	4.6	0.3	0.7	1.7
	Cg	35+	1	10	76	14	25.0	6.4	0.2	13	5.2	4.6	0.2	0.2	0.2
Wendigo	L-H	0-5													
	Ae	5-11	13	57	39	4	15.0	2.8	0.4	5	3.8	3.3	0.1	0.1	3.2
	Bm	11-50	16	55	38	7	15.0	3.2	0.2	2	4.6	4.1	0.4	0.3	1.9
	BC	50-65	37	70	28	2	25.0	4.0	0.2	2	5.6	4.0	0.3	0.5	1.0
	C	65+	4	70	27	3	22.5	5.0	0.2	2	6.0	5.5	0.1	0.2	0.4
Wendigo	L-H	0-5													
	Ae	5-9	2	63	31	6	2.5	2.0	0.2	5	3.9	3.2	0.2	0.2	1.9
	Bf	9-25	2	72	25	3	3.7	0.8	0.2	5	4.9	4.5	0.5	1.0	1.8
	BC	25-50	11	97	2	1	3.7	0.8	0.2	6	5.9	4.8	0.1	0.2	0.2
	C	50-108	3	98	1	1	3.7	0.8	0.2	5	6.6	5.3	0.0	0.2	0.1

B. Detailed Descriptions of Typical Soils

The profile descriptions of typical soil profiles are taken from Report No. 21 (1). These profiles were usually described in forested, non-agricultural areas, as evidenced by the surface horizonation. The taxonomic classification and soil horizon nomenclature are from the Canadian System of Soil Classification (7). Detailed descriptions of several soil profiles from the Timiskaming District, are also published in Evans and Marulandra's report (5).

BLANCHE SOIL

Parent Material: Lacustrine silt loam

Drainage: Well drained

Usual Classification: Orthic Gray Luvisol

Description:

LFH	-	3.0 cm raw humus and roots; very dark gray (10 YR 3/1); pH -5.2
Ah	-	0-3 cm silt loam; dark gray (10 YR 4/1); medium granular structure; friable consistency; stonefree; pH - 5.2
Ae_1	-	3-8 cm silt loam; white (10 YR 8/2); fine platy; soft, stonefree; pH - 5.0
Bf_1	-	8-20 cm silt loam; yellowish brown (10 YR 5/6); weak platy; soft; stonefree; pH - 5.2
Ae_2	-	20-51 cm silt loam; very pale brown (10 YR 7/3); weak platy; soft; stonefree; pH - 5.3
Bt	-	51-71 cm silty clay loam; brown (10 YR 5/3); medium subangular blocky; firm; stonefree; pH - 5.6
Bm	-	71-85 cm silt loam; yellowish brown (10 YR 5/4); weak medium subangular blocky; friable; pH - 5.8
C	-	85 cm+ silt loam; pale brown (10 YR 6/3); pseudo platy; friable; stonefree; noncalcareous; pH - 6.2

BRENTHA SOIL

Parent Material: Glacial till less than 30 cm thick over limestone bedrock

Drainage: Well-drained

Usual Classification: Dystric Brunisol

Description:

LFH	-	2.5-0 cm raw humus and roots
Ah	-	0-2.5 cm loam; very dark gray (10 YR 3/1); granular; friable; moderately stony; pH - 5.8
Ae	-	2.5-5 cm loam; white (10 YR 8/2); weakly platy; friable; moderately stony; pH - 5.6
Bm_1	-	5-15 cm loam; yellowish brown (10 YR 5/8); weak; medium subangular blocky; friable; moderately stony; pH - 6.5
Bm_2	-	15-28 cm loam; brownish yellow (10 YR 6/6); weak medium subangular blocky; friable; moderately stony; pH - 6.6
R	-	28 cm+; limestone bedrock

BRETHOUR SOIL

Parent Material: Lacustrine silt loam over lacustrine clay

Drainage: Poorly drained

Usual Classification: Orthic Gleysol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-15 cm silt loam; very dark grayish brown (10 YR 3/2); medium granular structure; friable consistency; stonefree; pH - 5.4
Bg_1	-	15-46 cm silt loam; light yellowish brown (10 YR 6/4); very mottled; weak subangular blocky; friable; stonefree; pH - 5.5
Bg_2	-	46-70 silt loam; olive-gray (5 YR 5/2); very mottled; massive; firm; stonefree; pH - 5.7
IICkg	-	70 cm+ clay; dark yellowish brown (10 YR 4/4); massive structure; very plastic when wet; very hard when dry; stonefree; calcareous; pH - 7.8

BUCKE SOIL

Parent Material: Variable depths of sand overlying clay

Drainage: Well-drained

Usual Classification: Orthic Humo-Ferric Podzol

Description:

LFH	-	2-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH -5.2.
Ae	-	0-5 cm sand; light gray (10 YR 7/2); single grain structure; loose consistency; stonefree; pH - 5.0
Bf	-	5-36 cm sand; yellowish brown (10 YR 5/8); single grain; loose; stonefree; pH - 6.3
IICk	-	36 cm+ clay; light brownish gray (10 YR 6/2); varved; very plastic when wet; very hard when dry; stonefree; calcareous; pH -7.8

BURT SOIL

Parent Material: Organic soil 40-160 cm deep over clayey, mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Mesisol

Description:

Om_1	-	0-40 cm partially decomposed sphagnum, grasses, sedges, mosses and/or wood; strongly acid in reaction
Om_2	-	40-112 cm dominantly moderately decomposed wood, grasses and sedges; strongly acid in reaction
IIC	-	112 cm+ mineral soil; usually with clayey textures

CANE SOIL

Parent Material: Lacustrine silt loam or silty clay loam

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-15 cm silt loam; very dark brown (10 YR 2/2); medium granular structure; friable consistency; stonefree; pH - 7.2
Bg_1	-	15-43 cm silt loam; pale yellow (2.5 Y 7/4); very mottled; mottles are olive-yellow (2.5 Y 6/8); laminar; friable; pH - 7.2
Bg_2	-	43-68 cm silt loam; light yellowish brown (2.5 Y 6/4); very mottled; massive; friable; stonefree; pH - 7.4
Ckg	-	68 cm+ silt loam; light gray (10 YR 7/2); laminar; friable, stonefree; calcareous; pH - 8.0

CASEY SOIL

Parent Material: Variable depths of lacustrine silt loam over lacustrine clay

Drainage: Imperfectly drained

Usual Classification: Gleyed Humo-Ferric Podzol

Description:

LFH	-	2-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH -5.3
Ae	-	0-5 cm silt loam; white (10 YR 8/2); fine platy structure; soft consistency; stonefree; pH - 5.0
Bfgj	-	5-20 cm silt loam; yellowish brown (10 YR 5/8); slightly mottled; weak platy; soft; stonefree; pH - 5.2
Bg	-	20-38 cm silt loam; very pale brown (10 YR 7/3); mottled; weak platy; soft; stonefree; pH - 5.2
IIBtg	-	38-60 cm silty clay loam; brown (10 YR 5/3); mottled; medium subangular blocky; friable; stonefree; pH - 5.7
IICk	-	60 cm+ clay; dark yellowish brown (10 YR 4/4); massive; very plastic when wet; very hard when dry; stonefree; calcareous; pH -7.8

CHAMBERLAIN SOIL

Parent Material: Organic soil greater than 160 cm deep

Drainage: Very poorly drained

Usual Classification: Typic mesisol

Description:

Om_1	-	0-40 cm partially to poorly decomposed organic material derived from sphagnum, grasses and sedges; strongly acidic in reaction
Om_2	-	>40 cm partially decomposed organic material derived from mosses, sedges, grasses; strongly acidic in reaction

COUTTS SOIL

Parent Material: Loamy glacial till

Drainage: Imperfectly drained

Usual Classification: Gleyed Humo-Ferric Podzol

Description:

LFH	-	2-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH - 5.2
Ah	-	0-5 cm loam; very dark brown (10 YR 2/2); medium crumb structure; friable consistency; very stony; pH - 5.3
Ae	-	5-10 cm sandy loam; white (10 YR 8/2); weak platy; friable; very stony; pH - 5.4
Bfg	-	10-40 cm loam; yellowish brown (10 YR 5/8); mottled; weak medium subangular blocky; friable; very stony; pH - 5.5
C	-	40 cm+ loam till; light gray (10 YR 7/1); stony; noncalcareous; pH - 5.5

COUTTSVILLE SOIL

Parent Material: Organic soil 40-160 cm deep over mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Mesisol

Description:

Om_1	-	0-40 cm partially decomposed grasses, sedges, mosses and/or wood; strongly acidic in reaction
Om_2	-	0-75 cm partially decomposed grasses, sedges and/or wood; strongly acidic in reaction
IIC	-	75 cm+ mineral subsoil

DACK SOIL

Parent Material: Calcareous lacustrine clay

Drainage: Well-drained

Usual Classification: Orthic Eutric Brunisol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-3 cm clay; dark grayish brown (10 YR 4/2); fine subangular blocky structure; hard consistency when dry; very plastic when wet; stonefree; pH - 6.2
Bm_1	-	3-28 cm clay; dark brown (7.5 YR 4/2); medium blocky; very hard when dry; very plastic when wet; stonefree; pH - 5.8
Bm_2	-	28-48 cm clay; dark brown (10 YR 4/3); medium subangular blocky; very hard when dry; very plastic when wet; stonefree; ph -6.8
Ck	-	48 cm+ clay; dark yellowish brown (10 YR 4/4); massive; very hard when dry; very plastic when wet; stonefree; calcareous; pH -8.0

DAWSON SOIL

Parent Material: Calcareous, stony loam till

Drainage: Well-drained

Usual Classification: Orthic Eutric Brunisol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-3 cm loam; very dark grayish brown (10 YR 3/2); fine crumb structure; friable consistency; very stony; pH - 7.1
Bm	-	3-33 cm loam; yellowish brown (10 YR 5/8); weak fine subangular blocky; friable; very stony; pH - 7.4
Ck	-	33 cm+ loam till; light yellowish brown (10 YR 6/4); very stony; calcareous; pH - 7.8

DYMOND SOIL

Parent Material: Calcareous, stony loam till

Drainage: Imperfectly drained

Usual Classification: Gleyed Eutric Brunisol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-3 cm loam; very dark grayish brown (10 YR 3/2); medium crumb structure; friable consistency; very stony; pH - 7.2
Bmgj	-	3-30 cm loam; brownish yellow (10 YR 6/6); mottled; weak medium subangular blocky; friable; very stony; pH - 7.4
Ck	-	30 cm+ loam till; light yellowish brown (10 YR 6/4); very stony; calcareous; pH - 7.8

EARLTON SOIL

Parent Material: Lacustrine silt loam and silty clay loam

Drainage: Imperfectly drained

Usual Classification: Gleyed Gray Luvisol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-5 cm silt loam; very dark grayish brown (10 YR 3/2); fine granular structure; friable consistency; stonefree; pH - 6.0
Aegj	-	5-18 cm silt loam; light gray (2.5 Y 7/2); mottled; fine platy; friable; stonefree; pH - 5.6
AB	-	18-43 cm silty clay loam; light yellowish brown (2.5 Y 6.4); mottled; fine subangular blocky; firm; stonefree; pH - 6.5
Btgj	-	43-66 cm silty clay loam; light olive-brown (2.5 Y 5/4); mottled; medium subangular blocky; firm; stonefree; pH - 7.0
Ck	-	66 cm+ silt loam; light brown to light gray (10 YR 7/2); platy; friable; stonefree; calcareous; pH - 8.0

ELK PIT SOIL

Parent Material: Kame moraine gravelly sands

Drainage: Well-drained

Usual Classification: Orthic Humo-Ferric Podzol

Description:

LFH - 3-0 cm partially decomposed leaves, twigs and needles; very dark gray (10 YR 3/1); pH - 5.3

Ae - 0-5 cm sand; light gray (10 YR 7/1); single grain structure; loose consistency; gravelly; pH - 4.8

Bf - 5-28 cm gravelly sand; yellowish brown (10 YR 5/6) single grain; loose; moderately to very stony; pH - 5.5

Bm - 28-58 cm gravelly sand; light yellowish brown (10 YR 6/4); single grain; loose; moderately to very stony; pH - 5.6

C - 58 cm+ gravelly sand; pale brown (10 YR 6/3); single grain; loose; very stony; noncalcareous; pH - 5.8

ENGLEHART SOIL

Parent Material: Variable depths of outwash sand over lacustrine clay

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description:

LFH - Thin layer of partially decomposed leaves, twigs, etc.

Ah - 0-13 cm sandy loam; very dark brown (10 YR 2/2); fine crumb structure; very variable consistency; stonefree; pH - 5.2

Bg - 13-46 cm sand; gray (10 YR 6/1); very mottled; single grain structure; loose consistency; stonefree; pH - 5.4

IICk - 46 cm+ clay; light brownish gray (10 YR 6/2); varved; very plastic consistency when wet; very hard when dry; stonefree; pH -7.8

EVANTUREL SOIL

Parent Material: Calcareous, lacustrine silt loam and silty clay loam

Drainage: Well-drained

Usual Classification: Orthic Gray Luvisol

Description:

LFH - Thin layer of partially decomposed leaves, twigs, etc.

Ah - 0-5 cm silt loam; very dark gray (10 YR 3/1); fine granular structure; friable consistency; stonefree; pH - 6.1

Bm_1 - 5-18 cm silt loam; yellowish brown (10 YR 5/6); medium granular; friable; stonefree; pH - 5.6

Bm_2 - 18-33 cm silt loam; very pale brown (10 YR 8/3); fine platy; friable; stonefree; pH - 5.5

Bt - 33-51 cm silty clay loam; yellowish brown (10 YR 5/4); medium subangular blocky; firm; stonefree; pH - 6.2

Btgj - 51-63 cm silty clay loam; pale brown (10 YR 6/3); mottled; mottles are brownish yellow (10 YR 6/6); laminar; firm; stonefree; pH - 7.4

Ck - 63 cm+ silt loam; light brown (7.5 YR 6/4); laminar; friable; stonefree; calcareous; pH - 8.0

FALARDEAU SOIL

Parent Material: Lacustrine silt loam and silty clay loam

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description: Ah - 0-18 cm silty clay loam; dark grayish brown (10 YR 4/2); medium granular structure; friable consistency; stonefree; pH - 5.6

Bg_1 - 18-48 cm silty clay loam; light yellowish brown (2.5 Y 6/4); very mottled; laminar; firm; stonefree; pH - 5.8

Bg_2 - 48-70 cm silty clay loam; pale olive (5 Y 6/3); very mottled; massive; firm; stonefree; pH - 6.2

Cg - 70 cm+ silty clay loam; pale brown (10 YR 6/3); laminar; firm; stonefree; noncalcareous; pH - 6.4

FRERE LAKE SOIL

Parent Material: Organic soil 40-160 cm deep over mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Fibrisol

Description: Of_1 - 0-40 cm relatively undecomposed sphagnum, etc.; strongly acidic in reaction

Of_2 - 40-70 cm partially decomposed grasses, sedges and/or wood; strongly acidic in reaction

Of_3 - 70-110 cm relatively undecomposed sphagnum, etc.; strongly acidic in reaction

IIC - 110 cm+ mineral subsoil

GAFFNEY SOIL

Parent Material: Outwash fine sandy loam

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description:

Ah	-	0-30 cm sandy loam; black (10 YR 2/0); weak granular structure; pH - 5.6
Bg	-	30-60 cm fine sand; pale brown (10 YR 6/2); weak granular structure; mottled; pH - 5.9
Cg	-	60 cm+ fine sand; light gray (10 YR 7/1); single grain; mottled; pH - 6.2

HAILEYBURY SOIL

Parent Material: Varved, lacustrine clays

Drainage: Well-drained

Usual Classification: Orthic Gray Luvisol

Description:

LFG	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-3 cm clay; very dark gray (10 YR 3/1); medium granular structure; friable consistency when dry; plastic when wet; stonefree; pH - 6.0.
Ae	-	3-10 cm silty clay; light gray (10 YR 7/2); fine platy; friable when dry; plastic when wet; stonefree; pH - 5.6
Bt_1	-	13-30 cm clay; brown (10 YR 5/3); coarse blocky; very hard when dry; very plastic when wet; stonefree; pH - 6.2
Bt_2	-	30-66 cm clay; dark brown (10 YR 4/3); fine blocky; very hard when dry; very plastic when wet; stonefree; pH - 7.0
Bt_3	-	66-86 cm clay; dark yellowish brown (10 YR 4/4); coarse blocky; very hard when dry; very plastic when wet; stonefree; pH - 7.4
Ck	-	86 cm+ clay; white (10 YR 8/2) and yellowish brown (10 YR 5/4); varved; very hard when dry; very plastic when wet; stonefree; calcareous; pH - 7.8

HANBURY SOIL

Parent Material: Varved, lacustrine clays

Drainage: Imperfectly drained

Usual Classification: Gleyed Gray Luvisol

Description:

LFH	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-3 cm clay; very dark gray (10 YR 3/1); medium granular structure; friable consistency when dry; plastic when wet; stonefree; pH - 6.1
Aeg	-	3-23 cm silty clay; light gray (10 YR 7.2); mottled; fine platy; friable when dry; plastic when wet; stonefree; pH - 5.8

Btg$_1$ - 23-33 cm clay; light yellowish brown (10 YR 6/4); mottled; coarse blocky; very hard when dry; very plastic when wet; stonefree; pH - 6.2

Btg$_2$ - 33-56 cm clay; brown (10 YR 5/3); mottled; medium blocky; very hard when dry; very plastic when wet; stonefree; pH - 7.2

Ck - 56 cm+ clay; white (10 YR 8/2) and yellowish brown (10 YR 5/4); varved; very hard when dry; very plastic when wet; stonefree; calcareous; pH - 7.8

HEASLIP SOIL

Parent Material: Well-decomposed organic materials greater than 160 cm thick

Drainage: Very poorly drained

Usual Classification: Typic Humisol

Description: Om - 0-40 cm of dominantly moderately decomposed organic materials

Oh - 40 cm+ well decomposed organic materials

HENWOOD SOIL

Parent Material: Sandy materials of kame moraine origin

Drainage: Well-drained

Usual Classification: Orthic Humo-Ferric Podzol

Description: LFH - 0-5 cm partially decomposed leaves, twigs, needles, etc.; very dark brown (10 YR 2/2); pH - 5.2

Ae - 5-10 cm sand; light gray (10 YR 7/1); single grain structure; loose consistency; slightly stony; pH - 5.0

Bf$_1$ - 10-33 cm sand; brownish yellow (10 YR 5/8); single grain; loose; slightly stony; pH - 5.2

Bf$_2$ - 33-69 cm sand; brownish yellow (10 YR 6/6); single grain; loose; slightly stony; pH - 5.4

C - sand; pale brown (10 YR 6/3); slightly stony; noncalcareous; pH - 5.6

HILLIARD SOIL

Parent Material: Moderately decomposed organic materials 40-160 cm thick over mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Mesisol

Description: Om$_1$ - 0-40 cm moderately decomposed organic materials derived from mosses, sedges, etc.

Om$_2$ - 40-130 cm moderately decomposed organic materials

IIC - 130 cm+ mineral subsoil

INGRAM SOIL

Parent Material: Relatively undecomposed organic materials greater than 160 cm thick

Drainage: Very poorly drained

Usual Classification: Typic Fibrisol

Description: Om - 0-40 cm moderately decomposed organic material, derived chiefly from mosses; strongly acidic in reaction

Of_1 - 40-120 cm slightly decomposed organic material, derived from mosses, wood, etc.; strongly acidic in reaction

Of_2 - 120 cm+ slightly decomposed organic material, derived from mosses, sedges, wood; strongly acidic in reaction

KANIMIWISKIA SOIL

Parent Material: Slightly decomposed organic material, greater than 160 cm thick

Drainage: Very poorly drained

Usual Classification: Typic Fibrisol

Description: Of_1 - 0-40 cm slightly decomposed sphagnum moss; very strongly acidic.

Of_2 - 40-120 cm slightly decomposed organic material derived from sphagnum, cedar chips, etc.; very strongly acidic.

Of_3 - 120 cm+ slightly decomposed organic material, dominantly of cedar origin; very strongly acidic.

KENABEEK SOIL

Parent Material: Noncalcareous, stratified outwash sand

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description: Ah - 0-13 cm sandy loam; very dark brown (10 YR 2/2); highly organic; fine crumb structure; friable consistency; stonefree; pH - 5.2

Bg - 13-46 cm sand; gray (10 YR 6/1); very mottled; single grain; loose, stonefree; pH - 5.5

Cg - sand; very pale brown (10 YR 7/3); very mottled; single grain; loose; stonefree; noncalcareous; pH - 5.6

KERNS SOIL

Parent Material: Moderately decomposed organic material 40 to 160 cm thick over sandy clay mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Mesisol

Description: Om_1 - 0-40 cm moderately decomposed organic material, derived from mosses, grasses and sedges

Om_2 - 40-130 cm moderately decomposed organic material

IIC - 130 cm+ sandy clay mineral subsoil

MALLARD SOIL

Parent Material: Outwash sand, sandy loam and gravelly sand

Drainage: Imperfectly drained

Usual Classification: Gleyed Humo-Ferric Podzol

Description: LFH - 3-0 cm raw humus and roots, very dark gray (10 YR 3/1); pH - 5.0

Ae - 0-8 cm sand; light gray (10 YR 7/1); single grain structure; loose consistency; stonefree; pH - 4.5

Bhfg - 8-46 cm sand; brown (10 YR 5/3); mottled; single grain; occasionally cemented; stonefree; pH - 5.3

Cg - 46 cm+ sand; very pale brown (10 YR 7/3); mottled; single grain; pH - 5.5

MAYBROOK SOIL

Parent Material: Slightly to moderately decomposed organic materials ranging between 40 and 160 cm thick over clayey mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Fibric Mesisol

Description: Of - 0-40 cm slightly decomposed organic materials derived mainly from sphagnum moss

Om - 40-130 cm moderately decomposed organic materials

IIC - 130 cm+ clayey mineral subsoil

MILBERTA SOIL

Parent Material: Varved, calcareous lacustrine clay

Drainage: Very poorly drained

Usual Classification: Orthic Humic Gleysol

Description: OH - 0-30 cm well-decomposed organic material; very dark brown (10 YR 2/2); pH - 6.5

Bg - 30-53 cm clay; gray (10 YR 6/1); mottled; mottles are yellow (2.5 Y 7/6); massive structure; very hard consistency when dry; very plastic when wet; stonefree; pH - 7.0

Ckg - 53 cm+ clay; white (10 YR 8/2) and yellowish brown (10 YR 5/4); varved; very hard when dry; very plastic when wet; stonefree; calcareous; pH - 7.8

McCOOL SOIL

Parent Material: Calcareous, lacustrine clay

Drainage: Imperfectly drained

Usual Classification: Gleyed Melanic Brunisol

Description:

- Ap - 0-13 cm clay; dark grayish brown (10 YR 4/2); fine subangular blocky structure; friable consistency when dry; very plastic when wet; stonefree; pH - 6.0
- $Bmgj_1$ - 13-23 cm clay; dark brown (7.5 YR 4/2); mottled; blocky; very hard when dry; very plastic when wet; stonefree; pH - 6.2
- $Bmgj_2$ - 23-38 cm clay; dark brown (10 YR 4/3); mottled; medium subangular blocky; very hard when dry; very plastic when wet; stonefree; pH - 7.0
- Ck - 38 cm+ clay; dark yellowish brown (10 YR 4/4); massive; very hard when dry; very plastic when wet; stonefree; calcareous; pH - 8.0

MISEMA RIVER SOIL

Parent Material: Moderately decomposed organic materials between 40 and 160 cm thick over clayey mineral subsoil

Drainage: Very poorly drained

Usual Classification: Terric Mesisol

Description:

- Om_1 - 0-40 cm of moderately decomposed organic materials
- Om_2 - 40-130 cm of moderately decomposed organic materials
- IIC - 130 cm+ clayey mineral subsoil

MOOSE SOIL

Parent Material: Noncalcareous stony loam till

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description:

- LFH - Thin layer of partially decomposed leaves, twigs, etc.
- Ah - 0-10 cm loam; black (10 YR 2/1); medium crumb structure; friable consistency; very stony; pH - 5.2
- Bg - 4-38 cm loam; dark gray (10 YR 4/1); very mottled; weak coarse subangular blocky; friable; very stony; pH - 5.6
- C - 38 cm+ loam till; light gray (10 YR 7/1); stony; noncalcareous; pH - 5.6

MUD LAKE SOIL

Parent Material: Dominantly moderately decomposed organic materials greater than 160 cm thick

Drainage: Very poorly drained

Usual Classification: Typic Mesisol

Description: Of - 0-40 cm slightly decomposed organic materials, derived from sphagnum moss and other bog-type plants

Om - 40 cm+ moderately decomposed organic materials

NEW LISKEARD SOIL

Parent Material: Varved, calcareous lacustrine clay

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description: Ap - 0-20 cm clay; very dark brown (10 YR 2/2); fine subangular blocky structure; very hard consistency when dry; very plastic when wet; stonefree; pH - 6.8

Bg_1 - 20-36 cm clay; grayish brown (10 YR 5/2); very mottled; mottles are strong brown (7.5 YR 5/8); coarse blocky; very hard when dry; very plastic when wet; stonefree; pH - 7.0

Bg_2 - 36-58 cm clay; light brownish gray (10 YR 6/2); very mottled; massive; very hard when dry; very plastic when wet; stonefree; pH - 7.2

Ckg - 58 cm+ clay; white (10 YR 8/2) and yellowish brown (10 YR 5/4); varved; very hard when dry; very plastic when wet; stonefree; calcareous; pH - 7.8

OTTERSKIN SOIL

Parent Material: Outwash sand at variable depths over clay

Drainage: Imperfectly drained

Usual Classification: Gleyed Humo-Ferric Podzol

Description: LFH - 5-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH - 5.0

Ae - 0-5 cm sand; light gray (10 YR 7/1); single grain structure; loose consistency; stonefree; pH - 4.8

$Bfgj_1$ - 5-45 cm sand; yellowish brown (10 YR 5/6); mottled; single grain; loose; stonefree; pH - 5.4

$Bfgj_2$ - 45-63 cm sand; brownish yellow (10 YR 6/6); mottled; single grain; loose; stonefree; pH - 5.8

IICkg - 63 cm+ clay; light brownish gray (10 YR 6/2); varved; very plastic when wet; very hard when dry; stonefree; calcareous; pH -7.8

PENSE SOIL

Parent Material: Silty lacustrine soil materials

Drainage: Imperfectly drained

Usual Classification: Gleyed Gray Luvisol

Description:

LFH	-	2-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH -5.1
Ah	-	0-5 cm silt loam; dark grayish brown (10 YR 4/2); medium granular structure; friable consistency; stonefree; pH - 5.1
Bmgj	-	5-20 cm silt loam; very pale brown (10 YR 7/3); mottled; weak platy; friable; stonefree; pH - 5.0
AB	-	20-33 cm silt loam; grayish brown (10 YR 5/2); mottled; weak medium subangular blocky; friable; stonefree; pH - 5.3
Btgj	-	33-69 cm silty clay loam; brown (10 YR 5/3); mottled; medium subangular blocky; plastic when wet; hard when dry; stonefree; pH - 5.4
C	-	68 cm+ silt loam; pale brown (10 YR 6/3); pseudo-platy; friable; stonefree; noncalcareous; pH - 6.2

SUTTON BAY SOIL

Parent Material: Calcareous stony loam till

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description:

LFG	-	Thin layer of partially decomposed leaves, twigs, etc.
Ah	-	0-15 cm loam; black (10 YR 2/1); medium granular structure; friable consistency; very stony; pH - 7.4
Bmg	-	15-36 cm loam; dark gray (10 YR 4/1); very mottled; weak medium subangular blocky; friable; very stony; pH - 7.6
Ckgj	-	36 cm+ loam till; light yellowish brown (10 YR 6/4); very mottled; very stony; calcareous; pH - 7.8

STURGEON RIVER SOIL

Parent Material: Slightly to moderately decomposed organic materials greater than 160 cm thick

Drainage: Very poorly drained

Usual Classification: Typic Mesisol

Description:

Oh	-	0-40 cm predominantly well-decomposed plant remains consisting of mosses and sledges; strongly acidic
Om_1	-	40-130 cm moderately decomposed plant remains consisting of sedges, common reeds; medium to strongly acidic
Om_2	-	130 cm+ moderately decomposed plant remains derived from common reeds, sedges; medium to strongly acidic

THWAITES SOIL

Parent Material: Variable depths of silt loam over calcareous, lacustrine clay

Drainage: Well-drained

Usual Classification: Podzolic Gray Luvisol

Description:

LFH	-	3-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH - 5.2
Ae_1	-	0-5 cm silt loam; white (10 YR 8/2); fine platy structure; soft consistency; stonefree; pH - 5.2
Bhf	-	5-25 cm silt loam; yellowish brown (10 YR 5/6); weak platy; soft; stonefree; pH - 5.3
Ae_2	-	25-46 cm silt loam; very pale brown (10 YR 7/3); weak platy; soft; stonefree; pH - 5.3
Bt	-	46-66 cm silty clay loam; yellowish brown (10 YR 5/5); medium subangular blocky; friable; stonefree; pH - 5.6
2Ck	-	66 cm+ clay; dark yellowish brown (10 YR 4/4); massive structure; very plastic when wet; very hard when dry; stonefree; calcareous; pH - 7.8

THORNLOE SOIL

Parent Material: Calcareous lacustrine clay

Drainage: Poorly drained

Usual Classification: Orthic Humic Gleysol

Description:

Ap	-	0-20 cm clay; very dark brown (10 YR 2/2); fine subangular blocky structure; friable consistency when dry; very plastic when wet; stonefree; pH - 6.5
Bg_1	-	20-30 cm clay; grayish brown (10 YR 5/2); very mottled; coarse blocky; very hard when dry; very plastic when wet; stonefree; pH - 6.7
Bg_2	-	30-46 cm clay; grayish brown (10 YR 5/2); very mottled; massive; very hard when dry; very plastic when wet; stonefree; pH - 6.8
Ckgj	-	46 cm+ clay; dark yellowish brown (10 YR 4/4); massive; very hard when dry; very plastic when wet; stonefree; calcareous; pH - 8.0

WABI SOIL

Parent Material: Noncalcareous, stony loam till

Drainage: Well-drained

Usual Classification: Orthic Humo-Ferric Podzol

Description:

LFH	-	2-0 cm partially decomposed litter of twigs, leaves and needles; very dark gray (10 YR 3/1); pH - 5.0
Ah	-	0-3 cm loam; very dark brown (10 YR 2/2); medium crumb structure; friable consistency; very stony; pH - 5.2

Ae	-	3-8 cm sandy loam; light gray (10 YR 7/2); weak platy; friable; very stony; pH - 5.4
Bf	-	8-46 cm loam; yellowish brown (10 YR 5/6); weak medium subangular blocky; friable; very stony; pH - 5.5
C	-	46 cm+ loam till; light gray (10 YR 7/1); noncalcareous; pH - 5.5

WENDIGO SOIL

Parent Material: Outwash sands

Drainage: Well-drained

Usual Classification: Orthic Humo-Ferric Podzol

Description:

A_o	-	2-0 cm raw humus and roots; very dark gray (10 YR 3/1); pH - 5.2
Ae	-	0-4 cm sand; light gray (10 YR 7/1); single grain structure; loose consistency; stonefree; pH - 5.0
Bhf_1	-	4-28 cm sand; yellowish brown (10 YR 5/8); single grain; loose; stonefree; pH - 5.5
Bhf_2	-	28-58 cm sand; light yellowish brown (10 YR 6/4); single grain; loose; stonefree; pH - 5.5
C	-	58 cm+ sand; very pale brown (10 YR 7/2); single grain; loose; stonefree; noncalcareous; pH - 5.5