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Reconnaissance Soil Survey of the CHAPLEAU~FOLEYET AREA Northern Ontario

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ABSTRACT

A reconnaissance soil survey of the Chapleau-Foleyet area was completed between 1980-1982. The Chapleau (41-0) and Foleyet (42-B) National Topographic Series map sheets (1:250 000) occupy approximately 33 000 km^2 in northeastern Ontario.

The area is sparsely populated and major occupations are associated with forestry and tourism. The mapped area straddles the Height of Land, with the Groundhog, Missinaibi and Kapuskasing Rivers flowing into the Arctic Ocean and the Montreal, Wenebegon and Aubinadong Rivers flowing into the Atlantic Ocean. The climate of the area is continental with cold winters and warm summers. Mean air temperatures are 1-2°C and mean summer temperatures are 15-17°C. Extreme lows may reach -48°C and extreme highs 42°C. Precipitation ranges from 700-900 mm, with approximately one third of the precipitation falling as snow.

The vegetation is principally that of the Boreal Forest, but to the south the vegetation contains increasing amounts of sugar maple and yellow birch. Black and white spruce, jack pine, aspen and balsam poplar, white birch and balsam fir comprise the major tree species. The underlying bedrock is Precambrian in age and consists predominantly of Archean intrusive granitic and migmatitic rocks, with subordinate amounts of mafic to intermediate metavolcanic and metasedimentary rocks. Ice of Wisconsonian age retreated from the area approximately 10 000 yrs B.P. leaving in its wake a great variety of glacial materials. Glaciofluvial outwash dominates the south central parts of the map sheets, with glaciolacustrine deposits associated with Lake Barlow-Ojibway dominating the northern parts of the area. Sandy acidic morainal till is common south of the glaciolacustrine deposits, with a loamy calcareous till from the Cochrane readvance occurring in the extreme northern parts of the mapped area.

Although a number of soils were recognised from the field study, the scale of mapping (1:250 000) precluded inclusion of many of these units on the final maps. Soil unit boundaries corresponded with the terrain units identified in the Northern Ontario Engineering Geology Terrain Study maps. These maps were the principal sources of information for pretyping the mapped area. Information contained within the Ontario Land Inventory maps proved of less value in describing soil units.

Twenty three soil units developed on morainal till, glaciofluvial outwash, glaciolacustrine deposits, eolian sands, recent alluvium and organic materials were differentiated within the mapped area. The soil units were differentiated on the basis of family particle sizes - sandy, loamy or clayey; drainage - rapid, well, imperfect or poor; reaction - acid or neutral; and calcareousness class - none or strongly. The soil units were subdivided on the basis of topography and amount of exposed bedrock. Well drained morainal tills and glaciofluvial outwash are dominated by Orthic Humo-Ferric Podzols and Eluviated Dystric Brunisols, glaciolacustrine deposits by Orthic and Gleyed Gray Luvisols and eolian deposits by Eluviated Dystric Brunisols. Organic soils are principally associated with glaciolacustrine deposits in the Foleyet sheet and glaciofluvial outwash in the Chapleau sheet.

The dominant soil units within the mapped area are acidic rapidly drained glaciofluvial sands (Sultan unit), acidic rapidly drained sandy (Chapleau unit) and well drained loamy (Foleyet unit) morainal tills, calcareous well drained (Seaton unit) and imperfectly drained (Wadsworth unit) glaciolacustrine loams. Shallow soils are more abundant in the southern parts of the mapped area, and morainal soils are generally associated with stony surface horizons and undulating to rolling topography.

Information included within this report will improve the soil resource data base of a little studied part of northern Ontario and should aid in making broad scale land management decisions within the Chapleau-Foleyet area.

RECONNAISSANCE SOIL SURVEY OF THE CHAPLEAU-FOLEYET AREA NORTHERN ONTARIO

by
L.J. Evans and B.H. Cameron

INTRODUCTION

At present there is little information on soil distribution for much of northern Ontario, except for soil surveys conducted in agricultural, or potentially agricultural, areas as part of the Canada Land Inventory, or by the Ontario Ministry of Natural Resources as part of their forest inventory program. Information on the properties and distribution of soils in northern Ontario is urgently required to aid in making long term decisions related to forest management, land use allocation and impact assessment of potentially harmful environmental hazards such as acid rain.

Since the time that elapses between the initiation of a typical soil survey and the publication of the final report is of necessity considerable, it is advantageous to use resource information already published at a scale suitable for the soil survey under consideration to speed the compilation of the soil information. The purpose of this study was to conduct as quickly and as inexpensively as possible a reconnaissance soil survey, at a scale of 1:250 000, of the Chapleau-Foleyet map sheets and to provide soil information that would be useful for making decisions appropriate to that scale. Extensive use was made of information contained within the Northern Ontario Engineering Geology Terrain Study (NOEGTS) maps produced for much of northern Ontario at a scale of 1:100 000.

DESCRIPTION OF AREA

Location and settlement

The Chapleau-Foleyet area is located in northern Ontario between latitudes 47°00' N and 49°00' N and longitudes 82°00' W and 84° 00' W (Figure 1). The two 1:250 000 National Topographic Series map sheets included in the study area are Chapleau (41-0), 47°00' N to 48°00' N and 82°00' W to 84°00' W, and Foleyet (42-B), 48°00' N to 49°00' N and 82°00' W to 84°00' W. The area encompassed by the Chapleau sheet is approximately 16 540 km^2 and that of the Foleyet sheet 16 260 km^2 giving a combined area of 32 800 km^2.

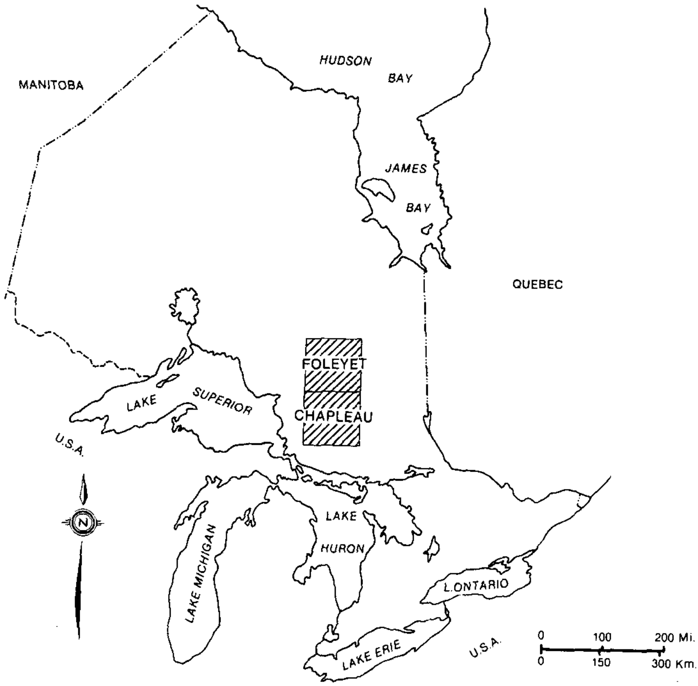

Figure 1. Location of Chapleau and Foleyet map sheets.

The area lies within the administrative districts of Algoma, Sudbury and Cochrane (Figure 2). Two major highways transect the area, Highway 129 from Thessalon to Chapleau and Highway 101 from Wawa to Chapleau and then via Foleyet to Timmins. There are numerous forest access roads and private forestry roads, particularly in the eastern and western sections of the Chapleau sheet and in the southern parts of the Foleyet sheet. Access by road is severely restricted or non-existent in the south central part of the Chapleau sheet and the central and northern parts of the Foleyet sheet. The major settlement in the area is at Chapleau (population 3365), with a small settlement at Foleyet (637). Both the Canadian National Railway and Canadian Pacific Railway transect the study area and there are small settlements along these railways. The principal occupations of the residents of the area are connected with forestry and tourism.

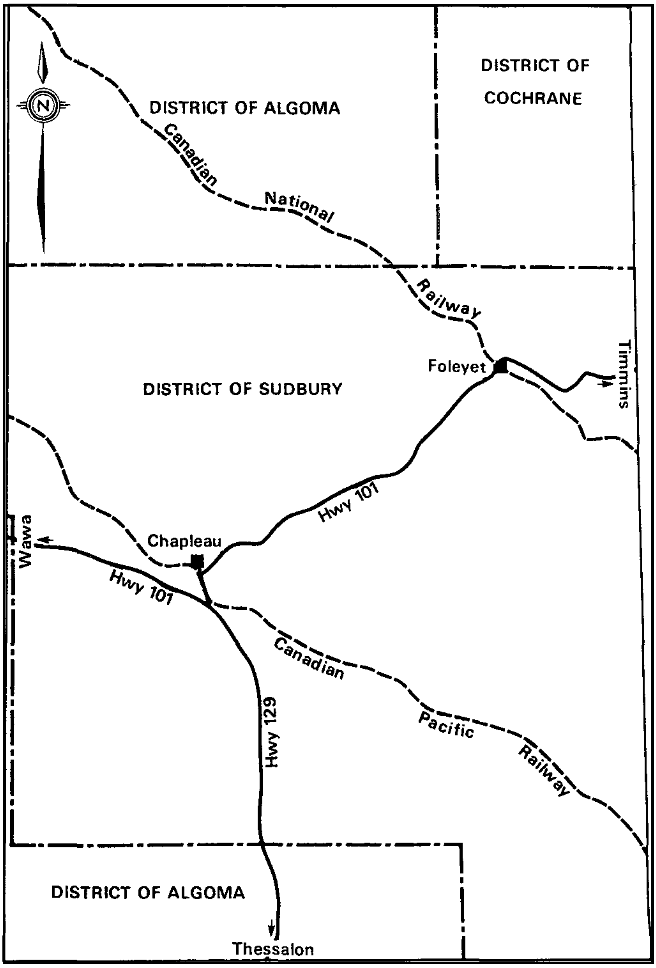

Figure 2. Major highways and railways in study area.

Topography and drainage

The mapped area lies across the divide separating the Atlantic and Arctic watersheds. To the north of the divide the land slopes rather gently to the shores of Hudson and James Bays, but to the south the descent is more rapid to the shores of Lake Superior and Lake Huron. The divide is often referred to as the Height of Land. Elevations along the divide are generally between 500 to 540 m, although individual hills, particularly in the rugged terrain in the southwest corner of the Chapleau sheet, rise to between 650 and 725 m. To the north, in the Foleyet sheet, the topography is generally flat, but gently sloping, with elevations between 360 and 300 m.

The major rivers of the Atlantic watershed are the Montreal, Cow and Goulais Rivers that drain into Lake Superior, and the Wenebegon, Aubinadong and Abinette that drain via the Mississagi River into Lake Huron (Figure 3). In the south east corner of the Chapleau sheet an extensive area of lakes (Ramsey, Biscotasi, Indian and Mozhabong) drain via the Spanish River into Lake Huron.

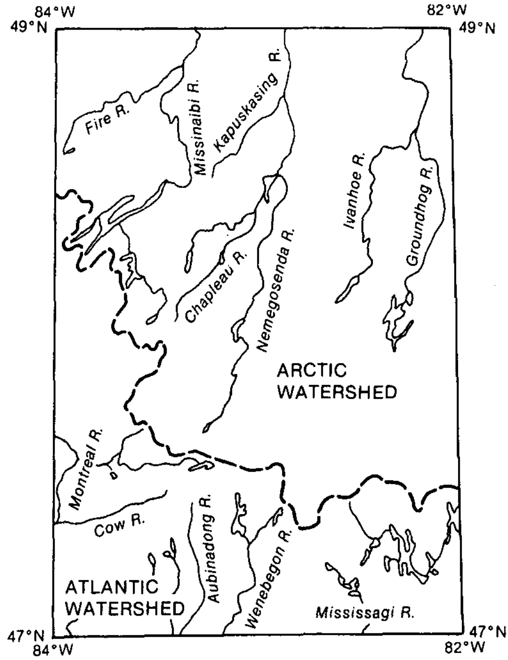

Figure 3. Major drainage basins and associated rivers.

In the Arctic watershed there are a number of major rivers that flow over the relatively flat plain north into James Bay. In the eastern and central parts of the Foleyet sheet the Kapuskasing and Groundhog Rivers drain the Chapleau, Nemegosenda and Ivanhoe Rivers and they themselves flow into the Mattagami River. From the west the Missinaibi River and its tributary, the Fire River, join the Mattagami River in the Moose River basin. The resulting Moose River enters James Bay at Moosonee.

Climate

The climate of northern Ontario is classified as modified continental, the modification resulting mainly from the Great Lakes to the south and, to a lesser extent, from Hudson Bay to the north (Chapman and Thomas 1968). A pattern of lower winter and higher summer precipitation prevails. In winter, cold polar air masses produce dry, clear conditions that persist for considerable periods of time. In summer, a continuing succession of cyclonic storms sweeps over the area and warm, humid air masses from the south alternate with cooler and drier air from the north. This alternation of air masses gives two to three days of fine weather followed by more humid weather accompanied by changeable winds and rain.

The Chapleau-Foleyet area occurs principally in the climatic region known as the Height of Land (Chapman and Thomas 1968). Long term average data from the four climatological stations in the area (Chapleau, Foleyet, Biscotasing and Ramsey) are shown in Tables 1-4.

Table 1. Climatological data for Chapleau. 47°N 50'N 83° 26'W. 432 m.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Daily Temp. °C	-16.4	-14.8	- 8.9	1.0	8.9	14.5	17.0	15.4	10.3	4.7	- 3.0	-12.9	1.3
Extreme Max. Temp.	7.8	14.4	23.3	27.8	35.0	39.4	39.4	35.6	35.6	27.2	19.4	11.7	39.4
Min. Temp.	-46.7	-46.7	-43.9	-33.3	-13.3	- 7.2	- 0.6	- 7.8	-10.0	-18.9	-37.2	-47.2	-47.2
Rainfall (mm)	3.2	2.4	4.6	40.2	78.4	78.2	66.4	115.6	116.9	67.7	40.7	6.7	621.0
Snowfall (cm)	46.5	38.6	31.8	10.5	1.6	0.0	0.0	0.0	0.5	19.3	42.3	55.4	246.5
Total Precip. (mm)	59.8	53.2	48.9	53.8	77.6	78.2	66.4	115.6	116.9	78.7	89.1	62.8	901.0

Table 2. Climatological data for Foleyet. 48°N 15′N 82° 26′W. 329 m.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Daily Temp. °C	-17.2	-15.2	- 9.0	1.1	8.0	13.9	16.1	15.1	10.2	4.7	- 3.4	-13.4	0.9
Extreme Max. Temp.	7.2	11.7	17.2	25.0	32.8	35.6	35.0	36.1	32.8	28.9	18.3	12.8	36.1
Extreme Min. Temp.	-47.2	-46.1	-42.8	-33.9	-12.8	- 6.7	- 3.9	- 3.9	-10.0	-15.6	-36.7	-43.3	-47.2
Rainfall (mm)	0.5	0.2	5.4	25.8	59.6	73.7	72.2	75.4	82.2	47.8	18.8	1.3	462.9
Snowfall (cm)	38.6	39.0	43.8	14.8	2.6	0.0	0.0	0.0	0.8	5.6	40.1	47.7	233.0
Total Precip. (mm)	39.1	39.1	45.9	40.0	61.9	73.7	72.2	75.4	83.0	53.3	59.6	45.2	688.4

Table 3. Climatological data for Biscotasing. 47° 18′N 82° 06′W. 407 m.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Daily Temp. °C	-15.6	-14.2	- 7.5	1.9	9.6	15.1	17.5	16.1	11.1	5.8	- 2.0	-11.8	2.2
Extreme Max. Temp.	11.7	11.1	23.9	28.3	33.3	35.0	42.2	35.6	32.8	26.1	18.3	13.9	42.2
Extreme Min. Temp.	-47.2	-46.7	-44.4	-39.4	-11.7	- 6.1	- 2.2	- 3.3	- 9.4	-20.6	-33.9	-47.8	-47.8
Rainfall (mm)	1.3	1.3	11.6	32.0	65.2	88.4	83.5	94.6	91.0	70.9	26.3	6.0	572.1
Snowfall (cm)	54.9	41.7	38.9	12.9	1.1	0.1	0.0	0.0	0.7	7.0	35.5	47.3	240.1
Total Precip. (mm)	56.2	43.2	51.1	44.8	66.4	88.5	83.5	94.6	91.7	77.9	61.8	53.3	813.0

Table 4. Climatological data for Ramsey. 47° 25′N 82° 19′W. 426 m.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Daily Temp. °C	-15.4	-14.0	- 7.6	1.7	9.6	14.6	17.2	15.9	11.0	5.3	- 2.6	-12.0	2.0
Extreme Max. Temp.	4.4	11.7	16.7	24.4	31.7	33.3	33.3	39.4	31.1	25.0	16.7	11.1	39.4
Extreme Min. Temp.	-40.0	-41.1	-34.4	-27.8	- 8.3	- 2.2	2.2	- 2.2	- 6.1	-15.6	-28.3	-37.8	-41.1
Rainfall (mm)	2.7	0.5	0.5	27.8	63.3	7.60	63.0	100.3	93.3	53.2	23.5	3.3	507.4
Snowfall (cm)	49.0	35.2	36.9	14.0	1.6	0.0	0.0	0.0	0.0	4.7	35.1	46.2	222.7
Total Precip. (mm)	52.0	37.1	47.3	41.6	67.9	76.0	63.0	100.3	93.2	58.2	56.0	48.2	740.8

Mean annual air temperatures range from 0.9 to 2.2°C for the four stations with total precipitations from 688 to 901 mm. January is the coldest month with daily temperatures averaging -16°C and July is the warmest month with a mean daily temperature of 17°C. Temperatures in winter however often fall below -40°C and summer temperatures rise to over 30°C. Approximately 30 per cent of the precipitation falls as snow.

Vegetation

Rowe (1972) places most of the mapped area in the Boreal Forest Region, with only the southern 10% in the Great Lakes-St. Lawrence Forest Region. The principal feature of the boreal forest vegetation is extensive stretches of black spruce[1] covering the poorly drained lowland flats and the gently rising upland. Mixed stands of trembling aspen, balsam poplar, balsam fir, white spruce and black spruce occur on better drained upland sites. Jack pine and, to a lesser extent, white birch are found on coarser textured drier sites on outwash deposits, beach ridges and eskers.

Along the Height of Land in the central parts of the mapped area the species composition is basically that of the Boreal Forest but also contains species more often associated with the Great Lakes-St. Lawrence Forest Region to the south. The predominant species of the forest are an association of balsam fir, black spruce and white birch, with scattered white spruce and trembling aspen becoming more dominant on upland sites. Jack pine is common on sandy ridges along rivers and on eskers. Associations of black spruce and tamarack or eastern white cedar and black spruce predominate in wet depressions and on organic soils. Dieback of white birch has become a problem in recent years.

The south part of the survey area, in the Great Lakes-St. Lawrence Forest Region, contains a mixed forest with a wider variety of species. Eastern white pine, white birch and white spruce are the predominant species and this association is often accompanied by balsam fir, trembling aspen and large tooth aspen. Red pine and jack pine occur on sandy or shallow sites. Yellow birch and sugar maple are found on local elevated areas having adequate soil depth and moisture. Black spruce with tamarack or eastern white cedar are common in poorly drained sites.

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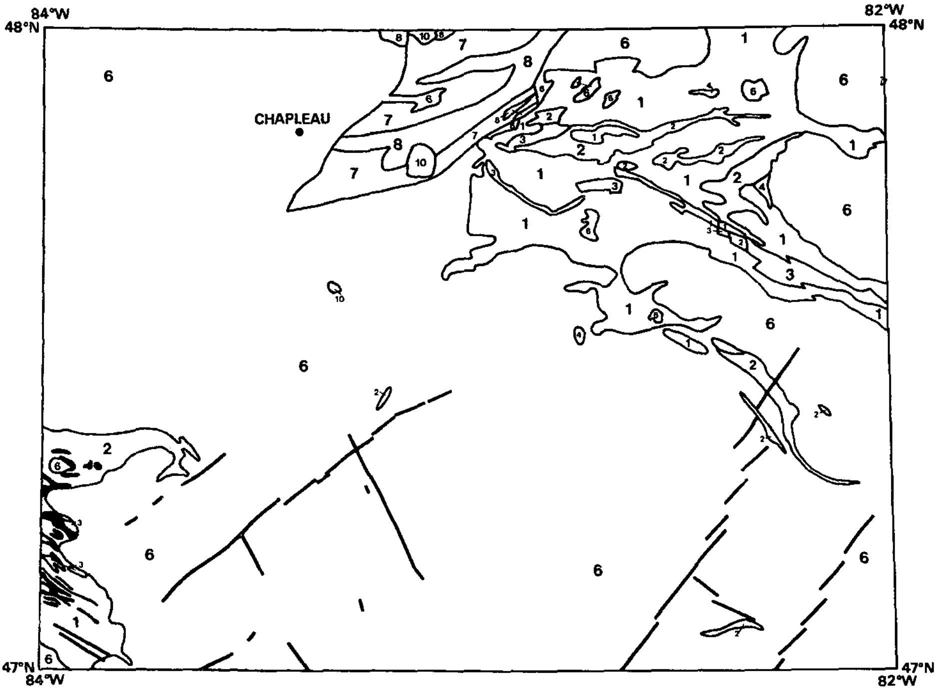
[1]Scientific names of all plant species are given in Appendix 1.

Bedrock geology

All the bedrock found in the Chapleau-Foleyet area, with the exception of some Mesozoic lamprophyre dykes, is Precambrian in age and belongs to the Superior Province. The rock consists largely of granitic plutons and granitic gneisses, together with highly metamorphosed metavolcanic and metasedimentary 'greenstone' belts, characteristic of much of the Archean age rocks of the Canadian Shield. The geology of the area has been described by Thurston et al (1977). Three of the structural subprovinces of the Canadian Shield recognized by Stockwell (1970) are found within the study area. These are the Wawa Subprovince, the Abitibi Subprovince and the Kapuskasing Structural Zone. The Wawa and Abitibi Subprovinces include extensive metavolcanic - metasedimentary belts surrounded by granitic rocks, and the Kapuskasing Structural Zone contains highly metamorphosed sediments with scattered occurrences of mafic intrusive rocks. A generalized geology of the Chapleau map sheet is shown in Figure 4 and of the Foleyet map sheet in Figure 5.

The major bedrock of the area is a mixture of intrusive granitic and migmatitic rock. These rocks cover approximately three quarters of the Chapleau-Foleyet area. The southern part of the region is dominated by felsic igneous rocks composed of massive to foliated coarse grained quartz monzonite and granodiorite, pink to red in colour. The granitic rocks of the northern part of the area consist of a broad band of dominantly metamorphosed gneissic trondhjemites and quartz diorites west of the south end of the Kapuskasing Structural Zone, and a weakly defined zone of trondhjemitic and granodioritic rocks around Missinaibi Lake. Plagioclase feldspar, quartz and potassium feldspar dominate mineralogically in varying proportions, with hornblende and biotite occurring as the major mafic minerals.

The migmatitic outcrops of the area possess a complex fabric, yet, except for the nature of the xenoliths, are generally similar in appearance throughout the area. The migmatites have been interpreted as allochthonous. The appearance is that of a mixed rock in which fragments and inclusions of metavolcanic and metasedimentary rocks (paleosomes) are embedded and engulfed in a lighter coloured rock (neosome). Although the nature and degree of assimilation of the xenoliths varies greatly, the mineralogical



LATE PRECAMBRIAN

11. Mafic to Intermediate Intrusive rocks
    Hornblende syenite

10. Carbonatite-alkalitic complexes
    Alkalitic syenite, nepheline syenite

EARLY PRECAMBRIAN

8. Shawmere Anorthosite complex
   Anorthosite, anorthositic gabbro, tonalite, monzonite

7. Kapuskasing Structural Zone rocks
   Meta-igneous, melanocratic granulites

6. Felsic Intrusive and Migmatitic rocks
   Quartz monzonite, granodiorite

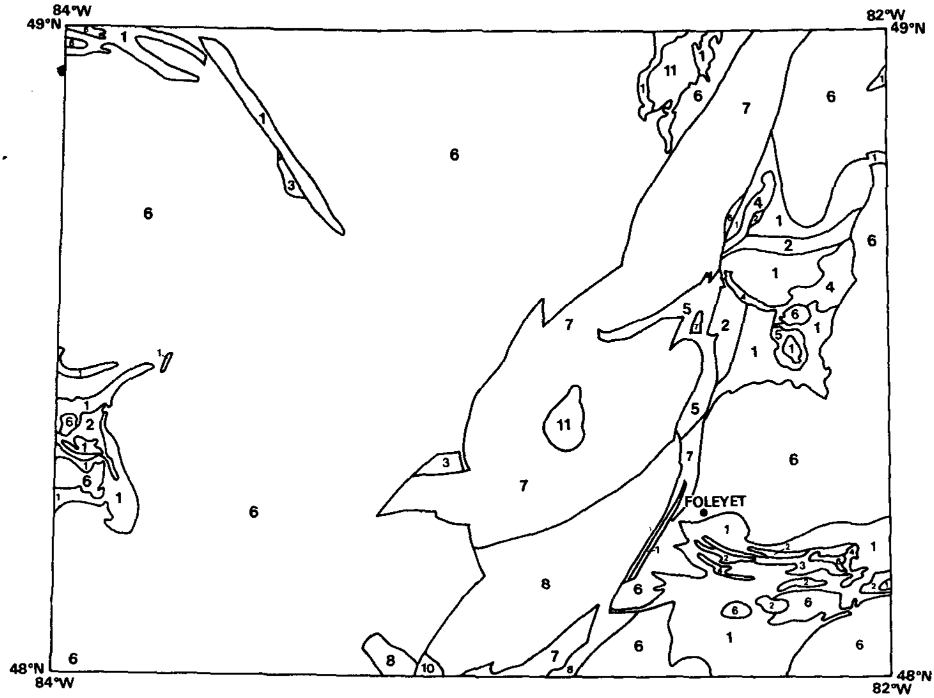
4. Mafic and Ultramafic Intrusive rocks
   Diorite, gabbro

3. Metasediments
   Greywacke, arkose, conglomerate

2. Felsic to Intermediate volcanics
   Rhyolite, porphyritic tuffs

1. Mafic to Intermediate volcanics
   Basalt, andesite

Figure 4. Generalized geology map of Chapleau area.



LATE PRECAMBRIAN

11. Mafic to Intermediate Intrusive rocks
    Hornblende syenite

10. Carbonatite-alkalitic complexes
    Alkalitic syenite, nepheline syenite

EARLY PRECAMBRIAN

8. Shawmere Anorthosite complex
   Anorthosite, anorthositic gabbro, tonalite, monzonite

7. Kapuskasing Structural Zone rocks
   Meta-igneous, melanocratic granulites

6. Felsic Intrusive and Migmatitic rocks
   Quartz monzonite, granodiorite

4. Mafic and Ultramafic Intrusive rocks
   Diorite, gabbro

3. Metasediments
   Greywacke, arkose, conglomerate

2. Felsic to Intermediate volcanics
   Rhyolite, porphyritic tuffs

1. Mafic to Intermediate volcanics
   Basalt, andesite

Figure 5. Generalized geology map of Foleyet area.

composition of metavolcanic xenoliths remains consistently close to 50 to 60 percent hornblende, 20 to 30 percent plagioclase feldspar and the remainder as quartz. The mineralogical composition and colour of the neosome varies with the degree of assimilation of the xenoliths.

'Greenstone' belts and other prominent structural and lithological units within the subprovinces have been informally named by Thurston et al (1977), except for the Batchawana complex which was not included in their study area. The location of these units is shown in Figure 6 and the subprovinces to which they belong in Table 5.

Table 5. Structural units within the Chapleau-Foleyet area.

Wawa subprovince
Michipicoten metavolcanic-metasedimentary belt
Kabinakagami Lake metavolcanic-metasedimentary belt
Saganash Lake metavolcanic-metasedimentary belt
Batchawana metavolcanic - metasedimentary belt
Abitibi Subprovince
Swayze-Deloro metavolcanic-metasedimentary belt
Belford-Strachan metavolcanic-metasedimentary belt
Kapuskasing Structural Zone (units which are spatially associated with the Zone and probably fall within its tectonic boundaries)
Shawmere anorthosite complex
Nemegosenda Lake carbonatite-alkalic complex
Seabrook Lake carbonatite-alkalic complex
Shenango intrusive complex

Metavolcanic and metasedimentary 'greenstone' belts underly about 10 per cent of the area, the Swayze-Deloro complex being the largest. Greenschist facies mafic to intermediate rocks predominate in these complexes, with amphibolite facies rocks occurring preferentially towards the margins of the belts. Greenschist facies rocks contain albitic plagioclase, chlorite, epidote and often carbonate as dominate minerals, with hornblende, biotite and quartz as subordinate minerals. Amphibolite facies rocks contain varying proportions of hornblende and plagioclase, with subordinate amounts of epidote, biotite and quartz. Basalts, andesites,

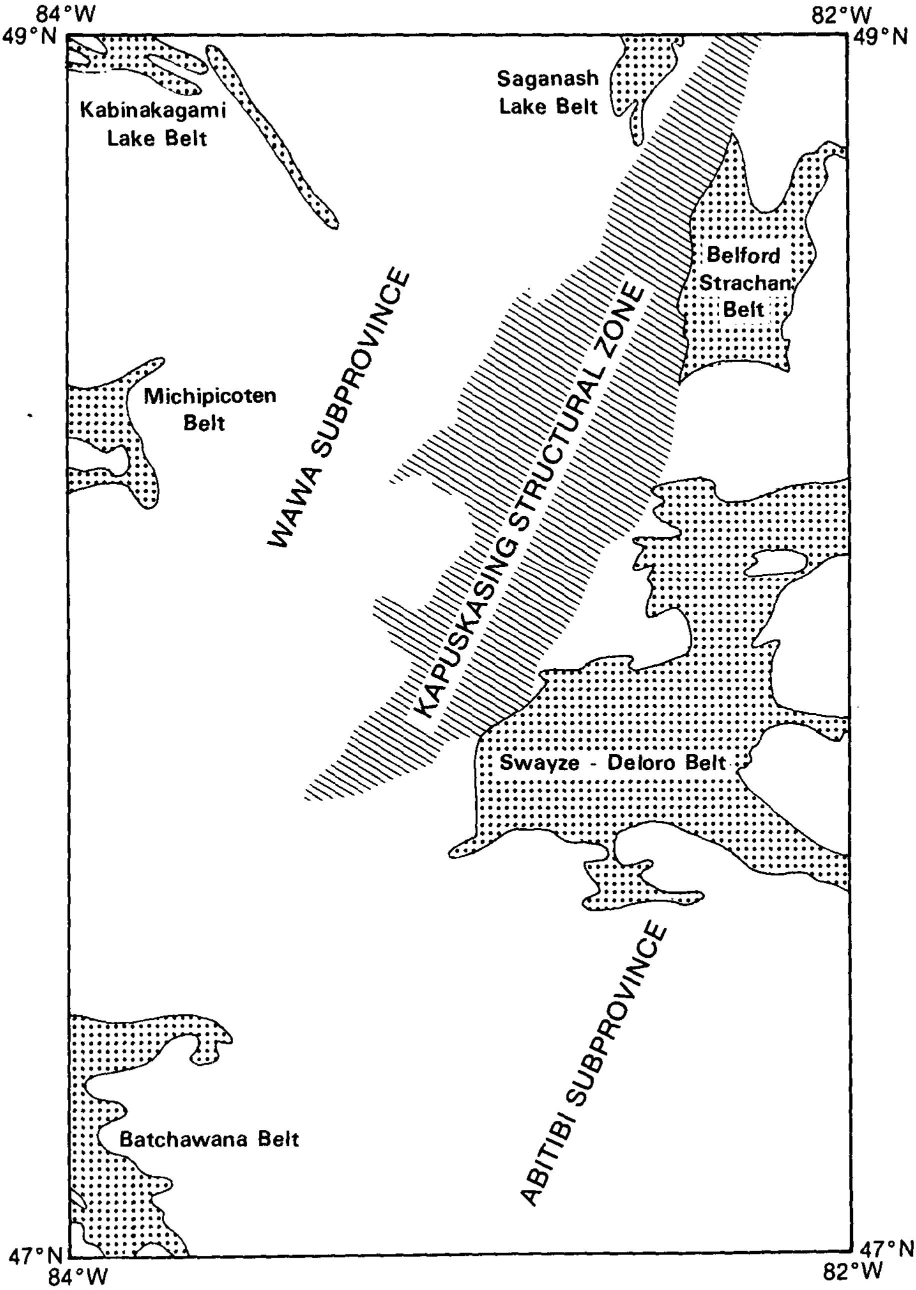


Figure 6. Location of major structural and lithological units.

amphibolites and hornblende schists are the major mafic and intermediate rocks found in these complexes.

Felsic to intermediate metavolcanics of greenschist facies grade are also found appreciably associated with the Swayze-Deloro, Michipicoten and Belford-Strachan belts. Rhyolite is the major felsic rock in the Swayze- Deloro complex with potassium feldspar, quartz and plagioclase feldspar as the major minerals. The felsic to intermediate rocks of the Michipicoten complex are typically porphyritic tuffs with a composition more albitic than the rocks of the Swayze-Deloro complex. Metasediments make up approximately 10 per cent of the Swayze-Deloro complex and consist largely of greywacke, arkose and conglomerate.

The Kapuskasing Structural Zone is the major structural feature within the mapped area. It is characterized by structural trends running nearly at right angles to the adjacent 'greenstone' belts, a higher grade of metamorphism of granulite facies, and abrupt changes in lithology throughout the zone. The major rock types encountered are meta-igneous rocks, melanocratic, pelitic and psammitic granulites and metasedimentary and metavolcanic gneisses. Plagioclase feldspars, quartz and hornblende dominate the mineralogy, with lesser amounts of pyroxene, biotite and garnet.

The Shawmere anorthosite complex has an areal extent of 1200 km^2 and lies adjacent to the Kapuskasing Structural Zone. Anorthosite and anorthositic gabbro are the major rock types with occurrences of tonalite and monzonite separating the complex into two distinct highly metamorphosed units. The common minerals of the anorthositic rocks are bytownite An_{70-74} and hornblende.

Other rocks of importance to soil distribution within the mapped area are some mafic and ultramafic rocks associated with the 'greenstone' belts, other mafic to intermediate rocks associated with the Kapuskasing Structural Zone (Shenango complex), and Late Precambrian carbonatite-alkalic complexes at Lackner Lake, Nemegosenda Lake and Seabrook Lake.

Quaternary geology

The glacial history of northeastern Ontario has been discussed by Boissonneau (1966, 1968) and summarized by Prest (1970). Detailed discussions for the Chapleau-Foleyet area have been provided by Thurston et al. (1977) and further information is provided, to a greater or lesser extent, in the NOEGT studies of the Wenebegon, Biscotasing, Chapleau, Ridout, Missinaibi Lake, Foleyet, Fire River and Elsas map sheets (1:100 000). The following discussion has largely been taken from these sources.

Deglaciation began (~ 11 000 yrs B.P.) in the Chapleau-Foleyet area when the ice front retreated to the position now marked by the Chapleau I series of moraines. Proglacial Lake Sultan was formed when meltwaters were ponded in a broad depression, lying between this ice front and the bedrock uplands to the south (Figure 7). Boissonneau (1968) believes that the ice then readvanced to the position marked by the Chapleau II morainic belt, overriding the Chapleau I moraines and the northern part of Lake Sultan. Roed and Hallett (1979a,b) however believe that it is more likely that this belt of moraines in the northern parts of the Chapleau and Ridout sheets represents a major standstill of the Laurentide ice within the study area. They have termed this belt of moraines the Sultan scarp and believe that the scarp formed during a halt in the recession of the glacier rather than during a readvance. The scarp is bounded on the south by an extensive glaciofluvial outwash plain representing a substantial outflow of water from a wide front. Modification of the scarp by wave action indicates that some of the meltwater channels may have been blocked, resulting in ponding for a brief period. Much of the meltwater escaped southwest and west through the valleys of the Cow and Montreal rivers and to the south through the valley of the Wenebegon river (Roed and Hallett 1980). In the extreme south of the study area the Wenebegon spillway emptied into the Mississagi valley where it eroded older valley train deposits. The presence of vast tracts of hummocky moraine and pitted outwash plains suggests that deglaciation in the northern parts of the Chapleau sheet occurred by mass disintegration of the ice sheet. Local ponding occurred, but most of the outwash sand exhibits features that suggest deposition in slowly moving water (Roed and Hallett 1979b).

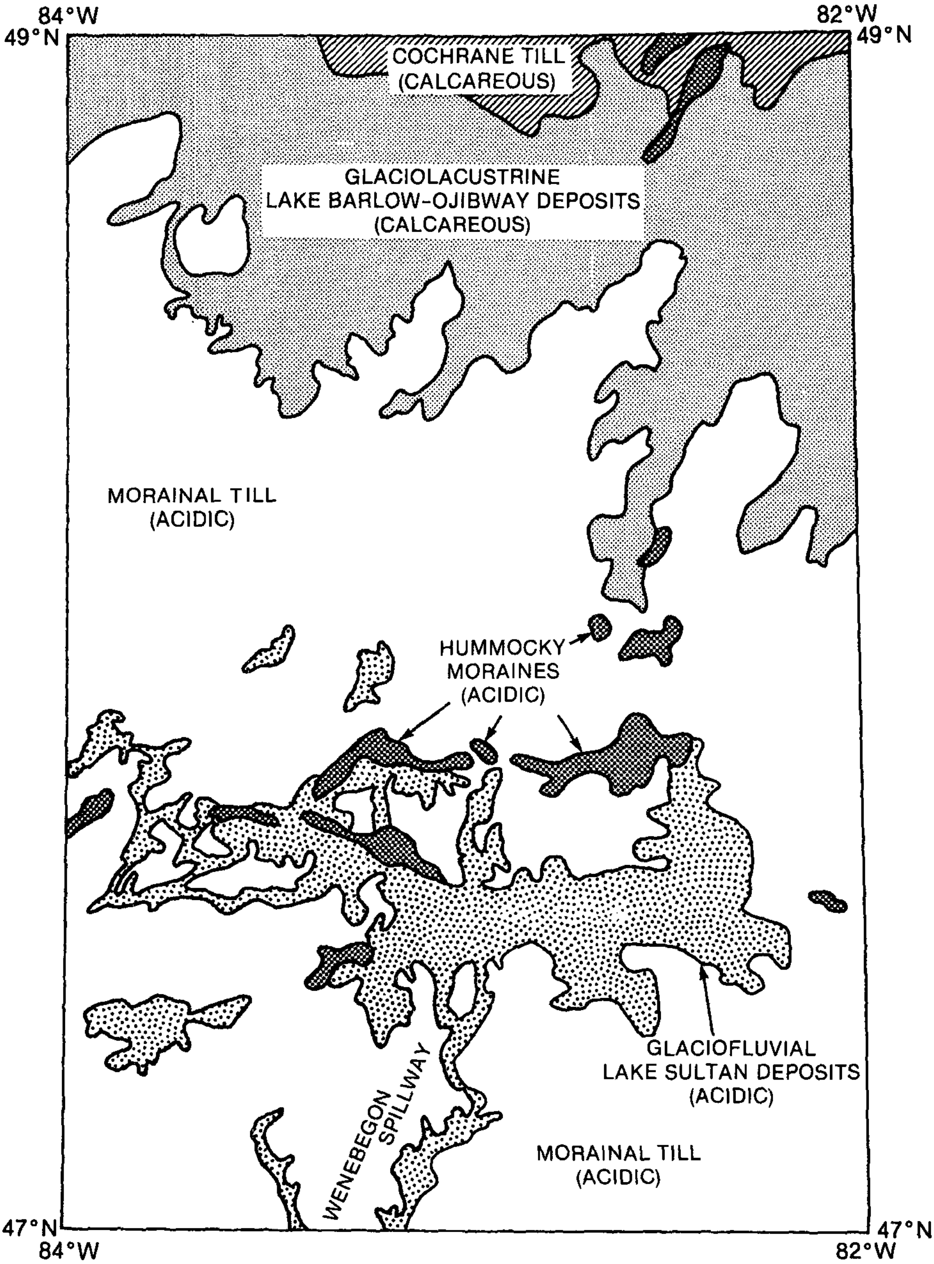


Figure 7. Generalized Quaternary geology map.

The major glacial feature of the Foleyet area is the extensive glaciolacustrine deposits of Lake Barlow-Ojibway. This lake formed between the ice front and the Height of Land and at its greatest extent extended approximately 960 km in an east-west direction and 240 km in a north-south direction. The most extensive deposits formed by this lake are the sheet-like bodies of rhythmites which extend uninterrupted across the Height of Land (Agterberg and Banerjee 1969).

In the study area, Lake Barlow-Ojibway deposits are confined largely to the Fire River and Elsas NOGET map sheets and to the Groundhog and Ivanhoe river basins of the Foleyet NOGET map sheet. The extensive glaciolacustrine deposits consist largely of lake plain banded silt and sand, and lake beach sand. Bedrock areas often have a capping of washed till and on some high hills above the level of Lake Barlow-Ojibway original acidic till may be found (Lee and Scott 1980b). To the south of the glaciolacustrine area an acidic bouldery sandy till was laid down by melting ice.

The final glacial episode of importance in the study area was a major readvance of the ice (the Cochrane Readvance) which overrode Lake Barlow-Ojibway deposits and deposited a fine textured till over glaciolacustrine and glaciofluvial deposits. This Cochrane till is found only in the northern portions of the Fire River and Elsas NOGET map sheets. Glacial ice finally retreated from the area approximately 9000 yrs B.P. Eolian activity has since modified some of the glaciofluvial outwash and tills, and extensive deposits of organic soil have developed in poorly drained depressions, particularly over glaciolacustrine deposits associated with Lake Barlow-Ojibway.

Surficial materials

Retreat of the ice from the area some 11 000-9000 yrs B.P. has left a complex mosaic of glacial materials in which the soils of today have developed. Because of the coarse textured nature of most of the Precambrian bedrock, much of the surficial material covering the central and southern parts of the mapped area is sandy in nature. In contrast, areas covered by Lake Barlow-Ojibway are generally finer textured, reflecting the glaciolacustrine origin of the materials and the fact that much of the deposit has been derived from Paleozoic sedimentary rocks of the Hudson Bay-James Bay Lowland. These latter materials also differ from the former in that they contain significant amounts of carbonates. These carbonates are probably derived largely from the limestones and dolostones of the Paleozoic rocks, but may also be derived in part from marl deposits formed in the glacial lake.

Generalized surficial geology maps of the Chapleau area are shown in Figure 8 and for the Foleyet area in Figure 9. These maps were generated from the NOEGTS maps of Roed and Hallett (1979a,b,c and 1980) and Lee and Scott (1980a,b,c and d).

The most extensive deposit of the area is sandy glacial till, generally as ground moraine (basal till), but also in the form of recessional moraines. In much of the area the till is associated with large areas of bedrock outcrops and is often drumlinized. In most of the Chapleau sheet and the southern part of the Foleyet sheet the till varies in depth from 1 to 7 m and is associated with a low to moderate undulating to slightly knobby landform (Roed and Hallet 1979a). Sandy till in hummocky terrain, formed by the mass disintegration of glacial ice, may be up to 30 m in thickness. The till is generally considerably thinner in areas of frequent bedrock exposure. In the northern part of the Foleyet map sheet a silty clay till is found with a low undulating relief. This till is believed to have formed by overiding of Lake Barlow-Ojibway deposits during the Cochrane readvance. This till often differs from the acidic tills to the south in that carbonates are generally present in the parent material.

The next major surficial material found in the mapped area is glaciofluvial outwash. Although found throughout all of the area, glaciofluvial outwash sands and gravels are particularly extensive in the northern part of the Chapleau sheet. They are believed to have been laid down by slowly running water, in what was termed Lake Sultan by Boissonneau (1968). These deposits are generally fine to coarse sands up to 2 m in thickness underlain by gravel. Thicknesses of up to 40 m have been inferred by Roed and Hallett (1979a). In the Foleyet sheet outwash sands and gravels are often associated with eskers. Eskers throughout the area range in height from 15 to 60 m (Lee and Scott 1980a,b). Kame deposits occur in the Chapleau sheet, particularly around Chapleau itself.

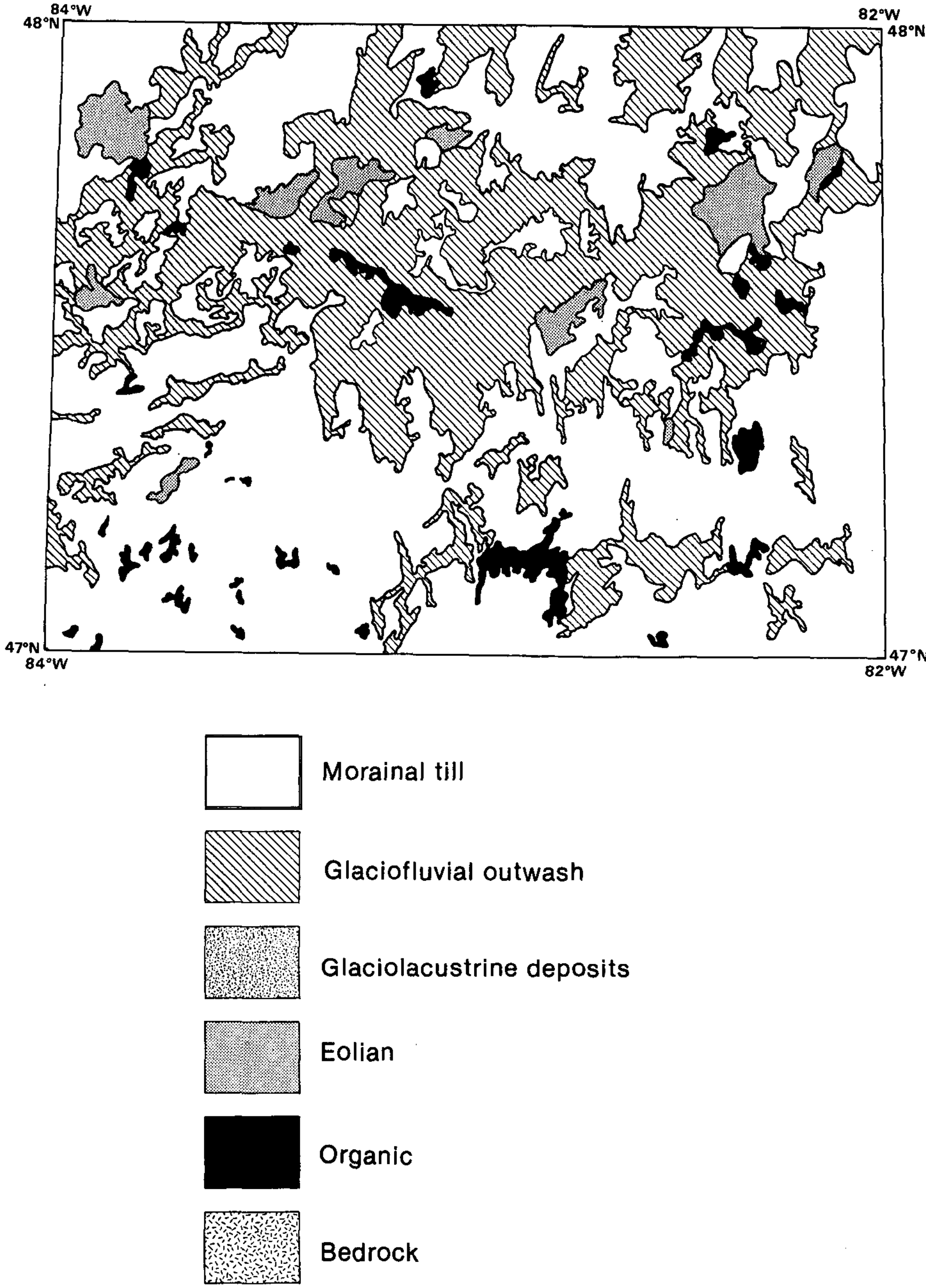


Figure 8. Surficial geology map of Chapleau area.

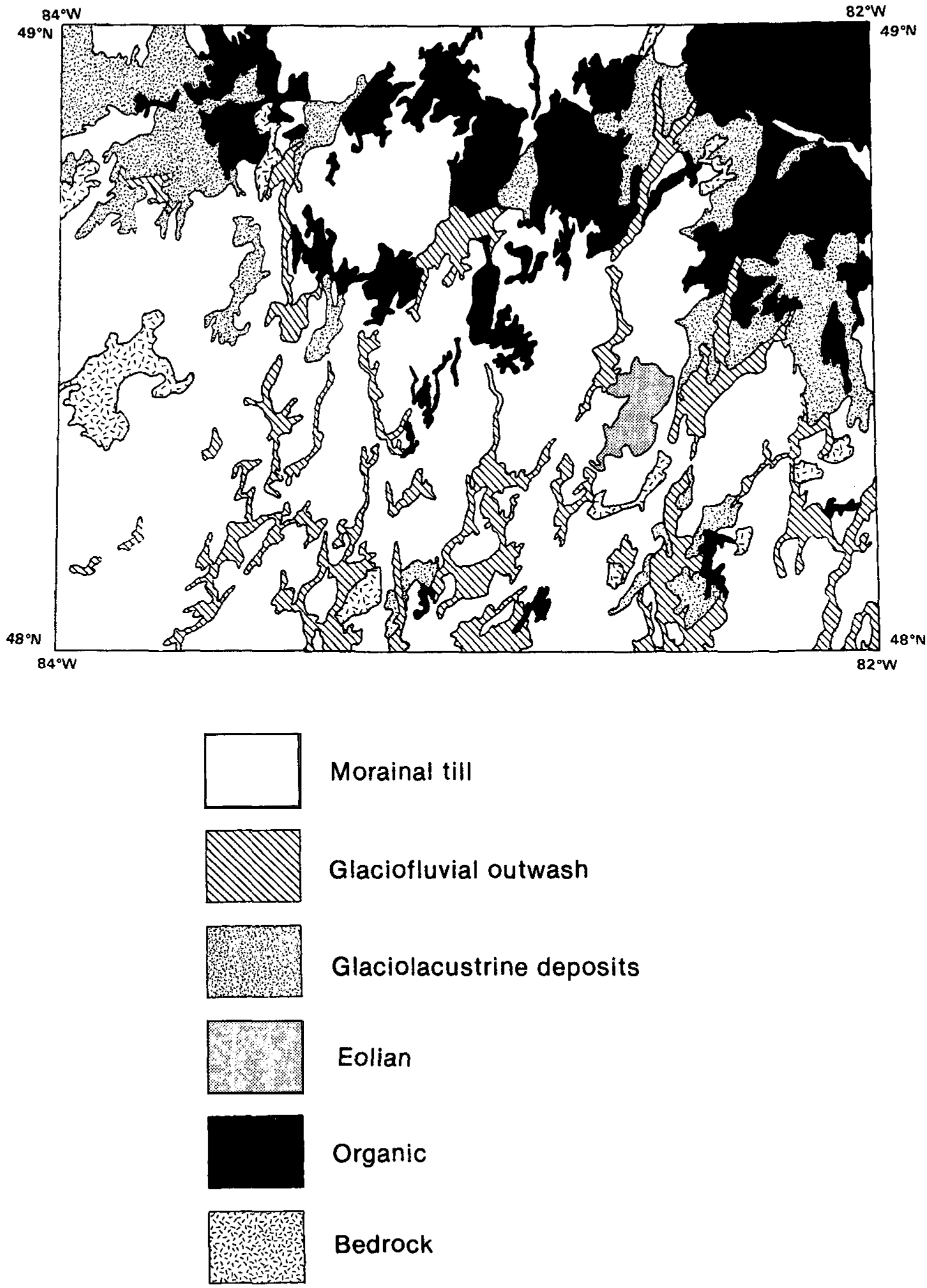


Figure 9. Surficial geology map of Foleyet area.

Eolian deposits of fine sand occur to any great extent only in the northern part of the Chapleau sheet. They are believed to be derived mainly from glaciofluvial sand and occur as U-shaped domes, small hills and ridges (Roed and Hallett 1979a). Much of the eolian deposits occur as a blanket, with a thickness up to 1 m.

Glaciolacustrine deposits occur only in the Foleyet sheet, being particularly extensive in the northern and eastern parts of the sheet. Tongues of glaciolacustrine material do however extend almost into the Chapleau sheet. Most of the deposits are lake plain sands and silts, with some clays, and lake plain sands and raised beaches. Their relief is generally low and the topography flat to gently undulating.

Organic deposits, composed mainly of sphagnum moss, occur throughout the area in poorly drained depressions or flat low lying terrain. They are commonly found associated with glaciolacustrine deposits in the northeast section of the Foleyet sheet, but extensive areas also occur along rivers and around lakes in much of the area. In the Chapleau sheet the most extensive areas occur along the Abinette River, north of Lake Ramsey and south of Chapleau adjacent to Highway 129.

The final surficial deposit of the mapped area is alluvium that occurs along most of the major rivers. The most extensive areas are adjacent to the Woman, Nemegosenda, Cow, Wenebegon, Abinette, Greenhill, Ivanhoe and Groundhog Rivers. Alluvial materials are generally sand and silt but organic deposits are often present.

METHODOLOGY

Existing information

At the start of this survey there was no published soil information available for the Chapleau (41-O) and Foleyet (42-B) map sheets. Soil information for the adjacent Timmins, Kapuskasing, Cochrane and Gogama map sheets was collected as part of the Canada Land Inventory program, with the emphasis on surveying those areas with the greatest agricultural potential. Consequently in Ontario more effort was put into mapping soils of the Northern Clay Belt than into soils associated with the coarser, shallower materials elsewhere on the Precambrian Shield.

Both the Chapleau and Foleyet map sheets were included in the Ontario Land Inventory (OLI) studies. The OLI maps were produced at a scale of 1:250 000 and the map units were established on the basis of reccurring patterns of physical features related to the degree of 'brokenness' of the land, soil texture, soil depth and moisture regime (Ontario Land Inventory 1976). Much use was made of the information contained within these studies at the start of the survey reported here. However, experience gained in the field convinced us that the information contained within the OLI reports was either not fully appropriate for our needs or was sometimes in error. Subsequently the maps and reports of the OLI studies did not contribute much to the information contained within this report.

Reconnaissance Quaternary geology maps of northeastern Ontario have been published at a scale of 1:500 000 (Boissonneau 1965a;b) and these provided us with a broad orientation to the area. Considerable use was made of the eight surficial geology reports within the Chapleau-Foleyet area which were available as part of the Northern Ontario Engineering Geology Terrain Study (Gartner, Mollard and Roed 1981). The 1:100 000 maps accompanying these reports are shown in Figure 10.

The principal technique for obtaining terrain information for the NOEGT studies was stereoscopic airphoto interpretation. Delineation of terrain units was performed on contact prints of airphotos and the intepretations then transferred manually onto photo mosaics at a scale of 1:100 000. The field work conducted in support of photointerpretation was generally of a reconnaissance nature.

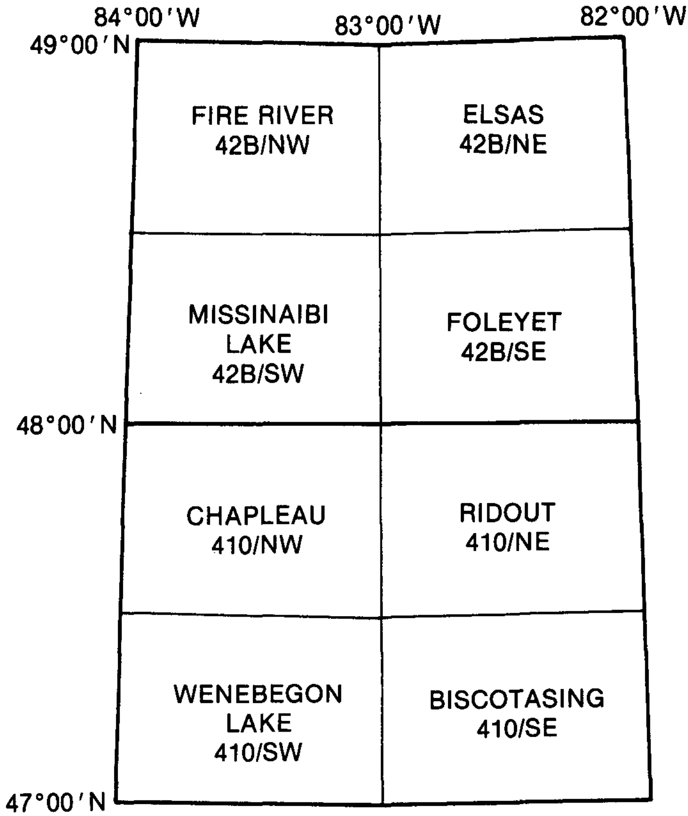


Figure 10. NOEGT study maps used in compiling resource information.

Delineation of map units

In our study the terrain unit delineations on the NOEGTS maps were checked using 1:50 000 aerial photographs and the Ontario Land Inventory maps. Because of the scale at which the NOEGTS maps were produced and the validity of boundary locations, it was decided to use these lines as the basis for the soil unit delineations shown in this report. The terrain unit boundaries produced at a scale of 1:100 000 in the NOEGTS maps were thus transferred to the 1:250 000 topographic base maps for both the Chapleau and Foleyet map sheets.

Site selection and mapping criteria

As an initial step in planning our field work a 2.5 x 2.5 cm grid was placed over both the Chapleau (41-0) and Foleyet (42-B) sheets. This grid gave approximately 430 grid line intersections on the Chapleau sheet and 370 on the Foleyet sheet, each intersection being considered a potential sampling location. These potential sampling locations were then transferred to the appropriate 1:50 000 topographic sheets. Because a primary objective of the survey was to produce a soil survey map and report as inexpensively as possible, only grid intersections within walking distances of roads were selected for actual sampling.

The following site characteristics were chosen to be recorded at each sampled location - mode of deposition of parent material, lithologic modifier, surface expression, local relief, surface stoniness, rockiness, moisture regime and drainage. A field card was designed to aid in the noting, compiling and standardisation of field observations. Guidelines for the description of these observations are given by the Ontario Institute of Pedology (1982) and Expert Committee on Soil Survey (1983). However the criteria classes were modified for use in our study to accommodate firstly the scale of mapping and secondly the requirements imposed by forest management at this scale of mapping.

The criteria classes finally chosen were:

1. mode of deposition of parent material; fluvial (alluvial), eolian, glaciofluvial, glaciolacustrine, morainal and organic.
2. coarse fragment lithologic modifier; a) igneous, sedimentary, metamorphic, b) coarse acid, coarse basic, fine acid, fine basic.
3. surface expression; level, inclined, undulating, rolling, hummocky, ridged.
4. local relief; < 15 m, 15-60 m, > 60 m.
5. surface stoniness; $< 0.01\%$, 0.01-3%, 3-15%, $> 15\%$.
6. rockiness (amount of exposed bedrock); $< 1\%$, 1-10%, 10-50%, 50-90%, >90%.
7. moisture regime; dry, fresh, moist, wet.
8. drainage; rapid (includes very rapid), well (includes moderately well), imperfect, poor (includes very poor).

In addition, texture, thickness and coarse fragment descriptions were made on each soil horizon recognized in the field.

Field study and analytical procedures

In the summers of 1981 and 1982 detailed site description cards were completed for 436 sites. Because of varying road access, the field observations were not equally distributed throughout the study area. Observations were particularly scarce in the northern part of the Foleyet sheet and in the south central portion of the Chapleau sheet.

Samples were taken of all parent materials (C or Ck horizons). Stones and fine earth were separated using a 2 mm sieve, and pH and texture determined on all C horizons. For all sites showing podzolic or brunisolic characteristics, composite samples of B horizons (the top 10 cm if the B horizon was thicker than 10 cm) were taken. Colour, organic carbon and sodium pyrophosphate extractable Fe and Al were measured on these horizons. The soils were then classified according to the Canadian System of Soil Classification (Canadian Soil Survey Committee 1978). For any C horizon having pH >6.5 the contents of calcite and dolomite were determined by the method of Zwarich and Mills (1971).

Establishment and characterisation of soil units

Data for all sampled sites were entered into a computer file and hierarchical sorts of the soil and landscape data were made. From these sorts a total of twenty three soil units were distinguished in the Chapleau and Foleyet map sheets. The soil units were characterized with respect to mode of deposition of parent material, family partice size, drainage, reaction class and calcareousness class. Family particle sizes were grouped into clayey, loamy or sandy. The sandy class was modified where appropriate as skeletal when more than 35% of the soil material consisted of material larger than 2 mm. Three reaction classes for characterising the parent material were also recognized - acid = pH < 5.5, neutral = pH 5.5-7.4 and alkaline = pH > 7.4, and three calcareousness classes - weakly = $CaCO_3$ equivalent less than 6%, strongly = 6-40% and extremely = > 40%. Each soil unit was given a unique geographical name and symbol corresponding to where the soil commonly occurs. The soil units are summarized in Table 6.

Three soils units (Gallagher, Nimitz and Racine) occur in areas too small to delineate at 1:250 000 scale and thus are not shown on the map or its accompanying legend. The associated mapped soil units are given in the description of map units.

Table 6. Soil units recognized from field study.

Soil Name	Particle size	Drainage	Reaction	Calcareousness class
A. Morainal				
Aubinadong (Ag)	Sandy-skeletal	Rapid	Acid	--
Chapleau (Cu)	Sandy	Rapid	Acid	--
Borden (Bn)	Sandy	Imperfect	Acid	--
Gallagher (Gr)	Sandy	Poor	Acid	--
Foleyet (Ft)	Loamy	Well	Acid	--
Racine (Re)	Loamy	Imperfect	Acid	--
Concobar (Cr)	Loamy	Well	Neutral	Strongly
Maude (Me)	Loamy	Imperfect	Neutral	Strongly
B. Glaciofluvial				
Aubrey (Ay)	Sandy-skeletal	Rapid	Acid	--
Sultan (Sn)	Sandy	Rapid	Acid	--
Kormak (Kk)	Sandy	Imperfect	Acid	--
Nimitz (Nz)	Sandy	Poor	Acid	--
Keaney (Ky)	Loamy	Well	Acid	--
Chewett (Ct)	Loamy	Imperfect	Acid	--

Soil Name	Particle size	Drainage	Reaction	Calcareousness class
C. Glaciolacustrine				
Oscar (Or)	Clayey	Imperfect	Neutral	Strongly
Seaton (St)	Loamy	Well	Neutral	Strongly
Wadsworth (Wh)	Loamy	Imperfect	Neutral	Strongly
D. Eolian				
Wakami (Wi)	Sandy	Rapid	Acid	--
Devon (Dn)	Loamy	Well	Acid	--
E. Eolian over glaciofluvial				
Shoals (Ss)	Sandy	Rapid	Acid	--
F. Morainal over glaciofluvial				
Missinaibi (Ms)	Sandy	Rapid	Acid	--
G. Alluvial				
Nemegos (Ns)	Variable	Variable	Variable	Variable
H. Organic				
Organic (Og)	Mesic	Poor	Acid	--

DESCRIPTION OF SOIL UNITS

Aubinadong

The Aubinadong soil unit is developed on rapidly drained sandy-skeletal morainal till. Textures of surface horizons are generally loamy sands, often overlying sands, moisture regimes predominantly dry and pH's strongly to extremely acidic. Surface expressions are generally undulating to rolling, and sometimes hummocky, and local relief is medium to high. Bedrock exposures are generally less than ten percent and shallow phases of the unit are rarely encountered. Surface stones are usually in excess of fifteen percent. Equal proportions of Orthic Humo-Ferric Podzols and Eluviated Dystric Brunisols comprise the unit.

Aubrey

The Aubrey soil unit is developed on rapidly drained, sandy-skeletal, glaciofluvial outwash. Textures range from loamy fine sands to coarse sands and pH's from strongly to extremely acidic. Surface expressions are level to undulating and local relief low to medium. Moisture regimes are predominantly dry. Surface stoniness is variable, but is usually over fifteen percent. Bedrock exposures within the unit are rare and shallow soils seldom encountered. The unit consists of equal proportions of Orthic Humo-Ferric Podzols and Eluviated Dystric Brunisols.

Borden

The Borden soil unit is the imperfectly drained member of the Chapleau catena and is developed on sandy morainal till. The textures are predominantly loamy sands, but can range from very fine sandy loams to coarse sands. Moisture regimes are mostly moist but include some fresh. pH's are very strongly to extremely acidic. Local relief is low to high and surface expressions undulating to rolling, and often hummocky. Bedrock exposures are variable within the unit and can range up to fifty percent. Shallow phases account for about thirty per cent of the unit and surface stones often cover fifteen percent of the soil surface. Gleyed Eluviated Dystric Brunisols and Gleyed Humo-Ferric Podzols are equally distributed within the unit.

Chapleau

The Chapleau soil unit is developed on rapidly drained sandy morainal till. Textures are predominantly loamy sands, but may range from loamy very fine sands to fine sands. Moisture regimes range from dry to fresh and pH's are strongly to extremely acidic. Local relief is medium to high and surface expression is undulating to rolling, and often hummocky. Bedrock exposures within the unit are very variable, ranging from none to up to fifty percent. Shallow phases of the Chapleau unit are estimated to occupy approximately forty percent of the unit. Surface stoniness is often in excess of fifteen percent. Taxonomically the unit consists of approximately equal amounts of Eluviated Dystric Brunisols and Orthic Humo-Ferric Podzols.

Chewett

The Chewett soil unit is the imperfectly drained member of the Keaney catena and is developed on loamy textured glaciofluvial outwash. Textures range from silt loams to fine sands. Moisture regimes are fresh and pH's very strongly to extremely acidic. Local relief is generally low and surface expressions level to undulating. Bedrock exposures within the unit are rare and shallow soils encountered infrequently. Coverage by surface stones is generally less than three percent. Gleyed Eluviated Dystric Brunisols and Gleyed Humo-Ferric Podzols are the soils that make up the unit in a ratio of approximately two to one. Although areas belonging to this unit were delineated on the soil maps, they could also be expected to occur as inclusions within the Keaney-Organic (Ky + Og) map unit.

Concobar

The Concobar soil unit is developed on well drained loamy calcareous morainal till. Textures range from silt loams to sandy clay loams to fine sandy loams. Moisture regimes are fresh and pH's range from very strongly acid in surface horizons to neutral in strongly calcareous Ck horizons. Local relief is low to medium and surface expressions undulating. Bedrock exposures occupy up to ten percent of the unit, although shallow soils are rarely encountered. Surface stones are common and cover approximately three to fifteen percent of the soil surface. Taxonomically the soils are classified as Orthic Gray Luvisols.

Devon

The Devon soil unit is developed on well drained loamy textured eolian sands. Textures are predominantly silt loams, loamy very fine sands and very fine sands. Moisture regimes are fresh and pH's very strongly to extremely acidic. Local relief is low to medium and surface expressions are undulating to rolling. Bedrock exposures in the unit are rare, although shallow soils constitute about twenty five percent of the unit. Surface stones are rarely encountered. Eluviated Dystric Brunisols and Orthic Humo-Ferric Podzols are distributed equally within the unit.

Foleyet

The Foleyet soil unit is developed on well drained loamy morainal till. Family particle sizes include both coarse silty and coarse loamy and textures range from silts to sandy loams. Moisture regimes are fresh and pH's strongly to extremely acidic. Surface expressions are generally rolling to undulating, but can sometimes be hummocky, and local relief is low to high. Bedrock exposures are variable but are generally not in excess of fifty percent. Bedrock occurs within 1 m of the surface in about fifty percent of the unit; particularly in areas with a coarse silty family particle size. Surface stones are often in excess of fifteen percent. Two thirds of the soils are classified as Orthic Humo-Ferric Podzols and one third as Eluviated Dystric Brunisols. Podzolic soils are particularly common on silty and silty loam textures.

Gallagher

The Gallagher soil unit is the poorly drained member of the Chapleau catena and is developed on sandy morainal till. The textures are predominantly loamy sands and the moisture regime moist. pH's are extremely acidic. Local relief is low to medium and surface expressions undulating to rolling. The amount of bedrock outcrop in the unit is variable and may reach fifty percent. Shallow phases occupy about thirty percent of the unit and coverage of the soil surface by stones is generally fifteen percent. Orthic Humic Gleysols and Gleyed Humo-Ferric Podzols are equally distributed throughout the unit. No soils belonging to this unit were mapped at a scale of 1:250 000 owing to insufficient acreage but they could be expected to occur within the Chapleau-Organic (Cu + Og) map unit.

Keaney

The Keaney soil unit is developed on well drained loamy glaciofluvial outwash. Textures range from silt loams to fine sands with the sand, loamy sands and sandy loams containing sands that are very fine or fine in size. Moisture regimes are fresh and pH's strongly to extremely acidic. Local relief is mostly low and surface expressions level to undulating and rarely hummocky. Little, if any, bedrock is exposed within the unit and shallow soils are rarely encountered. The content of surface stones is generally low, but may sometimes reach fifteen percent. Two thirds of the unit is made up of Eluviated Dystric Brunisols and one third of Orthic Humo-Ferric Podzols.

Kormak

The Kormak soil unit is the imperfectly drained member of the Sultan catena and is thus developed on sandy glaciofluvial outwash. The unit has a low to medium local relief with a level to gently undulating surface expression. Moisture regimes range from fresh to moist and textures from loamy very fine sands to coarse sands. pH's are very strongly to extremely acidic. Surface stones are generally less than three percent. Gleyed Eluviated Dystric Brunisols predominate within the unit with some Gleyed Humo-Ferric Podzols. Although areas belonging to this soil unit were delineated on the soil maps, they could also be expected to occur within the Sultan-Organic (Sn + Og) map unit.

Maude

The Maude soil unit is the imperfectly drained member of the Concobar catena and is developed on loamy textured calcareous morainal till. Textures are predominantly silt loams. Moisture regimes are moist and pH's very strongly acid in surface horizons and neutral in strongly calcareous Ck horizons. Local relief is low to medium and surface expressions undulating. Bedrock exposures occupy ten percent of the unit, although shallow soils are rarely encountered. Surface stones are common and usually cover between three to fifteen percent of the soil surface. Taxonomically the soils consist of Gleyed Gray Luvisols.

Missinaibi

The Missinaibi soil unit is developed on rapidly drained morainal till overlying sandy glaciofluvial outwash. Generally the textures of the upper horizons are loamy fine sands and loamy sands overlying sands and coarse sands. Moisture regimes are dry to fresh and pH's strongly to extremely acidic. Local relief varies from low to high and surface expression from undulating to rolling. Bedrock exposures within the unit are rare and shallow soils seldom encountered. Surface stones are generally in excess of three percent but rarely exceed fifteen percent. Two thirds of the unit consist of Orthic Humo-Ferric Podzols and one third Eluviated Dystric Brunisols. Although a considerable number of sites belonging to the Missinaibi soil unit were examined in the field, only a few areas occurred in sufficient extent to be mapped at a scale of 1:250 000.

Nemegos

The Nemegos soil unit is developed on recent alluvial deposits associated with some of the major rivers, particularly the Woman, Nemegosenda, Cow, Wenebegon, Abinette, Greenhill, Ivanhoe and Groundhog. Textures are highly variable and organic inclusions frequently encountered. Moisture regimes range from dry to wet and pH's from medium to extremely acidic. Local relief is generally low and surface expressions level. Surface stoninesses are very variable and are greater in the Chapleau sheet.

Nimitz

The Nimitz soil unit is the poorly drained member of the Sultan catena. It is developed on sandy glaciofluvial outwash with textures similar to the Sultan and Kormak soil units. Topography is level to undulating and local relief low to high. Moisture regimes are moist and pH's strongly to extremely acidic. Surface stones are generally less than three percent. Orthic Humic Gleysols with some Gleyed Humo-Ferric Podzols are the major soils of the unit. No soils belonging to the Nimitz soil unit were mapped at a scale of 1:250 000 owing to insufficient acreage, but could be expected to occur within the Sultan-Organics (Sn + Og) map unit.

Organics

Organic soils are not widely distributed in the Chapleau sheet but become increasingly abundant north into the Foleyet sheet. Organic soils constitute less than two percent of the Chapleau sheet and approximately fifteen percent in the Foleyet sheet. The major organic units in the Chapleau sheet are developed either on glaciofluvial outwash ascribable to Lake Sultan or in the morainal areas at the headwaters of major rivers. In the Foleyet sheet organic soils are chiefly associated with glaciolacustrine deposits. The organic soils have been classified as Typic Mesisols and are associated with both Terric and Lithic great groups.

Oscar

The Oscar soil unit is developed on moderately well to imperfectly drained clayey glaciolacustrine deposits. Textures range from silty clays to heavy clays and varving is often observed in subsurface horizons. Moisture regimes are fresh to moist and pH's range from medium acid in surface horizons to neutral in strongly calcareous Ck horizons. Local relief is low and surface expressions undulating to level. Bedrock exposures, shallow phases and surface stones are not encountered in this soil unit. Orthic and Gleyed Gray Luvisols comprise the unit.

Racine

The Racine soil unit is the imperfectly drained member of the Foleyet catena and is developed on loamy textured morainal till. Family particle sizes include both coarse silty and coarse loamy classes and textures range from silts to fine sandy loams, with clay contents generally less than a few percent. Moisture regimes are moist to fresh and pH's strongly to extremely acidic. Surface expressions are undulating to rolling, and sometimes hummocky. Local relief is low to medium. The amount of bedrock outcrop in the unit is variable, but is usually around ten percent, and approximately half the unit has bedrock within 1 m of the surface. Surface stones cover up to fifteen percent of the soil surface. Gleyed Humo-Ferric Podzols and Gleyed Eluviated Dystric Brunisols occur in approximately equal proportions. No soils belonging to the Racine soil unit were mapped at a scale of 1:250 000 owing to insufficient acreage, but could be expected to occur within the Foleyet-Organics (Ft + Og) map unit.

Seaton

The Seaton soil unit is developed on well drained loamy glaciolacustrine deposits. Textures range from fine sandy loams to silty clay loams. Moisture regimes are fresh and pH's range from very strongly acidic in surface horizons to neutral in strongly calcareous Ck horizons. Local relief is low to medium and surface expressions undulating to level. Bedrock exposures are rarely encountered and shallow phases of the unit uncommon. Surface stones are generally absent. Taxonomically the unit consists of Orthic Gray Luvisols.

Shoals

The Shoals soil unit is developed on sandy glaciofluvial outwash, with the upper horizons of the solum modified by eolian action. Textures of the unit are generally sandy loams overlying coarse sands. Moistures regimes are dry and pH's strongly to extremely acidic. Local relief is generally low and surface expressions level to hummocky. Surface stones are rare to up to three percent and bedrock exposures rarely encountered. Shallow soils are however frequently encountered. The soils are classified as Eluviated Dystric Brunisols.

Sultan

The Sultan soil unit is one of the most extensive of the soil units mapped in the Chapleau-Foleyet area. It is developed on sandy glaciofluvial outwash and is rapidly drained, with moisture regimes ranging from dry to fresh. Local relief is generally low to medium and surface expressions are level to undulating. Bedrock exposures within the unit are uncommon and shallow phases of this soil are rarely encountered. Surface stones are normally less than three percent.

Textures of the soils range from fine to coarse sands and from loamy fine sands to loamy coarse sands. Stratification is often encountered within the soil profile. pH's are very strongly to extremely acidic. Eluviated Dystric Brunisols are the major soils of the unit, with up to twenty five percent of the unit being classified as Orthic Humo-Ferric Podzols.

Wadsworth

The Wadsworth soil unit is the imperfectly drained member of the Seaton catena and is developed on loamy glaciolacustrine deposits. Textures range from fine sandy loams to silty clay loams and moisture regimes from fresh to moist. pH's range from very strongly acidic in surface horizons to neutral in the strongly calcareous Ck horizons. Local relief is low and surface expressions level to undulating. Bedrock exposures are rarely encountered as are shallow phases of this unit. Surface stones are generally absent. Taxonomically the unit consists of Gleyed Gray Luvisols.

Wakami

The Wakami soil unit is developed on rapidly drained eolian sands. Textures are predominantly fine sands with some sands and loamy fine sands. Moisture regimes are largely fresh and pH's very strongly to extremely acidic. Local relief is low to medium and surface expressions undulating to rolling and often hummocky. Bedrock exposures in the unit are rare and shallow soils seldom encountered. Surface stones are negligible. Soils within the unit are classified as Eluviated Dystric Brunisols.

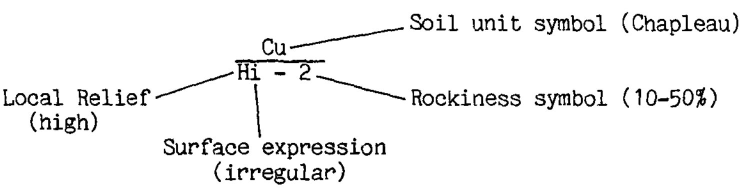
MAP UNITS

On the maps published by the NOEGT study, each map delineation has been described by a terrain unit letter code (TULC) comprising four components - landform, material, topography and drainage. The landforms recognised were morainal, glaciofluvial, glaciolacustrine, glaciomarine, alluvial, collovial, eolian, organic and bedrock. Eight terms (sand, silt, clay, boulders, gravel, rubble, peat and till) to describe the parent material were added to the landform descriptors. The topography was described in terms of local relief and surface expression. Drainage was described as wet, dry or mixed.

The next stage in our mapping procedure was to correlate the units described in the soil legend with the TULC depicted on the NOEGTS maps. Because the purposes of, and hence the criteria used in, the NOEGTS maps were different from those of the present study, some classes of the NOEGTS TULC components were grouped to satisfy the purposes and scale of mapping of the present study.

A comparison was made between the unique TUCL's occurring in the eight NOEGTS maps used in this study with the soil units found as part of the field survey. The agreement between the TULC's and information from our sampled locations was sufficient to allow each unique TULC code to be assigned a soil unit code. This methodology allowed soil unit symbols to be allocated to any NOEGTS delineations that were not visited in the present survey.

In addition to the assignment of a unique soil unit symbol to our map delineations, topographic and rockiness (amount of exposed bedrock) information was also added; topography was then described using three local relief terms - low (L), moderate (M) and high (H) and two surface expression terms - irregular (i) and regular (r). "Irregular" surface expressions correspond to hummocky and ridged surface expression classes and "regular" to level, inclined, undulating and rolling surface expression classes. An example of the map notation symbol used for the Chapleau-Foleyet area is shown below.



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Appendix I. Common and botanical names of tree species.

Aspen, large tooth	*Populus grandidentata* Michx.
Aspen, trembling	*Populus tremuloides* Michx.
Birch, yellow	*Betula alleghaniensis* Britton
Birch, white	*Betula papyrifera* Marsh.
Cedar, eastern white	*Thuja occidentalis* L.
Fir, balsam	*Abies balsamea* (L.) Mill.
Maple, sugar	*Acer saccharum* Marsh.
Pine, eastern white	*Pinus strobus* L.
Pine, jack	*Pinus banksiana* Lamb.
Pine, red	*Pinus resinosa* Ait.
Poplar, balsam	*Populus balsamifera* L.
Spruce, black	*Picea mariana* (Mill.) B.S.P.
Spruce, white	*Picea glauca* (Moench) Voss
Tamarack	*Larix laricina* (Du Roi) K. Koch

Appendix II. Soil legend accompanying the Chapleau (41-0) and Foleyet (42-B) map sheets.

Map Symbol	Soil Name	Parent Material	Family Particle Size	Predominant Texture	Calcareousness Class	Reaction	Drainage	Moisture Regime	Surface Stoniness
Ag	Aubinadong	Morainal	Sandy-skeletal	Loamy sand, Loamy very fine sand	-	Acid	Rapid	Dry to fresh	3
Ay	Aubrey	Glaciofluvial	Sandy-skeletal	Coarse sand	-	Acid	Rapid	Dry	3-1
Bn	Borden	Morainal	Sandy	Loamy sand	-	Acid	Imperfect	Moist to fresh	3-2
Cr	Concobar	Morainal	Loamy	Silt loam	Strongly	Neutral	Well	Fresh	2-1
Ct	Chewett	Glaciofluvial	Loamy	Silt loam, Fine sand	-	Acid	Imperfect	Fresh	1-0
Cu	Chapleau	Morainal	Sandy	Loamy sand	-	Acid	Rapid	Dry to fresh	3-2
Dn	Devon	Eolian	Loamy	Very fine sand	-				
Ft	Foleyet	Morainal	Loamy	Fine sandy loam, Silt loam	-	Acid	Well	Fresh	3-1
Kk	Kormak	Glaciofluvial	Sandy	Fine sand,	-	Acid	Imperfect	Fresh to moist	1-2
Ky	Keaney	Glaciofluvial	Loamy	Very fine sandy loam	-	Acid	Well	Fresh	2-0
Me	Maude	Morainal	Loamy	Silt loam	Strongly	Neutral	Imperfect	Moist	3-1
Ms	Missinaibi	Morainal/ Glaciofluvial	Sandy	Loamy fine sand, Loamy sand	-	Acid	Rapid	Dry to fresh	1-2
Ns	Nemegos	Alluvial	Variable	Variable	-	Variable	Variable	Fresh to wet	Variable
Og	Organic	Organic	Mesic	-	-	Acid	Poor	Wet	-
Or	Oscar	Glaciolacustrine	Clayey	Clay, Silty clay,	Strongly	Neutral	Imperfect	Fresh to moist	0
RL	Rockland	Less than 10 cm of soil material over bedrock			-	-	-	-	-
Sn	Sultan	Glaciofluvial	Sandy	Medium sand, Fine sand, Coarse sand	-	Acid	Rapid	Dry to fresh	1-2
Ss	Shoals	Eolian/ Glaciofluvial	Sandy	Fine sand, Coarse sand	-	Acid	Rapid	Dry to fresh	0-1
St	Seaton	Glaciolacustrine	Loamy	Silt loam	Strongly	Neutral	Well	Fresh	0
Wh	Wadsworth	Glaciolacustrine	Loamy	Silt loam	Strongly	Neutral	Imperfect	Fresh to moist	0
Wi	Wakami	Eolian	Sandy	Fine sand	-	Acid	Rapid	Fresh to dry	0