SOIL SURVEY

of

SHEFFORD, BROME
AND
MISSISQUOI COUNTIES
in the
PROVINCE OF QUEBEC

by
**D. B. CANN, P. LAJOIE
and P. C. STOBBE**

Experimental Farms Service,
Dominion Department of Agriculture
in Co-operation with the Quebec Department
of Agriculture and Macdonald College, McGill University.

OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.
KING'S PRINTER AND CONTROLLER OF STATIONERY
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TABLE OF CONTENTS

I. INTRODUCTION

This report deals with the soils of Shefford, Brome and Missisquoi counties which are located in the Eastern Townships of Quebec, and which were surveyed in 1941 and 1942. This is the second report dealing with the soils of the Eastern Townships region of the province, the previous report, covering the counties of Stanstead, Richmond, Sherbrooke and Compton was published in 1942.

The discussion is divided into two general sections. In the first part of the report a general description of the area is given, covering its location, physiography, climate, agricultural history and development. The second part of the report deals with the soils—their origin, classification, description, crop productivity and management. The soils are tentatively rated according to their suitability for the common crops and grouped into five classes.

Accompanying the report are three maps, one for each county, which show the location and extent of the different soil types. Suitable symbols appear on the map showing the name, texture, stoniness and relief of the soil. It should be clearly pointed out that the soil map is not detailed enough to show all the variations on any individual farm, nor is the grouping of the soils into land use classes any index to their probable cash value, since a great many other factors, discussed in the text, have to be considered. However, it may be used as a guide in the selection of land over fairly large areas and serve to identify the soil types wherever they may be found.

The problem of soil erosion is one of increasing importance in the area. A large amount of valuable top soil is being lost annually and specific management practices are necessary for certain soil types. The relation of erosion to soil types has been discussed with the individual soils. The major problems in connection with the production of general farm crops in the area appears to be stoniness, relief, drainage, fertility, acidity and susceptibility to erosion.

INDEX MAP
OF

CENTRAL QUEBEC

SHOWING LOCATION OF SURVEYED AREAS

LEGENDE	LEGEND
Frontiere internationale	International boundary
Limite de comte	County boundary.
Region discutee dans ce rapport	Area discussed in this report.
Cartes publiees par le Ministere Provincial de l'Agriculture	Maps published by Provincial Department of Agriculture.
Cartes et rapports publies par le Ministere Federal de l'Agriculture.	Maps and reports published by Dominion Department of Agriculture.
Comtes classifies par le Federal mais non publies	Counties surveyed by Dominion but not published.
Comtes classifies par la Province mais non publies	Counties surveyed by Province but not published.

II. DESCRIPTION OF THE AREA

Location and Extent

The counties of Shefford, Brome and Missisquoi are located in the south central portion of the province and are the western counties of the area known as the Eastern Townships of Quebec. The surveyed areas extend from the Richelieu River on the west to Lake Memphremagog on the east—a distance of 53 miles—and from the International Boundary on the south to the northern limit of Shefford county—a distance of 41 miles. The area is irregular in shape, with Brome and Missisquoi counties lying adjacent to each other along the International Boundary and Shefford county forming the northern boundary of Brome county. The total area consists of 1,445 square miles or 924,800 acres which are distributed in the three counties as shown below.

	Area		
County	*Sq. Miles*	*Acres*	*% of Total*
Shefford	560.3	358,598.4	38.8
Brome	495.1	316,851.2	34.3
Missisquoi	389.6	249,350.4	26.9
	1,445.0	924,800.0	100.0

The area is bounded on the west by the Richelieu River, Iberville, Rouville and Bagot counties; on the north by Bagot county; on the east by Richmond, Sherbrooke and Stanstead counties (previously surveyed and reported in Dept. of Agriculture Tech. Bull. No. 45, 1943); on the south by the International Boundary and the states of Vermont and New York. The towns of Bedford, Cowansville and Granby are about fifty miles from Montreal and Waterloo, which is near the center of the area, is about 60 miles from Montreal.

Physiography

Topography.—The surveyed area lies partly in the Appalachian Upland and partly in the St. Lawrence Lowlands, so that a wide range of relief is found. On the basis of relief, the area may be divided into three sections. The eastern section is hilly and mountainous, the central section strongly undulating to strongly rolling and the western section level to gently undulating.

The eastern section of the area is occupied by the Sutton mountain range—an extension of the Green Mountains of Vermont. This range occupies most of eastern Brome and Shefford counties and runs in a northeasterly direction, decreasing in altitude towards the north. Many prominent peaks, such as Round Top, Foster Mountain, Chagnon Mountain, Sugar Loaf and Owl's Head, varying in altitude from 1800 to 3000 feet above sea level, are found in this range. The range is broken in several places by gaps and is dissected by many small and a few large streams. The average altitude of the eastern section is about 1200 ft. above sea level.

The western section of the area is occupied by the St. Lawrence Lowlands—a broad, level plain which formed the bed of the post-glacial Champlain Sea. The only distinct topographic features in this plain are the Monteregian Hills—

isolated volcanic cores around which the Champlain Sea formed beaches. Small undulations formed by deposits of glacial till or outwash break the relief of this otherwise level plain, whose average elevation is 100 to 200 feet above sea level.

Between these two extremes of relief, the central section of the surveyed area varies from undulating to rolling or hilly as one proceeds from west to east. The southern part of the central section is quite hilly, varying in elevation from 600 to 1000 feet and has several isolated hills such as Shefford mountain, Gale mountain and Brome mountain which are higher than the surrounding country. Towards the north the central section becomes gently undulating to rolling and has an elevation of 400 to 600 feet above sea level. Several streams which have their origin in the high mountain range to the east, cross the area and give it a highly dissected appearance.

The average topographic conditions of each soil area are indicated on the map with symbols.

Geology.—With the exception of an area of Pre-Cambrian rocks and a few scattered intrusions of igneous rocks, the rock formations underlying the surveyed area belong to the Paleozoic age and consist of slates, shales, sandstones and limestones. Several systems of rocks are represented, as shown below and their distribution is shown in the accompanying sketch map.

$$\text{Paleozoic}\left\{\begin{array}{l}\text{Devonian}\\\text{Silurian}\\\text{Ordovician}\\\text{Cambrian}\end{array}\right.$$

Pre-Cambrian

Volcanic and Plutonic Rocks

The Devonian and Silurian rocks are confined to a small area along the western shore of Lake Memphremagog and consist of grey and black limestones and slates with some dolomitic limestones. Fossils are quite prevalent in the Devonian rocks.

The Pre-Cambrian rocks are confined to the Sutton mountain range. They have been separated into two portions, (1) those of the central axis, composed of micaceous and quartzose schists, and (2) those of the outer flanking portion composed of a series of greenish chloritic schists associated with black slates and hard sandstones. These schists weather easily and a large proportion of this material is found in the overlying drift.

The Cambrian rocks lie on either side of, and adjacent to the Pre-Cambrian rocks. On the eastern side of the range, the rocks occur as a band of grey and black slates and quartzite about two or three miles wide, while on the western side of the range, these rocks consists of greenish and black slates and local deposits of quartzose sandstones, varying in width from one to four miles. At Frelighsburg the Cambrian rocks are more sandy and micaceous than usual and resemble the Cambrian rocks found farther east. A separate area of Upper Cambrian rocks underlies the western half of Shefford county and consists of reddish and greenish Sillery (?) slates and hard greenish sandstone. The only other area of Cambrian rocks occurs in the township of St. Armand. Here the rocks consist of white or reddish siliceous dolomitic strata, together with bands of black slates.

The Ordovician rocks are represented by nearly all members of the system. In ascending order these are the Potsdam, Calciferous, Chazy, Trenton and Black

River, Utica and Lorraine formations. They are composed of slates, sandstones and limestones and are irregularly distributed throughout the area west of the Sutton mountain anticline, as shown on the sketch map. The rocks of the Potsdam formation occur only as scattered fragments of hard sandstone and no outcrops of this formation occurs in the surveyed area. The larger part of the area covered by the Ordovician rocks is represented by the Trenton and Black River formation, composed of black slate and interbedded dark-coloured limestone. The Calciferous formation outcrops in small areas near Phillipsburg. The Chazy formation is characterized by blue grey slates which are frequently dolomitic. The Utica rocks are found in the western part of Missisquoi county, between Missisquoi Bay and the Richelieu River. They consist of brownish black and brown slates with occasional bands of dolomitic limestone.

The igneous rocks found in the area are scattered. They consist of syenites, diorites, dolerites and serpentine and are confined to the igneous masses of Brome and Shefford mountains. Where the igneous masses have come into contact with the slates, much metamorphism has occurred, and the slates are wrinkled and schistose.

In the table below a summary of the various rock formations occurring in the area is given:

Age	*Formation*	*Composition*	*Distribution*
Paleozoic	Devonian	grey and black limestones and slates; some dolomitic limestone.	western shore of Lake Memphremagog.
	Ordovician	Potsdam sandstone	scattered fragments in western Missisquoi county.
		Trenton and Black River slates and limestones; Calciferous fossiliferous limestone; Chazy slates and dolomitic limestone; Utica and Lorraine slates, shales and limestone;	Central Shefford and Missisquoi counties, Phillipsburg, western Brome and central Shefford, western Missisquoi.
	Cambrian	slates, sandstones and quartzites;	both sides of Sutton mountain range.
Pre-Cambrian		Micaceous and Chloritic schists	Sutton mountain.
Igneous rocks		diorite, syenite, granite serpentine;	Brome and Shefford mountains.

Surface Geology.—During the Pleistocene age the surveyed area was covered by ice many hundreds of feet thick. The glaciers moved over hills and valleys, picking up soil and rock masses, crushing, mixing and finally re-depositing them as a mantle of drift over the bedrock. Some of this crushed material was also deposited by streams formed by the melting ice. This drift varies in thickness from a thin veneer to many feet and is very mixed in composition. Since deposition climatic forces have acted on this material, changing its colour, structure and composition to form the present-day soils.

The glacial till deposits vary in composition, texture, depth and compactness. In most places the till contains a major proportion of fragments of the underlying rock formation. The till deposits of the eastern section of the area are derived mainly from chloritic and micaceous schist of the Sutton mountain range. The deposits are olive grey to grey in colour and have a texture varying from a loam to a sandy loam and in places contain considerable slate. The relief varies from hilly to mountainous and surface drainage is good, but internal drainage may vary from good to poor depending on the porosity or compactness of the till. There is usually considerable surface stone on these materials and occasional rock outcrops.

In the central section of the area, the till is derived principally from slates and sandstones. The texture varies from greyish brown sandy loam or loam to a shaly sandy loam. The topography varies from undulating to rolling or sometimes hilly and surface drainage is usually good except in depressional areas. Internal drainage is variable. On the rolling to hilly relief, it is usually good, while on the undulating relief it tends to be imperfect or poor. In places the till is very porous and has been modified by water action, in some places resembling outwash material.

The till deposits of the western part of the area are derived mainly from shaly Ordovician rocks, which are often high in lime. The till is greyish or greyish brown in colour and varies from a loam to a clay loam in texture. The relief varies from very gently undulating to gently rolling and surface drainage varies from good to imperfect. Internal drainage varies from good to poor, depending on the texture and relief. There is usually very little surface stone on this material.

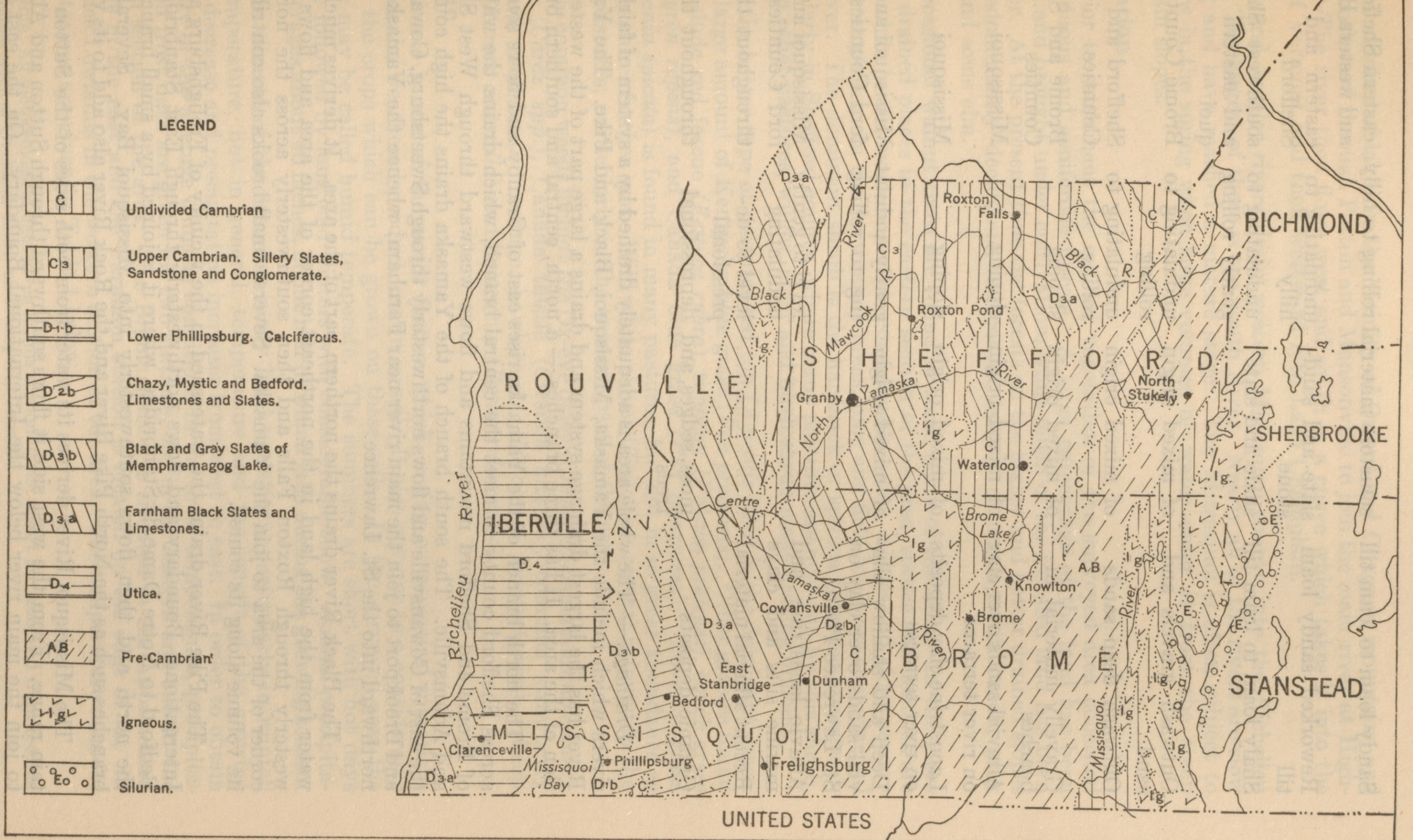
Deposits of glacial outwash are found throughout the area in the form of kames, eskers and outwash plains. They are composed of sands and gravels, sometimes stratified, but in places unsorted and full of boulders. The material is mainly igneous in origin with some slate and shale present in minor quantities. These materials are porous and often excessively drained, but in some places the sand is fine enough to hold a considerable amount of the moisture.

Along the river valleys of the Appalachian Upland are alluvial deposits of deep sands in the form of flood plains or alluvial fans and shallow (2-5 feet) sandy deposits over lacustrine silts and clays in the form of terraces. In places, these silts and clays have no covering of sand and exist as heavy-textured terraces along the stream courses. On the St. Lawrence Plain in the western section of the area the water deposited material, other than outwash, consists of deposits of sand over clay varying in depth from a few inches to several feet, alluvial or lacustrine silts and clays and heavy marine clays. Drainage varies from good to excessive in the deep sands to imperfect to poor in the clays. Throughout the area are depressions in which restricted drainage and accumulation of organic matter has resulted in the formation of peat and muck.

The principal materials from which the soils are developed are summarized in the table below:

Type of Material	*Derived from*	*Topography*	*Location*
Loam to clay loam till	shale and slate	undulating	central Missisquoi County
Loam to clay loam till	calcareous shale and slate	undulating	western Missisquoi County
Sandy loam till	slate and sandstone	level to undulating	central Shefford County
Sandy loam to loam till	slates	rolling to hilly	eastern Brome County

GEOLOGICAL MAP OF THE AREA



Sandy loam to loam till	schistose material	rolling to hilly	eastern Shefford and western Brome
Reworked sandy loam till	slate and sandstone	undulating to hilly	eastern and central Shefford
Shaly loam to loam till	shale and slate	undulating to gently rolling	southwest Shefford and eastern Missisquoi
Outwash gravels and sand	of mixed origin	undulating to rolling	Brome County
Outwash deep sands	of mixed origin	undulating to rolling	Shefford and Brome Counties
Gravelly material in beaches	of mixed origin	sloping	Brome and Shefford Counties
Alluvial sands over clay on river terraces	of mixed origin	sloping	Missisquoi
Lacustrine clay deposits on river terraces	of mixed origin	sloping	Missisquoi
Deep and shallow alluvial sands over clay on St. Lawrence Plain	of mixed origin	gently undulating to rolling	Missisquoi and Shefford Counties
Alluvio-lacustrine and marine silts and clays	....	level to gently undulating	Missisquoi and Shefford Counties
Recent alluvial material	....	level to depressional	throughout the area
Organic deposits	moss, sedges, and trees	depressional	throughout the area

Drainage.— The whole area is adequately drained by a system of fairly large rivers which include the Yamaska, Missisquoi, Black and Pike. The Yamaska River has the largest drainage system and drains a large part of the western portion of the area. It has three branches — a north, central and southern branch.

The north branch of the Yamaska rises east of Granby and flows southwest across Shefford county to meet the central branch, which drains the watershed of Brome and Shefford mountains and flows westward through West Shefford and Adamsville. The south branch of the Yamaska drains the high country to the east of Cowansville and flows northwesterly through Sweetsburg, Cowansville, and Brookport to join the main river near Farnham, whence the Yamaska flows northward into the St. Lawrence.

The Black River drains the northern part of the area. It derives much of its water from the high land in the northeast corner of the area and flows northwesterly through Roxton Falls and then southwesterly across the northwest corner of the area to join the Yamaska. Several small brooks also contribute to its volume along its course.

The Pike River drains the watershed in the vicinity of Frelighsburg and the International Boundary and flows northwesterly through East Stanbridge and Bedford to Notre Dame de Stanbridge, where it is joined by a small branch from the north and then flows southwesterly into Missisquoi Bay. Several small branches such as the North Pike River and the Rock River also add to its volume.

The Missisquoi River derives its water from both sides of the Sutton mountain range. From the west side it flows southward through Sutton and Abercorn to join the main river below the International Boundary. On the east side, it drains a number of lakes in the vicinity of Orford and Chagnon mountains and flows southward through Potton and Mansonville to join the main river at Highwater. The river then flows west and south in a curve which takes it into the state of Vermont and then westward into Lake Champlain.

Several smaller rivers drain western Missisquoi county into the Richelieu River. The largest of these is the South River. Nearly all of the rivers are slow flowing and have reached a mature stage. The Missisquoi is often subject to overflow in the spring when large volumes of water enter it from the steep mountain slopes.

Vegetation

Prior to settlement the natural vegetation of the surveyed area consisted of deciduous and coniferous forests. A large percentage of the land has been cleared and brought under cultivation, while much of the forested land has been cut over. At the present time the forests on the higher and better drained slopes are predominantly deciduous and consist largely of maple, with beach, grey birch and some elm.

Occasional walnut trees are found in some parts of the area. In the more poorly drained places in the eastern section of the area, spruce and hemlock are found, while in the western section considerable cedar, willow and alder occupy the wetter places. In the very sandy areas, pine and field birch are the principal tree cover. The dominant shrub is the hardhack or spiraea (*Spiraea tomentosa*), particularly in Shefford county, where many pastures are over-run by this shrub, while in other pastures, willow, alder and birch shrub make grazing difficult.

In the better type of pastures red top (*Agrostis alba*) is the dominant grass, with a large amount of Kentucky blue grass (*Poa pratensis*). Other grasses found here include red fescue (*Festuca rubra*), timothy (*Phleum pratense*), couch grass (*Agropyron repens*), and Canada blue grass (*Poa compressa*). Poverty grass (*Danthonia spicata*) is found in many pastures, but not in so great abundance as in the pastures farther east. Wild white clover (*Trifolium repens*) is found in the better pastures, particularly in the western part of the area.

The common weeds include the Ox-eye daisy (*Chrysanthemum leucanthemum*), sedges, (*Carex spp.*), Canada thistle (*Cirsium arvense*), common strawberry (*Fragaria virginiania*), orange hawkweed (*Hieraceum aurantiacum*), sheep sorrel (*Rumex acetosella*) and buttercup (*Ranunculus acris*).

Climate

Climate is one of the major factors which, acting on geological materials, produces the weathered product known as soil. It also governs to a considerable extent, the crops which can be grown on these soils. In the surveyed area the climate may be called humid temperate. The summers are short with hot days and are followed by long cold winters with considerable snow. Annual precipitation averages about 40 inches, about half of which falls during the growing season.

The climate of the area has many local variations, particularly in rainfall and temperature, but in general, temperature and the length of the growing season decrease and precipitation increases from west to east. In order to obtain a picture of the average climatic conditions in the area, temperature, precipitation and frost data are given for two stations, one in the eastern and one in the western section of the area. The Brome station is situated in the Appalachian foothills in the east and the Farnham station is located on the edge of the St. Lawrence Lowlands in the western section of the area. The temperature data for these stations are given in Table 1 below.

Note: All meteorological data given in this section of the report are compiled from records of the Meteorological Division, Dept. of Transport, Canada.

TABLE I.

TEMPERATURES RECORDED AT BROME AND FARNHAM. 15-YEAR AVERAGE.

(1923 - 1937)

Month	Brome (Elevation 678 ft.)			Farnham (Elevation 191 ft.)		
	Mean Daily Temp.	Highest	Lowest	Mean Daily Temp.	Highest	Lowest
December	17.5	65	—38	21	56	—35
January	15.5	57	—35	15	55	—40
February	14.0	51	—37	17	56	—38
Winter	15.6			17.6		
March	25.0	67	—36	26	67	—23
April	38.1	80	0	40	80	0
May	51.4	88	22	53	90	24
Spring	38.1			39.6		
June	61.0	92	31	63	94	31
July	65.4	92	36	67	94	37
August	62.5	92	33	65	92	34
Summer	62.9			65		
September	56.7	88	21	58	89	24
October	44.7	78	11	46	84	15
November	33.2	68	—13	34	70	—10
Fall	44.8			46		
Year	40.4			42		

The average temperatures at Farnham are slightly higher than those at Brome, but Farnham has recorded lower extreme temperatures than Brome in December and January during the period covered by the data in Table I. It should be noted that even during the summer months the low temperatures recorded indicate a possible frost hazard.

The data for precipitation at the two stations are given in Table II below.

TABLE II.

Mean Monthly Precipitation at Brome and Farnham. 1923-1937.

Month	Brome	Farnham
	inches	inches
December	3.11	2.80
January	4.21	3.45
February	2.77	2.33
Winter	10.09	8.58
March	3.43	2.98
April	3.76	3.34
May	3.79	3.07
Spring	10.98	9.39
June	4.32	3.18
July	4.72	3.93
August	3.31	2.72
Summer	12.35	9.83
September	4.71	3.58
October	3.99	3.30
November	4.00	3.70
Fall	12.65	10.58
ANNUAL	46.07	38.38
Growing Season	20.85	16.48

It is evident from the above table that the eastern part of the area receives more precipitation that the western part. This may be due in part to the effect of the Sutton mountain range on the climatic conditions in the eastern section of the area. Brome receives 20.85 inches or 45.2 per cent of its total rainfall during the growing season, while Farnham only received 16.48 inches or 43 per cent during the same period. Precipitation is heaviest at both stations during the month of July and Farnham receives slightly more precipitation during the fall than during the summer, although the variation is not great at either of the stations. The mean monthly precipitation is fairly uniformly distributed during the growing season. August is the dryest month during the growing season and late summer drought periods occur more frequently in the western than in the eastern section of the area.

Table III presents data on the length of growing season at the two stations.

TABLE III.

Length of the Frost-free Growing Season. 15-Year Average – 1923-1937.

Station	Latest Frost Recorded	Earliest Frost Recorded	Average Dates		Frost-Free Period Days		
			Last Frost	First Frost	Ave.	Longest	Shortest
Brome	June 16	Sept. 4	May 29	Sept. 17	111	140	90
Farnham	June 28	Sept. 10	May 26	Sept. 19	116	140	76

There appears to be little difference in the length of the growing season between these two stations. Farnham has a slightly longer period of frost-free days, but has recorded one period which is considerably shorter than the shortest season at Brome. On the other hand, both stations report the same number of days during the longest frost-free period.

The fact that the western part of the area receives less rainfall and has a slightly higher temperature (more evaporation) than the eastern part, is probably of benefit to farmers. The soils of the western part of the area are usually heavy textured and have generally a smooth topography, so that precipitation tends to enter the soil very slowly, whereas the eastern soils are more open textured and have greater relief so that drainage, both surface and internal, is facilitated. If the western part of the area received the same rainfall as the eastern part, it is probable that many of the soils would be too wet to work. On the other hand, soils in the western section tend to dry out and bake in the summer.

History and Development of Agriculture

Until the year 1791, the area under discussion was covered with forest and in order to facilitate settlement, grants of land were offered to prospective settlers. These individuals usually formed themselves into companies and selected one of their number to act as their agent in securing the land grants and the necessary surveys connected with it. Most of the settlers entered Canada from the United States, finding here a refuge from the disturbances caused by the American Revolution and their desire to remain loyal to the British Crown. Others were interested only in acquiring new and fertile lands and making a fresh start in a new country. The early settlers suffered many hardships, but the soil was fertile and fish and game were abundant in the streams and forests. Clearing the land was a heavy task and until the land was cleared and seeded down, which was usually not until the third year, little could be done towards keeping livestock. Whatever stock was brought in by the settlers was fed on wild grass, corn stalks and leaves.

It appears that corn was the first crop planted by the settlers and this was ground by hand until mills were erected. As the land was cleared, the acreages of corn and oats increased and surplus grain was sold at distant markets such as Montreal. One of the chief sources of income in the early days was that from potash, made from the wood ashes of burned timber. The clearing of land led to the introduction of more cattle on the better areas of farm land and the dairy industry developed rapidly, accompanied by improvements in crop practices and the increased growing of grains, hay and clover. The first wheeled vehicle to enter the area (1807) was an ox-drawn cart and it carried the iron fittings to build the first mill. The townships of Brome, Bolton and Potton in Brome county were settled in 1797 and the other townships were established soon after this. The census of 1861 gives a population of 3,136 inhabitants for this area. The population increased rapidly and more recent figures are given in Table IV.

TABLE IV.
POPULATION OF SHEFFORD, BROME AND MISSISQUOI COUNTIES.

County	1921	1931	1941	No. on farms 1931	% on farms 1931	Size of farm family 1931
Shefford	25,734	28,262	33,381	13,094	46.4	5.3
Brome	13,381	12,433	12,485	8,866	71.2	5.1
Missisquoi	17,709	19,636	21,442	10,042	53.1	5.7
Total	56,824	60,331	67,308	32,002	53.1	

Table IV shows that there is a general trend toward increase in population, particularly in Shefford county. This has been due in part to industrial development in the towns of Granby and Waterloo. In Brome county, nearly three-fourths of the population were on farms in 1931, while only 53 per cent were on farms throughout the whole area. The percentage is lower in Shefford county where the two large towns of Granby and Waterloo account for a large part of the population which is engaged in pursuits other than farming.

Table V shows the utilization of land in the area. This table reveals that in Shefford and Missisquoi counties nearly all of the land is occupied, while in Brome county only 79 per cent is occupied. This is due to the large area of rough land in the south and eastern part of Brome county. Shefford county has the greatest number of farms, the largest acreage per farm and the greatest amount of cleared land per farm, followed in turn by Missisquoi and Brome counties.

The average size of the families on the farms is between five and six persons, but in Brome county this family must derive its support from forty-six acres of improved land as compared with seventy-five and seventy-one acres in Shefford and Missisquoi counties respectively. However, the average farm in Brome county has a larger acreage in pasture and forest than the farms in the other two counties.

In Table VI data are presented showing the acreage and distribution of crops in the area over a recent ten-year period. The 1940 figures present quite a contrast to those of 1931. In 1940 the acreages of wheat, barley, fodder corn, mixed grain and roots were considerably larger than in 1931, while acreages of oats, potatoes, hay and clover were less. Wheat, barley and mixed-grain acreages were larger in all counties, corn was larger in Brome and roots in Missisquoi county.

In 1941 the acreage of oats, corn, mixed grain and roots increased over the 1940 figures. There was a decline in acreage of wheat, barley, potatoes and hay and clover. It is difficult to draw any definite conclusions from these figures as they reflect wartime conditions to some extent. The general trend in Table VI would seem to indicate that acreages of hay and clover are slowly decreasing and more corn and mixed grain together with roots are being grown. Oats are a more or less stable crop.

The number and quality of dairy cows has greatly increased in recent years and the production of butter and cheese is an important source of income. Besides this, other products such as honey, maple sugar and syrup, and poultry products contribute to the farm income. In Missisquoi county orcharding is an important industry and many large commercial orchards are found here. In general, the farms in western Missisquoi and Shefford counties are devoted to dairying; central and southern Missisquoi county is largely devoted to orcharding, and the remainder of the area follows mixed farming as an agricultural pursuit. The value of farm products per 100 acres of occupied land in 1931 varied from $1000 to $1499 and the average value of dairy products per farm in the same year was $500-$600 in Shefford and Brome and $400-$500 in Missisquoi county. From 5 to 14 per cent of the farms in the surveyed area reported electricity and 35 to 45 per cent had automobiles in 1931. These percentages have risen in recent years (2).

Transportation and Markets

The area under discussion is adequately supplied with roads and railways to facilitate getting farm products to market. The No. 1 highway from Montreal to Sherbrooke passes through the central section of the area from west to east through Granby, Waterloo, Eastman and Magog. This highway splits at Marie-

TABLE V.

Land Utilization in the Surveyed Area. 1931*

County	Total land area Acres	Acres occupied land	% of total occupied	No. of farms	Av. Ac. per Farm	Improved cleared land		Unimproved occupied land			
						Total	Ave. per Farm	Natural Pasture	Wooded	Swamp	Total
Shefford	358598	348097	97.0	2258	154.1	168118	74.4	102668	71381	5930	179979
Brome	316852	251072	79.2	1724	145.6	79359	46.0	91118	76592	4003	171713
Missisquoi	249350	225653	90.4	1749	123.2	124969	71.4	54040	39894	6750	100684
TOTAL	924800	824822	89.1	5731	143.7	372446	64.9	247826	187867	16683	452376

TABLE VI

Acreage and Distribution of Crops*

County	Year	Wheat	Oats	Barley	Fodder Corn	Mixed Grain	Hay & Clover	Potatoes	Roots
Shefford	1931	80	26224	1172	1069	1452	92575	1881	553
	1940	260	22630	2730	1000	2090	87450	2510	920
	1941	56	28747	1951	2008	2003	89168	1861	1019
Brome	1931	50	8824	226	1271	179	58112	1171	370
	1940	100	7450	2530	2050	510	47390	850	370
	1941	52	10637	654	1511	307	44439	1067	480
Missisquoi	1931	203	24175	1240	2688	514	69396	1515	385
	1940	650	17560	4830	2510	1280	69220	970	570
	1941	208	19310	2394	2793	3906	56954	1202	409
TOTAL	1931	333	59223	2638	5018	2145	220083	4567	1308
	1940	1010	47640	10090	5560	3880	204060	4330	1860
	1941	316	58694	4999	6312	6216	190561	4130	1908

* Compiled from Statistical Year Book — Quebec 1934-1942.

ville and runs farther southeastwards as route 40 to Cowansville. Route 52 runs westward through Stanbridge and Bedford to Pike River, where it meets the No. 7 highway running north from Phillipsburg to St. Johns, and turns south and westward through western Missisquoi county. All of these highways are of concrete or macadamized material. From Knowlton, a highway—No. 39— runs east and south through Bolton Pass to Mansonville and Highwater on the east side of the Sutton mountain range. On the west side of the range, another highway—No. 13—runs south from No. 52 near Sweetsburg, to Sutton and Abercorn. Both No. 39 and No. 52 are connected with the No. 1 highway by a paved road running north from Knowlton to Waterloo.

From Waterloo, No. 39 continues north and east through eastern Shefford county to Racine, while No. 13 runs north from Cowansville to Granby, Roxton Pond, Roxton Falls and Drummondville through the western part of Shefford county. There are many secondary roads between those mentioned here and most of them are in good condition.

Several railway lines run through the area. The main eastern line of the Canadian Pacific Railway from Montreal to St. John, N.B. crosses the area from west to east passing through the towns of Brookport, Adamsville, West Shefford, Foster, Eastman and Magog. One branch of this line runs south from Foster through Knowlton to Sutton Junction, Sutton and Abercorn. At Sutton Junction it is met by a second branch which runs east from Brookport through Cowansville. A third branch of this railroad runs north along the Missisquoi valley on the east side of the Sutton mountain range from Highwater to Eastman and north through Lawrenceville and Racine to Richmond. A fourth branch runs north from Waterloo through Roxton Falls and Actonvale to Drummondville.

The Canadian National Railway operates a branch line from Farnham to Granby and Waterloo. A motor train from Granby to Montreal is operated by the Montreal and Southern Counties Railway.

The largest market centers in the area are Granby, Cowansville, Farnham, Bedford and Waterloo, but there are several smaller towns which offer a market for farm produce. Among these may be mentioned Sutton, Abercorn, Mansonville, Roxton Pond, Roxton Falls, Knowlton, Dunham, Frelighsburg and Phillipsburg. Some of these centers, particularly Knowlton, enjoy a thriving summer trade.

The proximity of the western part of the area to large centers such as St. Hyacinthe, Drummondville and Montreal makes the marketing of certain products feasible in these centers.

Most of the larger towns are centers of important industries such as textiles, machinery, wood products, tile and building materials. In 1941 the town of Granby had 36 establishments employing a total of 3852 persons, with a gross production value of $17,096,507. The towns of Farnham and Waterloo had 17 and 13 establishments with products valued at $4,292,601 and $3,446,017 respectively. (9) Some of the smaller towns have local industries such as lumber mills, canning factories and creameries which bring in considerable revenue and employ many people. These towns provide an excellent market for farm produce.

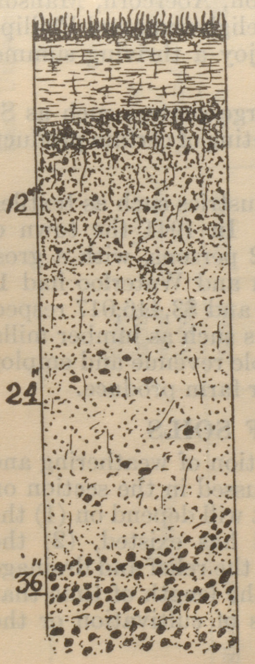
III. MORPHOLOGY AND GENESIS OF SOILS

The soils of the surveyed area are a product of the action of weathering and development forces on the various geologic materials discussed in the section on surface geology. The characteristics of the soil at any point will depend on (1) the climate and vegetation under which the parent material has existed, (2) the physical and mineralogical composition of the material, (3) the relief and drainage of the material (4) the animal life in and on the soil, 5) the length of time that the forces of development have acted and (6) the effects of cultivation or the work of man.

Under certain climatic and vegetative conditions, the well-drained soils on the different parent materials tend to acquire certain characteristics in common. Such soils are referred to as "zonal" soils. Within the broad areas occupied by zonal soils, local environmental conditions such as poor or excessive drainage or extreme differences in the nature of the parent material result in the development of soils which differ greatly in their characteristics from the zonal soils. These soils are known as "intrazonal" soils. The term "azonal" soils is given to those soils which show no characteristic development.

The majority of the soils in the surveyed area fall into two zonal groups namely the "Podsols" and the "Brown Podsolic" soils. The Podsol soils are the most common well-drained soils in Shefford county, while the Brown Podsolic soils are dominant in eastern Missisquoi and in parts of Brome county. The major difference between the soils of these two groups in the extent of leaching which is reflected in the profiles or cross sections showing the different layers or horizons of the soil. The Podsols have a marked grey layer (A_2 horizon) immediately below the leaf mould, while in the Brown Podsolic soils this horizon is usually absent or only feebly developed. The degree of development of this horizon gives some indication of the extent of leaching.

A normal well-drained mature Podsol profile of this region developed under mixed forest cover has an organic mat on the surface, (A_0 horizon) composed of leaf litter, needles and moss from 1 to 2 inches in thickness. This may be underlain by a weakly-developed black mineralized layer (A_1 horizon) ½ to 1 inch in thickness, but in most cases this horizon is absent. Under the organic mat is an ashy grey leached layer (A_2 horizon) from 1 to 5 inches thick. This A_2 horizon is characteristic of Podsol soils. The B horizon, which is found below the A_2 may be yellowish brown, brown or reddish brown becoming lighter in colour with depth. In places the upper part of the B horizon may be indurated. The B horizon grades into the unweathered parent material or C horizon. In most places the depth of the solum ranges from 20-36 inches. A profile of the Colton soil described below is typical of the Podsol soils of the area.



←— A_0 loose needles; leaf litter, and semi-decomposed organic matter

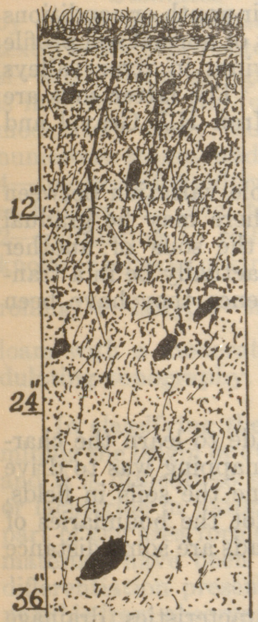
←— A_2 grey fine sandy loam; weak platy structure; friable; occasional gravel fragments. pH 5.4

←— B_1 light brown sandy loam; granular; loose and friable; some fine gravel: pH 5.6

←— B_2 yellowish to greyish brown sandy loam; granular; moderately firm; usually quite coarse; some gravel; pH 5.8

←— C greyish sand and gravel; becomes stratified with depth; occasional cobbles of granite: pH 5.8

The well-drained Brown Podsolic soils in the area have developed under hardwood forest and they may be considered as imperfectly developed Podsols. They are developed under a hardwood forest, and because of less severe leaching they usually have a better supply and distribution of plant nutrients throughout the profile than the Podsols. The well-drained Brown Podsolic soils in the area, under forest cover, have an organic mat (A_0 horizon) on the surface from ½ to 1 inch thick, consisting of leaf litter and semi-decomposed organic material. The A_1 horizon or dark mineralized layer is usually better developed in these soils than in the Podsols and is about ½ to 1 inch thick. This is often underlain by a thin leached layer which varies from a mere film to about 1 inch in thickness, but it occasionally may occur in deeper pockets. In many places this A_2 horizon is absent or not noticeable. The B horizon which is found below the A_2, is brown, becoming lighter coloured with depth and grading gradually into a grey to olive grey parent material. The depth of the solum varies from 20 to 30 inches in these soils. The C horizon is often firm to compact and may restrict drainage. The Blandford soils are representative of the Brown Podsolic group and a profile is described below:



A_0 leaf litter; roots; etc.;

A_1 black loam to sandy loam; weak crumb structure; friable; pH 5.0

A_2 grey loam to sandy loam; structureless; friable; usually in pockets or absent; pH 5.2

B_1 dark brown fine sandy loam to loam; friable; crumb structure; pH 5.6

B_2 dark olive brown sandy loam; weakly developed granular structure; occasional stones and boulders; friable; pH 5.7

C dark grey to olive grey sandy loam to loam till; firm, weakly laminated; contains angular fragments of schist and sandstone; pH 5.8

About 30 per cent of the soils mapped in the area may be considered as "Intrazonal" soils practically all of which have developed under imperfectly to poorly drained conditions. Due to excessive moisture, lack of air and lower temperature the soil climate of these soils differs greatly from that of the well-drained zonal soils. As a result the general characteristics and the profiles of the Intrazonal soils differ greatly from those of the zonal soils. The Intrazonal soils generally contain more organic matter in the surface horizons than the zonal soils and have dark mottled or discoloured subsoils due to lack of oxidation.

The Intrazonal soils of the surveyed area fall into the following four groups or types.

1. The "Bog" soils which have been developed from plant remains and swamp or marsh types of vegetation. They have mucky or peaty surface soils and peaty subsoils.

2. The "Half Bog" soils have developed under a swamp-forest type of vegetation. Under undisturbed conditions they have a mucky or peaty surface soil which is underlain by a greyish mottled mineral soil.

3. The "Groundwater Podsol" soils in the surveyed area have developed from imperfectly to poorly drained sandy deposits. They have a thin organic layer which rests upon a light grey, leached sandy layer which in turn rests upon a dark brown or a considerably mottled horizon which may be irregularly cemented with iron or organic compounds.

4. A fourth group of Intrazonal soils has been recognized in the area which differs somewhat from the groups described above.

The soils of this group are imperfectly drained and are developed on heavy parent materials. These soils have a dark grey to grey brown granular mineralized layer under the leaf mould which rests over a grey to brownish grey subsoil or poorly developed B horizon. The soils of this group are among the most fertile and most intensively farmed soils in the area.

A small percentage of the soils in the area belongs to the "Azonal" soils which have no well-defined profile development owing to their youth or conditions of parent material and relief which prevent the development of normal soil profile characteristics. This group includes soils on recent alluvium in river valleys and soils on freshly weathered gravel and rock fragments. The latter soils are referred to as "Lithosols" and include such soils as the Iron Hill Gravel and many areas mapped as Rough Stony land.

It should be pointed out that there may be considerable variation between the soils of any one of the groups described above and there may be gradual changes in characteristics from the soils of one group to the soils of another group. According to their characteristics certain soils may actually be in a transitional class from one group to another, but for convenience they have been identified with the group which they resemble most.

IV. SOIL SURVEY METHODS

After a broad reconnaissance of the area had been made to learn the characteristics of the different soil types, the usual method of mapping was to drive along the roads in the area, stopping frequently to examine the soils in fields, road-cuts and under virgin conditions in forests and to plot the boundaries of the different soil types on base maps. In areas where the roads are some distance apart, traverses were made on foot to examine the soils.

The stoniness of the soils, the variation in profile characteristics, drainage and related agricultural data were recorded in field note books. Along the roads, the boundaries between the soil types could be determined quite accurately, but in heavily wooded areas the lines were drawn from observations made at several points some distance apart. These lines were plotted on maps of the Topographical Survey having a scale of one inch to one mile. The stoniness and topography were shown on the map for each soil area.

When the mapping had been completed, each soil type was carefully sampled by digging a large pit in which the profile was typical of the soil type and taking a sample of each genetic horizon. These samples were placed in glass containers and taken to the laboratory where they were dried and analysed.

The methods used to analyse the soils are described in the Methods of Analysis of the Association of Official Agricultural Chemists. Available phosphorous and potash were determined colorimetrically according to the method of Truog.

V. SOILS

The soils of the area were classified into series, types and phases. A series includes all the soils which are developed from similar parent material under the same climatic conditions and show the same genetic horizons in the profile. That is, each series would have the same parent material, sequence and colour of horizons, structure, drainage and range in relief. Each soil series is designated by the name of a town or important geographical unit which occurs near to where the soil is found.

The type includes those soils within the series which are similar in the texture of the surface soil. The soil type is the principal unit of mapping. The phase of a soil type denotes some variation in relief, stoniness, drainage or erosion which has an agricultural significance of such importance as to require separation from the main soil type.

The above named conditions are shown on the soil maps by the following symbols: $\frac{\text{Soil name—Texture}}{\text{Stoniness—Topography}}$ for example $\frac{\text{Bdcl.}}{2 \quad 1}$ Each soil name is indicated by one or more suitable letters as indicated on the map legend. The different textures are represented by the following letters, c—clay, cl—clay loam, l—loam, sl—sandy loam, gl—gravelly loam, s—sand, The approximate extent of stoniness is indicated by the following numbers: 0—stone free, 1—occasional stone, 2—moderately stony, but stones do not seriously interfere with cultivation, 3—numerous stones and boulders which considerably interfere with cultivation, 4—too stony for cultivation. The different topographic conditions are represented as follows: 0—level to gently undulating, 1—gently undulating to undulating, 2—undulating to rolling, 2a—Kamey topography (short, rounded or irregular knolls or hillocks of stratified drift separated by depressions), 3—rolling to strongly rolling, 4—hilly, 5—mountainous. The symbol $\frac{\text{Bdcl}}{2 \quad 1}$ represents a Bedford clay loam with a moderate amount of stones and with a gently undulating to undulating topography.

In classifying the soils of the area some difficulty was experienced in determining the origin or even the method of deposition of some of the parent materials and it is difficult to say, in some cases, whether the material is marine, alluvial or lacustrine in nature. This is particularly true of the materials found in that part of the area formerly occupied by the Champlain Sea, where some of the soil materials have been affected by both methods of deposition. The scheme of differentiation presented below attempts to classify these soils as accurately as possible from observations made in the field. As knowledge of these soils increases, it is possible that several adjustments will have to be made.

Soil Differentiation

A. Soils of the Appalachian Upland Developed from Till

1. Sandy loam to loam till derived from slates.

   (a) well drained.
   Ascot sandy loam.................... P
   Ascot sandy loam—shallow phase...... P

   (c) poorly drained.
   Magog loam....................... P

2. Sandy loam to loam till derived from schistose materials.

   (a) well drained.
   Berkshire loam.......................... P
   Berkshire loam—shallow phase.......... P
   Blandford loam.......................... BP
   Blandford loam—shallow phase......... BP
   Blandford gravelly loam.................. BP
   Blandford sandy loam.................... BP

   (b) imperfectly drained.
   Woodbridge loam........................ BP
   Woodbridge loam—shallow phase..... BP

   (c) poorly drained.
   Peru loam............................... I-H

3. Sandy loam till derived mainly from slate and sandstone.

   (a) well drained.
   Roxton slaty sandy loam................ P

   (c) poorly drained.
   Mawcook sandy loam.................. I-H
   Mawcook gravelly sandy loam......... I-H

4. Reworked sandy loam till derived largely from slate and sandstone.

   (a) well drained.
   Racine sandy loam....................... P
   Racine sandy loam—shallow phase.... P

   (c) poorly drained.
   Brompton sandy loam.................. I-H
   Brompton gravelly loam................ I-H

5. Shaly loam to loam till derived from soft shale and slate.

   (a) well drained.
   Shefford shaly loam..................... BP
   Shefford shaly loam—shallow phase.... BP

   (c) poorly drained.
   Milton sandy loam..................... I-H

B. Soils on the St. Lawrence Plain Developed from Till

1. Loam to clay loam till derived from shale and slate.

   (a) well drained.
   St. Sebastien shaly loam............... BP
   St. Sebastien shaly clay loam.......... BP

2. Loam to clay loam till derived from underlying calcareous rocks.

   (a) well drained.
   Henryville loam.......................... BF

   (c) poorly drained.
   Bedford sandy clay loam................ I
   Bedford clay loam....................... I

3. Reworked sandy loam to clay loam till derived from slates and limestones.
   (b) imperfectly drained.
      St. Brigide clay loam.................... I
      St. Brigide sandy loam................... I

4. Shallow till over limestone bedrock.
   (a) well drained.
      Farmington loam.......................... BP

C. Soils of the Appalachian Area Developed from Water-Deposited Materials

1. Outwash sands and gravels in river valleys.
   (a) good to excessive drainage.
      Colton sandy loam........................ P

2. Outwash coarse sands in river valleys.
   (a) good to excessive drainage.
      St. Francis sandy loam................... BP

3. Poorly sorted sands and gravels in kames and eskers.
   (a) good to excessive drainage.
      Knowlton gravelly sandy loam............. BP

4. Stratified gravelly material deposited as beaches.
   (a) well drained.
      Rougemont gravelly loam.................. BP
      Rougemont gravelly sandy loam............ BP

5. Alluvial sands over clay on river terraces.
   (a) well drained.
      Sheldon sandy loam....................... P

6. Clay loam to silt loam material on river terraces.
   (a) well drained.
      Suffield loam............................ BP
      Suffield clay loam....................... BP

7. Recently deposited alluvium along the valley floor.
   (a) well drained.
      Milby sandy loam......................... A
   (b) imperfectly drained.
      Milby silt loam.......................... A
   (c) poorly drained.
      Alluvial soils—undifferentiated.......... A

D. Soils of the St. Lawrence Plain Developed from Water-Deposited Materials

1. Deep sands over clay.
   (a) well drained.
      Ste. Sophie.............................. P
   (b) imperfectly drained.
      Rubicon sandy loam....................... GP
      Rubicon fine sandy loam.................. GP

2. Shallow sandy deposits over clay.
   (b) imperfectly drained.
      St. Damase sandy loam I

3. Alluvio-lacustrine clay loam to silt loam deposits.
   (b) imperfectly drained.
      Yamaska silt loam........................ I
      Yamaska loam............................. I
      Yamaska fine sandy loam.................. I

4. Alluvio-lacustrine silty clay loam to clay deposits.
   (b) imperfectly drained.
      Richelieu clay loam...................... I
      Richelieu fine sandy loam................ I
   (c) poorly drained.
      Iberville clay loam...................... H

5. Lacustrine-marine clays.
   (b) imperfectly drained.
      Ste. Rosalie clay loam................... I
      Ste. Rosalie heavy clay loam............. I
      Ste. Rosalie loam........................ I
      Ste. Rosalie clay loam—calcareous phase.. I

E. Miscellaneous Soils

1. Shallow gravels derived from syenite.
   (a) well drained.
      Iron Hill gravel......................... L
2. Shallow soil material of variable composition and origin.
   (b) variable drainage.
      Rough stony land.........................Land type
3. Well decomposed organic deposits.
   (c) poorly drained.
      Muck..................................... B
      Shallow muck............................. B
4. Poorly decomposed organic deposits.
   (c) poorly drained.
      Peat..................................... B
5. Thin organic accumulations over mineral soil material.
   (c) poorly drained.
      Swampy land.............................. H

F. Soil Complexes

Milton-Shefford complex
Henryville-Bedford Complex
Henryville-Ste. Rosalie Complex
St. Sebastien-Ste. Rosalie Complex

P —Podsol soil
BP —Brown Podsolic soil
BF —Brown Forest soil
B —Bog soil
I-H—Half-Bog soil
GP —Groundwater Podsol soil
I —Intrazonal soil (Group IV)
A —Azonal Alluvial
L —Lithosol

A. Soils of the Appalachian Upland Developed from Till

The soils of the Appalachian Upland include representatives of both the Podsol and Brown Podsolic group of soils. As much of the glacial material has been transported only a short distance, the under-lying rock formations play an important part in the distribution of materials from which the soils have developed.

The well-drained soils of the area have developed under a mixed hardwood vegetation consisting chiefly of maple, birch and beech, while the imperfectly- and poorly-drained soils have developed under a mixed coniferous and deciduous tree cover consisting mainly of red maple, birch, poplar and spruce.

Soils developed from till derived largely from slate include the Ascot and Magog soils. The Ascot soils are well drained and occur on rolling to hilly topography. They are heavily leached acid soils and usually have considerable stone on the surface. In places the soils are shallow and rock outcrops occur. They are not cultivated extensively, but used chiefly for pasture. The Magog soils are associated with the Ascot soils in imperfectly- or poorly-drained positions.

The Berkshire, Blandford, Woodbridge and Peru soils are developed from till derived mainly from miceacous and chloritic schist and occur principally along the Sutton mountain range. The Berkshire soils occur at high elevations, are well drained and occupy rolling to hilly topography. They occur at higher elevation than any other of the soil types in the area and they are usually shallow and stony . Very little of this soil type is cleared and under cultivation. Blandford soils are well drained and occupy rolling to hilly topography below the Berkshire soils. The relief is usually smoother than that of the Berkshire soils, and there is less stone on the surface. The Blandford soils are extensively cleared and cultivated and are suitable for mixed farming. Woodbridge soils occur on fairly steep slopes below the Blandford soils and are developed from similar materials. They are imperfectly drained due to a compact substratum. The upper part of the profile generally has adequate drainage, but water flows along the top of the compact subsoil during the wet periods of the year causing seepage spots. This makes the Woodbridge soils unsuitable for deep rooted crops, although considerable areas of this type have been planted to orchard. Associated with the Blandford and Woodbridge soils in the poorly drained positions are the Peru soils. They occur on long slopes or in depressional areas and are usually quite stony. Only small local areas of these soils have been cultivated and they are used chiefly for pasture. All the soils developed from schist materials are acid, particularly in the surface layer.

The Roxton, Racine, Mawcook and Brompton soils are developed from a sandy loam till derived from slate and sandstone. The Roxton and Racine soils are well drained and have an undulating to rolling relief. The Roxton soils are very slaty and occupy broad terraces while the Racine soils are gravelly, contain more sandstone and the till has been considerably reworked by water. They are acid soils and have only a fair moisture-holding capacity. The Racine soils are usually very stony and not much of them has been cultivated. The Roxton soils are also quite stony, but some areas have been planted to orchards. The Mawcook and Brompton soils are associated with the Roxton and Racine soils respectively in the imperfectly- and poorly-drained positions. Considerable areas of these soils have been cleared and are used for pasture. Some of the better-drained areas of these soil types have been cultivated.

The Shefford and Milton soils are developed from a shaly loam till derived from soft shale and slate. The Shefford soils are well drained and occur on undulating to gently rolling topography. They are usually quite free of surface stone and easily cultivated. Most of the Shefford soils are cleared and these soils are especially adapted to orchard. The Milton soils are associated with the

Shefford soils in poorly-drained positions and depressional areas. The greater proportion of this type is cleared and it is used mostly for pasture, but some hay and grain crops are grown on the better-drained areas.

The Ascot, Roxton, Berkshire and Racine soils belong to the Podsol group of soils, while the Shefford, Blandford and Woodbridge soils are members of the Brown Podsolic group. The Peru and Milton soils may be classed as Half-Bog soils, while the Mawcook and Brompton soils are Groundwater Podsols. The soils developed from till in the Appalachian Upland are described below.

Ascot Sandy Loam

The Ascot sandy loam is found in eastern Brome county, where it occupies an area of 6,842 acres. It is developed from a greyish sandy loam to loam till derived from non-calcareous slates. The relief varies from rolling to hilly. On the lower slopes and in the depressional areas the Ascot soils are associated with the Magog soils, developed from similar parent material. The Ascot sandy loam is well drained, and often has considerable stone on the surface in the form of boulders. Outcrops of bedrock also occur frequently. The natural vegetation consists principally of maple, field birch and spruce.

A description of a typical undisturbed profile of the Ascot sandy loam is given below.

Horizon	*Depth*	*Description*
A_0	0″–½″	Leaf litter and semi-decomposed organic matter.
A_1	½″–1″	Black sandy loam; weak crumb structure; friable; small slate fragments; pH 5.0.
A_2	1″–3″	Grey sandy loam to loam; weak platy structure; often structureless; friable; pH 5.3.
B_1	3″–10″	Reddish brown sandy loam; granular; friable; many roots; slate fragments; pH 5.6.
B_2	10″–18″	Dark yellowish brown sandy loam; friable; many roots; some slate fragments; pH 6.0.
C	below 18″–20″	Greyish sandy loam till; firm to compact; numerous slate fragments and occasional pebbles of sandstone; pH 6.4.

The A_0 horizon of this soil is usually very thin and the A_1 horizon is frequently absent or very weakly developed. The A_2 horizon may vary in depth from one to four or five inches within a short distance. The reddish brown colour of the B_1 horizon is very characteristic in this soil and the soil material has a coarse, gritty feeling when rubbed between the fingers. The profile is acid throughout and is often more acid (pH 4.7-5.8) than the one described above. The cultivated surface soil is a greyish brown sandy loam to plough depth.

Agriculture.—Very little of the Ascot sandy loam is under cultivation. Clearing is usually unprofitable because of surface stone. Consequently most of the cut-over areas are used for pasture. The natural fertility of the Ascot soils is low. On the cultivated areas hay, grain and corn are grown, but yields are low unless fertilizer is used. Good response is had from phosphatic fertilizers on this soil type.

Most of the pastures are in poor condition and moss hummocks, spiraea and birch sprouts are common. Where sufficient grazing has been carried on and the shrub growth kept down, the pastures are fairly good. Kentucky blue grass s the dominant grass in the better pastures, while under poor management poverty grass is the main species.

Ascot Sandy Loam—Shallow Phase

Associated with the Ascot sandy loam is a shallow phase which occupies 5,00C acres. It is found on the more hilly relief of the Ascot soils and is usually well drained, except in a few places where the bedrock holds up the water. Rock outcrops are frequently observed on the shallow phase and there are occasional boulders on the surface. The natural vegetation is the same as that on the deeper sandy loam.

The profile is similar to that of the deeper Ascot soils in colour and texture, but the B_2 and C horizons are usually very thin and contain considerable slate. The average depth of soil over the bedrock varies from 15 to 20 inches. Practically none of this phase is cultivated and any cleared areas are used as rough pasture.

Magog Loam

The Magog loam is found in Brome county where it occupies a total area of 2,750 acres. It is developed from material similar to that of the Ascot soils with which it is associated. It generally is found on the lower slopes and in depressional areas associated with the Ascot soils and has a nearly level to rolling relief. About two-thirds of the type occurs on rolling topography. Drainage is usually poor, but the variation in relief results in different local drainage conditions, which are best on the rolling type of topography.

The surface is often stony and boulders are present in variable quantities. There is also a considerable amount of stone in the soil. The native vegetation consists principally of red maple, old field birch, spruce and poplar. A description of a typical profile of the Magog loam is given below.

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Black loam containing a large amount of semi-decomposed organic material; friable when dry; but mucky when wet; pH 5.1.
A_2	2″–8″	Grey loam; firm to compact; numerous slate fragments and sub-angular pebbles; pH 5.1.
B_1 (G)	8″–20″	Dark greyish sandy loam to loam; firm; mottled with blue and yellow streaks; some slate fragments and pebbles; pH 5.4.
B_2	20″–40″	Dark yellowish grey to olive coloured loam; firm; massive; mottled; contains slate fragments and sandstone pebbles; pH 6.0.
C	below 40″–45″	Dark grey loam till; firm to compact; mottled; considerable slate and occasional cobbles of sandstone; pH 6.8.

In some places the surface is a sandy loam in texture and the upper part of the profile is somewhat sandier and better drained than the above profile. The A_2 horizon of this soil is very characteristic. It is usually firm or compact and very stony. Most of the stones in the profile appear to be concentrated in this layer. The C horizon is frequently at considerable depth and is only exposed in deep cuts or ditches. The profile is acid throughout, but generally not so acid as the Ascot soils. When cultivated, the surface soil has a dull greyish white appearance due to the mixing of the A_2 horizon with the surface layer.

Agriculture.—Only about 200 acres of the Magog loam is cleared in the area. The presence of surface stone and the large quantity of stone in the profile combined with usually poor drainage conditions, makes clearing a tedious and unprofitable process. In other counties, however, large areas of the Magog soils have been cleared and cultivated. (1).

When cleared and cultivated, the Magog loam tends to become compacted after the stones have been removed and needs to be broken about every two or three years for best results. Natural fertility of the Magog soils is fair and these soils are slightly better supplied with phosporus and potash than the Ascot soils. The principal crops grown are hay and oats and some roots. On the better-drained areas hay yields 1-½ tons per acre and oats 30-40 bushels per acre depending on soil management. Most of the cleared, uncultivated areas are used for pasture which, because of superior moisture conditions, furnishes a better growth of grass than the pastures on the Ascot soils. However, undergrazing has resulted in the growth of moss hummocks and birch sprouts, which soon reduce the value of the pasture.

Berkshire Loam

The Berkshire loam occurs in both Brome and Shefford counties occupying 2208 and 2176 acres respectively in these counties. It is developed from a sandy loam to loam till derived chiefly from micaceous and chloritic schist. The topography varies from strongly rolling to hilly with steep slopes and the general elevation of this soil is higher than that of any other soil type in the area. It is usually found associated with the Blandford and Woodbridge soils which are developed from similar material at lower elevations. Drainage is good and surface run-off is usually rapid due to the nature of the slopes. Surface boulders are quite frequent on this type. The natural vegetation consists almost entirely of mixed hardwoods such as maple, grey birch, yellow birch, beech and some elm. A description of a typical virgin profile of the Berkshire loam is given below.

Horizon	*Depth*	*Description*
A_0	0″–½″	Leaf litter, semi-decomposed organic matter, etc.
A_1	½″–1″	Black sandy loam; crumb structure; friable; pH 5.4.
A_2	1″–2″	Grey fine sandy loam; often absent; weak platy structure; friable; pH 5.2.
B_1	2″– 3″	Dark coffee coloured loam; often absent; loose; friable; pH 5.8.
B_2	3″–12″	Dark yellowish brown to brown loam; loose; fluffy; occasional stones; pH 6.3.
B^3	12″–20″	Yellowish brown loam; somewhat firmer than B_2; occasional stones; pH 6.3.
C_1	20″–28″	Yellowish grey sandy loam; altered till; compact; pH 6.5.
C_2	below 28″–36″	Dark grey loam till; compact; contains considerable quantity of schistose fragments and occasional boulders; pH 6.8.

The profile described above is found only on the higher slopes where virgin forest exists and the soil has not been disturbed for a long time. Often, the thin A_1 and B_1 horizons are absent, or very weakly developed so that the B_1 and B_2 horizons appear as one layer. The leached A_2 horizon is usually very thin or occurs in pockets. In Brome county the depth of the profile to the parent material varies, but generally does not exceed 36 inches. The surface soil is strongly acid, while the subsoil is only slightly acid. The cultivated soil is a brown mellow loam to plough depth.

Agriculture.—The Berkshire loam has not been cultivated extensively and there are very few cleared areas which are used for crops. The reason for this is partly due to its stoniness and in part to its elevation and inaccessibility. Consequently, the usual practice is to cut the trees and to use the cleared areas for pasture. The clearing of the steeper slopes makes them susceptible to considerable erosion by water.

The natural fertility of the Berkshire soils is only fair. Where they have been cultivated, hay and grain are the principal crops grown with small local acreages of potatoes and corn. Hay yields of 1-1½ tons per acre and oat yields of 25-30 bushels per acre have been obtained. In general, this soil type is used mainly for pasture for young stock to supplement the farm pastures on the lower slopes.

Berkshire Loam—Shallow Phase

The larger amount of the Berkshire loam occurs as a shallow phase of that described above. This phase is confined to Brome county, where it occurs along the upper slopes of the Sutton mountain range and occupies an area of 10,758 acres. The topography varies from hilly to mountainous. The soil is well drained, with rapid surface run-off due to the steep slopes. The surface is quite stony and boulders occur frequently. Rock outcrops also occur. Most of the shallow phase is covered with forest comprised of the same species of trees as on the Berkshire loam.

The profile of the shallow phase of the Berkshire loam is similar in colour and texture to that of the deeper loam, but the individual horizons are not so thick nor so well developed. There is a considerable quantity of schist fragments throughout the profile and occasional boulders or blocks of schist are found in the profile itself. The small areas which are cleared are used for rough pasture and practically none of this phase is cultivated, except for a few local gardens.

Blandford Loam

The Blandford loam is one of the most extensive soil types in the surveyed area. It occurs chiefly in Brome and Shefford counties with some small areas in Missisquoi county and occupies a total of 56,659 acres. This soil type has been developed from firm grey to olive grey loam till derived principally from Pre-Cambrian schist and some sandstone. The topography is dominantly rolling with some comparatively high hills and deep valleys, but a few areas are more gently rolling or undulating in nature. The external drainage of the Blandford loam is moderate to rapid, while the internal drainage varies from good to imperfect. On some of the larger slopes, seepage over the firm parent material takes place. The amount of stones on the surface varies from few on the smoother areas to numerous on the rolling topography. The natural vegetation consists principally of hardwood — maple, grey birch and beech. A virgin profile of a typical Blandford loam is described below.

Horizon	*Depth*	*Description*
A_0	0″–½″	Leaf litter; roots, etc.
A_1	½″–1″	Black loam to sandy loam; weak crumb structure; friable; small fragments of schist and sandstone; pH 5.0.
A_2	1″–2″	Grey loam to sandy loam; structureless; friable; usually absent pH 5.2.
B_1	2″–8″	Dark brown fine sandy loam to loam; crumb structure; friable; usually free from stones; pH 5.6.
B_2	8″–22″	Dark olive brown sandy loam to loam; weakly developed fine granular structure; occasional stones and boulders; friable; mottled with darker patches; pH 5.7.
C	below 22″–26″	Dark grey to olive grey sandy loam to loam till; firm; weakly laminated structure which crushes easily between the fingers; contains angular fragments of schist and sandstone; pH 5.8.

The development of the grey A_2 horizon varies considerably. It usually does not occur as a continuous layer which can be observed in all profiles, but more frequently is found in small pockets or as a very thin grey streak which is visible when the soil is dry. The Blandford loam is moderately to strongly acid throughout the profile, the surface layers being very acid in some cases. The cultivated soil is a brown mellow loam to plough depth.

Agriculture.—Like most of the soils of the area, the use of the Blandford loam is conditioned by the amount of stones on the surface. The largest cleared areas occur near Lawrenceville, North Stukely and Racine on rolling to hilly topography. Most of the areas designated as 3.3 and 3.4 on the map, have been left in bush, although small areas on all the phases have been cleared.

When well managed, the Blandford loam is a productive soil, but its acidity must be taken into account when crops are planted. When applications of lime are used, clover and alfalfa succeed, but the latter has not been grown extensively enough to determine just what soil management practices are best. Oats, corn and potatoes are grown on this soil type and yields are above the average of other soils of the Appalachian Upland. Farmers use a 4-8-10 fertilizer for potatoes and 2-12-6 on grain for improved yields. Some of the pastures have been fertilized with a 2-12-10 fertilizer and the results obtained are very encouraging. On the steeper slopes, erosion is severe with cultivated soils, but as most of these slopes are in woods or grass, the erosion is well controlled.

Blandford Loam—Shallow Phase

Associated with the Blandford loam is a shallow phase which occupies a total of 101,804 acres in Brome, Shefford and Missisquoi counties. It is developed from material similar to the Blandford loam, but the average depth over bedrock is shallower and in some places is only 10 to 15 inches. The topography is generally strongly rolling to hilly or even mountainous. Both internal and surface drainage are generally good, but in some places the underlying rock holds up the water. The surface usually has more stones and boulders on it than the smoother loam. Occasional rock outcrops occur, but generally the bedrock is not exposed. Vegetation consists chiefly of maple, grey birch, beech and elm.

This phase of the Blandford loam may vary considerably in depth within a short distance and consequently the development of the profile will vary. Generally the shallow phase is more acid than the deeper loam, but in spite of this, it seems to be quite productive. The cultivated surface soil has the same appearance as the deeper loam.

Agriculture.—Fairly large areas of the shallow phase have been cleared. Stoniness and depth of soil limit the use of this type in most cases, but there are some places where the soil is shallow without much stone on the surface and these areas may be cultivated. Where cultivated, the principal crops are hay and oats, which give yields equal to those on the deeper loam, while corn and potatoes do not seem to be so productive as on the deeper soils.

Most of the rougher cleared areas are used for pasture which is fair and improves greatly when fertilized with 0-16-6 fertilizer. Manure is a valuable addition to this soil and should be used whenever possible on the steeper slopes, where sheet erosion tends to remove the surface soil, rich in organic matter. The fields are usually left in hay for long periods and become badly run out. Applications of manure greatly improve these fields. Undoubtedly the long periods of hay have saved the steeper slopes from serious erosion, which takes place readily when hoed crops are grown.

Blandford Sandy Loam

This soil type occurs in small, scattered areas in northern Shefford county and occupies a total of 3,948 acres. It is derived from sandy schistose material and is associated with the Blandford loam. It occurs on gently undulating topography and is generally imperfectly drained. It is not so stony as other Blandford soils. A large proportion of this type is covered with trees.

The profile resembles that of the Blandford loam in appearance, but is sandier in the surface horizons. The B horizon is somewhat mottled and shows imperfect drainage, but drainage is not a serious problem on this type. Practically all of the cleared areas are used for pasture. Crop yields are lower than on the Blandford loam.

Blandford Gravelly Loam

Some small areas on the slopes of Brome and Shefford mountains were mapped as Blandford gravelly loam. These areas occupy a total of 467 acres. The soil is derived principally from schist, but has a quantity of gravel of igneous origin in the profile. The topography is sloping and external and internal drainage is usually good. The surface is very stony and covered with large boulders and very little of this type is cleared and under cultivation. Small areas have been planted to apple orchards which appear to do well on this soil type. The natural vegetation consists of birch, maple and beech trees.

The surface soil is a dark brown gravelly loam to a depth of about two inches and this is underlain by a brown gravelly loam to a depth of 20 to 24 inches, which grades through a yellowish brown, slightly mottled, gravelly loam to a fairly compact till at depths varying from 24 to 36 inches from the surface. The profile is quite acid throughout (pH 5.0-5.6) and contains occasional boulders of igneous rock.

Woodbridge Loam

The Woodbridge loam occurs in all three counties and has a total area of 21,376 acres. It is generally found on the lower slopes, below the Blandford soils, with which it is associated and developed on similar parent materials. The topography may be described as long and steep slopes. External drainage varies from good to imperfect, while the internal drainage is imperfect. The Woodbridge loam is usually very stony on the surface and most of the stones are boulder size. Natural vegetation consists of maple, grey birch, beech, basswood and occasional pines. A description of a virgin profile of the Woodbridge loam is given below.

Horizon	*Depth*	*Description*
A_0	0″–1½″	Leaf litter, etc.
A_1	1½″–2″	Dark brown to black loam; crumb structure; friable pH 4.8.
A_2		Usually absent or just a trace of grey sandy loam.
B_1	2″–8″	Brown loam; weak crumb structure; friable; some stones; has darker brown areas along old root channels; pH 5.0.
B_2	8″–22″	Light brown to yellowish brown loam; friable; schist fragments and sandstone cobbles; may be slightly mottled; pH 5.1.
C	below 22″–26″	Dark grey to yellowish grey loam till; compact; mottled; laminated structure; pH 5.8.

An important characteristic of this soil is the compact C horizon, which restricts water and root penetration. The upper horizons are usually well drained and friable, but water seeps along the top of the compact subsoil and is injurious to plant roots, especially during wet seasons. The B horizon is often brown right down to the yellowish grey subsoil and appears to be a different soil superimposed on the compact till. It has been observed frequently that this compact subsoil softens up in the spring of the year, but becomes compact as the soil dries out. The whole profile is acid in reaction, more so than the Blandford soils. When cultivated, the surface soil is a light brown loam to plough depth.

Agriculture.—Due to stoniness the Woodbridge soils are difficult and expensive to clear, but despite this fact, clearing is being carried on rather extensively. The natural fertility of the Woodbridge soils is about the same as that of the Blandford soils, but Woodbridge soils are well supplied with potash.

In the Frelighsburg district a considerable proportion of this soil type has been planted to orchard. If the profile is deep enough, the trees do well, but drainage is usually necessary for best results. As will be mentioned later, apple trees on these soils tend to suffer from a lack of magnesium and this has to be corrected with amendments. The cleared areas do not seem to be used for other crops to any extent.

The steeper slopes are subject to severe erosion, especially when they are ploughed or new orchards are set out. In places severe rill erosion was observed where ploughing had been done up and down the slope. It would be advisable to cultivate across the slope or to leave sod strips between the ploughed areas to lessen the erosion. Some of the rougher, cleared land had been used for pasture, which is fairly good and contains a good proportion of bent grass, Kentucky blue grass and wild white clover. The application of phosphate to these pastures gives excellent returns.

Woodbridge Loam—Shallow Phase

This phase of the Woodbridge loam occurs in Missisquoi county, where about 950 acres were mapped. It differs from the Woodbridge loam in the depth to the compact subsoil. The surface is usually very stony and drainage is not quite so good as in the deeper loam.

The A horizon is richer in organic matter and the profile shows considerable mottling in the B horizons as compared with the deeper Woodbridge loam, but maintains the dark brown colour down to the lighter coloured compact C horizon. The compact substratum being close to the surface prevents penetration of the tree roots and the trees become shallow rooted.

At Frelighsburg, this soil type has been planted to orchard but under-drainage is necessary for success.

Peru Loam

The Peru loam is found in Brome and Missisquoi counties and occupies a total area of 6,290 acres. It is developed from parent material similar to that of the Blandford and Woodbridge soils and occurs in association with these soil types. It usually occurs on long gentle slopes or in depressional areas. The external drainage is only fair to poor as surface run-off is slow and the internal drainage is poor. There is generally a considerable quantity of stone on the surface, somewhat similar to the shallow Woodbridge soils. The tree vegetation consists principally of maple, birch, beech, spruce and hemlock. A description of a virgin profile of the Peru is given below,

Horizon	*Depth*	*Description*
A_0–A_1	0″–6″	Brownish black loam; some semi-decomposed organic material; weak crumb structure; friable when dry; numerous stones; pH 5.0.
B_1	6″–11″	Rusty brown loam; granular; mottled; some sandstone cobbles; pH 5.2
B_2	11″–26″	Yellowish brown to yellowish grey sandy loam to loam; mottled; firm to compact; considerable schist and slate fragments; pH 5.8.
C	below 26″–30″	Yellowish grey sandy loam till; compact; mottled; considerable schist; pH 6.0.

The surface layer of this soil is high in organic matter and in the poorly drained places, it is mucky in appearance. The B_1 horizon is usually highly mottled, but in some of the better drained places it has a rich brown colour. An A_2 horizon is found infrequently in this soil type. The compact substratum restricts the downward movement of water and the long slopes make the lateral movement of water very slow. Some fields which appear dry on the surface are often saturated with moisture and the presence of scirpus and sedges indicates the wet condition of the soil. The profile is quite acid throughout. The cultivated surface soil is a black to dark brown loam.

Agriculture.—Stoniness and poor drainage have discouraged clearing on this soil type, so that very few cleared areas are found. These are used chiefly for pasture, which seems to become hummocky due to the tramping of the cattle on the organic surface. The pastures, however furnish fairly good feeding and the chief grasses are creeping bent, Kentucky blue grass, red fescue and poverty grass. Many of the pastures are undergrazed and spiraea, alder and other shrubs grow uncontrolled. Where the soil has been drained and cultivated, some excellent crops of timothy yielding two tons per acre have been seen. It is probable that drainage and crop rotation would develop this soil into valuable farm land in places where the removal of surface stones is not too costly.

Roxton Slaty Sandy Loam

This soil type is found mainly in Shefford county and it occupies a total area of 24,921 acres or 2.66 per cent of the total surveyed area. The Roxton soils are developed from slaty sandy loam till derived from slate and sandstone. In places it would appear that the till had been considerably worked by water, since very little weathered material is found. This soil type occupies broad terraces which have a gently undulating to rolling relief. On the lower-lying areas the Roxton soils are associated with the poorly-drained Mawcook soils. Both internal and extenal drainage is good and in some cases may be excessive. The larger proportion of this soil is quite stony and a few outcrops occur, but there are some areas which have few stones on the surface. Maple, beech and birch form the dominant tree cover. The Roxton slaty sandy loam is described below.

Horizon	*Depth*	*Description*
A_0–A_1	0″–1½″	Leaf litter; semi-decomposed organic matter and black sandy loam; usually very thin and containing many slate fragments; pH 4.0.
A_2	1½″–3″	Grey or pinkish grey sandy loam to loam; structureless; many slate fragments; pH 4.2.
B_1	3″–8″	Light brown to brown slaty sandy loam; granular; friable; considerable slate and some sandstone pebbles; pH 4.6.
B_2	8″–18″	Yellowish brown sandy loam; extremely slaty with very little weathered material; occasional blocks or slabs or slate; pH 5.0.
C	below 18″–20″	Grey sandy loam till; extremely slaty and grades into slate bedrock; very little weathered material; pH 5.4.

The depth of the surface layer varies considerably, but it is usually 1 to 2 inches thick. In most places it is difficult to distinguish a B_1 and B_2 horizon. The depth of the soil over bedrock varies considerably throughout the area. In some places the bedrock is at a depth of 20 to 40 inches below the surface. The soil is very acid due to the nature of the parent material and the ease of leaching, but in spite of this the A_2 horizon is very patchy and is poorly developed in places. When cultivated, the surface soil is a brown slaty sandy loam to plough depth.

Agriculture.—A moderately large area of Roxton soil has been cleared, but very little of it has been cultivated. The natural fertility of this soil type is fairly good, but moisture relationships tend to be a limiting factor in crop production. In some of the more favourable locations, potatoes and truck crops are grown. Some hay and grain are also grown, but yields are usually low due to moisture conditions, as the soil tends to dry out rapidly. In some of the lower lying areas, the moisture conditions are better, probably because of the presence of bed rock at fairly shallow depth. Some areas of the Roxton slaty sandy loam, particularly those designated as 2.1 and 2.2, have been planted to orchards, which seem to be quite successful. The more stony areas (3.2, 3.3) are used only for pasture and these furnish poor grazing due to lack of moisture.

Mawcook Sandy Loam

The Mawcook sandy loam occurs in the western and northwestern parts of Shefford county and occupies a total area of 22,954 acres or 2.4 per cent of the surveyed area. It is associated with the Roxton soils having developed from similar material and is found on level to undulating topography. Both surface and internal drainage are poor and there is generally considerable stone on the surface of the soil. The principal trees growing on this soil type are poplar and old field birch. The profile described below is typical of the Mawcook soils.

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Black sandy loam; some semi-decomposed organic material; friable when dry; some slate fragments and cobbles of sandstone; pH 4.5.
A_2	2″–6″	Greyish sandy loam to loam; pinkish cast; structureless; slate and sandstone fragments; pH 4.4.
B	6″–20″	Light yellowish brown sandy loam to fine sandy loam; pinkish cast; firm; mottled; slate and sandstone fragments; pH 5.8.
C	below 20″–22″	Light brown fine sandy loam till; mottled; firm; numerous fragments of slate and sandstone; pH 6.3.

There is considerable variation in texture of the B and C horizons and a heavy loam texture is frequently encountered in these horizons. The red slate from which the Mawcook and Roxton soils are derived imparts a pinkish tinge to the horizons and occasional red mottled spots appear. In this respect the

Mawcook soils somewhat resemble the Milton soils described later, except that in the Milton soils, the red spots are very frequent and are intimately mixed with other diverse colours. The surface horizons of the Mawcook sandy loam are very acid, but the acidity diminishes with depth, becoming slight in the C horizon. When cultivated, the Mawcook sandy loam has a greyish brown to black surface, which is fairly high in organic matter.

Agriculture.—The larger cleared areas of this soil type occur southwest of Granby, where the soil has a fairly level topography. Stoniness is the chief obstacle to clearing and where much of the stone approaches boulder size, it is not practical to try clearing. Many stone piles in the area are evidence of the labour required to clear this land. Most of the cleared land is used for hay and grain or pasture. Hay yields ¾ to 1 ton per acre and oats 25 to 30 bushels per acre. Buckwheat is often grown alone or in a mixture with oats on this soil type. Pasture on this soil type tends to be poor, possibly due to the acidity of the soil and its poor drainage.

Mawcook Gravelly Sandy Loam

A small area (150 acres) of Mawcook gravelly sandy loam in western Shefford county was mapped. It resembles the other Mawcook soils in appearance but has a quantity of gravel and coarse sand throughout the profile. It tends to be very poorly drained and occupies level to depressional areas. In some places there is clay at a depth of 3½ to 4 feet below the surface.

It has about the same agricultural value as the sandy loam and where these two types occur in close association they are cultivated as one unit.

Racine Sandy Loam

The Racine sandy loam is found in Brome and Shefford counties where it occupies an area of 47,080 acres. It is developed from a sandy loam till derived from Cambrian slates and sandstones. The till has been considerably worked by water and in a few places it resembles somewhat glacial outwash. The topography varies from undulating to strongly rolling and there is a wide variation in stoniness in different parts of the area. On the gently undulating to undulating areas, the Racine soils are associated with the poorly-drained Brompton soils described below. Both internal and external drainage of the Racine soils are moderate and, in some cases rapid. The uncleared areas support a stand of maple, birch, spruce and occasional pine trees. The profile of the Racine sandy loam described below gives a general picture of the type.

Horizon	*Depth*	*Description*
A_0–A_1	0″–1½″	Black sandy loam and semi-decomposed litter; weak crumb structure; some slate fragments; pH 4.1.
A_2	1½″–2½″	Greyish white sandy loam; structureless; loose and porous; usually very patchy; fragments of slate and sandstone; pH 4.7.
B_1	2½″–8″	Reddish brown sandy loam to loam; granular; friable; slate fragments and occasional sandstone cobbles; pH 4.4.
B_2	8″–22″	Yellowish brown sandy loam; granular; quite firm; often very sandy in patches; slate and sandstone cobbles; occasional boulders; pH 4.7.
C	below 22″–24″	Grey sandy loam till; firm; slightly mottled usually gravelly; contains boulders of sandstone; pH 4.8.

In a few places the grey A_2 horizon has a pinkish cast, but this is not common. There are also places where there is enough gravel in the profile to make this type suitable for road construction material and the action of water on the materials from which the soil is developed is evident. This soil type is probably more variable in the texture of its horizons than any other type in the area. The profile is highly acid throughout and this is one of the most acid soils in the surveyed area. Where the soil has been cultivated it has developed a brown sandy loam surface soil to plough depth.

Agriculture.—The use of the Racine sandy loam appears to be determined by the amount of stone that has to be cleared from the land before cultivation may be carried on. About 10,000 acres of this type are partly cleared and cultivated of which about 1,000 acres are cultivated and in crops. Those areas designated on the map as 2.1, 2.2, 2.3 and 2.4 may be readily cleared and some parts of these areas are already in use. The Racine sandy loam with numerous stones and undulating to rolling topography designated on the maps as 3.2 is the most common phase of this series. It occupies about 38,000 acres, part of which is cleared and some of the cleared areas are under cultivation.

The principal crops grown include hay, grain, corn and potatoes. Hay yields ¾ to 1 ton per acre and silage corn about 10 to 12 tons per acre although in some places the corn yields are low. When fertilizer and manure are used, oats produce 35 to 40 bushels per acre. Potatoes seem to do well and 200 to 300 bushels per acre have been reported, although the general average is much lower. The land is usually left in hay for long periods and the fields become run out. The Racine sandy loam responds well to phosphate fertilization and needs organic matter for best results. The 2.1 areas are not so well drained as the rest of the phases and for this reason are usually left in pasture. Most of the cleared 3.2 areas are in pasture also. The pastures on this soil type are usually fair and show a fair amount of wild white clover.

Racine Sandy Loam—Shallow Phase

Associated with the Racine sandy loam on rolling to hilly topography, about 33,000 acres were mapped as a shallow phase of this soil type. The shallow phase differs from the normal Racine sandy loam in being shallower over bedrock and having a much stonier surface. Both external and internal drainage are good on the shallow phase.

The profile is similar to that of the normal sandy loam in colour and texture, but usually contains more sandstone cobbles and boulders. Due to its stoniness, only very small areas of this phase are cleared and these are used for pasture, particularly for sheep. About 22,000 acres of the shallow phase are stony enough to make clearing impractical or impossible.

Brompton Sandy Loam

The Brompton sandy loam occurs in all three counties of the surveyed areas and occupies a total of 48,569 acres. It is developed from till similar to that of the Racine soils and occurs in association with them. It has not been subjected to so much water action as the parent material of the Racine soils and contains less gravel and cobbles. The topography varies from gently undulating to undulating and in some cases, rolling. Drainage is usually poor and there is usually enough stone on the surface to require clearing before cultivation may be carried on. Red maple, birch, poplar and some spruce make up the principal natural vegetation. The Brompton sandy loam is described below.

Horizon	*Depth*	*Description*
A_0–A_1	0″–6″	Dark brown to black sandy loam to loam usually mixed with leaf litter and semi-decomposed organic material; many roots; crumb structure; friable when dry; mucky when wet; pH 5.2.
A_2	6″–10″	Grey sandy loam; mottled; firm to compact when dry; numerous small stones of slate and sandstone; pH 5.6.
B	10″–20″	Yellowish grey sandy loam; firm; mottled; horizons indistinct; some sandstone cobbles and occasional boulders; pH 6.4.
C	below 20″	Yellowish grey sandy loam till; firm to compact; fragments of slate and occasional sandstone boulders; pH 6.6.

There is considerable variation in the depth of the organic material on the surface under forest vegetation and after clearing there seems to occur a rapid reduction of organic matter. The depth of the leached layer is variable, but it does not contain the quantity of stone found in the A_2 horizon of the Magog soils. There is no definite line of demarcation between the B and C horizons, although in some of the better drained places the B horizons shows a weakly developed brown colour. The soil is quite acid, but less so than the Racine soils. When cultivated the surface becomes a greyish brown loam to sandy loam.

Agriculture.—The Brompton loam, like the Racine soils, generally has a quantity of stones on the surface, but there are large areas of level to undulating land of this type which are an inducement to clearing even at the cost of long and tedious labour. These soils are similar to the Magog soils in the amount of labour required to clear them. Once they have been cleared and most of the surface stone removed, the soils are suitable for a variety of crops. By far the largest area of this type has been designated 3.2 and it is on this phase that most of the cultivation of the Brompton soils is carried on. Like the Magog soils, the Brompton loam requires frequent breaking for the best results.

The chief crops are hay and grain. Hay yields about 1 to 1½ tons per acre and is usually cropped for several successive years. Oats yield 30 to 35 bushels per acre and are often grown as mixed grain with barley or wheat. On account of drainage conditions, corn does not grow well, but on the better drained areas, roots and potatoes seem to yield a fair crop. The soil responds well to fertilization, particularly with phosphate and there is evidence that nitrogen may be of some benefit despite the amount of organic matter on the surface.

The pastures on this soil type are generally poor, but with a little 0-16-6 fertilizer they can be greatly improved. Some of the areas still under tree cover are used for pasturing young stock, but it takes a considerable area to support a small number of cattle.

Brompton Gravelly Loam

This soil type occupies a small area of 333 acres along the eastern slope of Pine mountain in Brome county. The profile differs from that of the Brompton loam described above in having a quantity of gravel throughout the profile. This is accompanied by slightly better drainage conditions. The C horizon is more compact than in the loam, but crushes easily between the fingers to a coarse gravelly sandy loam. This soil type has numerous boulders on the surface and is used chiefly for pasture.

Shefford Shaly Loam

The Shefford shaly loam is found in all three counties of the surveyed area and occupies a total of 38,624 acres. It is developed from sandy loam till derived principally from Ordovician shale with some sandstone material. The topography varies from gently undulating to rolling and both internal and external drainage is good. On the gently-undulating to undulating topography the Shefford soils are associated with the poorly-drained Milton soils. The surface is comparatively free from stone, although occasional boulders or slabs of slate occur in some areas. The principal tree cover consists of maple, elm and old field birch. A description of a virgin profile of the Shefford shaly loam is given below:

Horizon	*Depth*	*Description*
A_0	0″–½″	Leaf litter; roots, etc.
A_1	½″–1″	Black to dark brown loam; weakly developed crumb structure; some soft shale fragments; pH 4.9.
A_2	trace	Grey sandy loam; structureless; often absent.
B_1	1″–8″	Light brown shaly loam; loose and porous; friable; pH 5.1.
B_2	8″–22″	Yellowish brown shaly loam; friable, variable content of shale; occasional sandstone cobbles; pH 5.2.
C	below 22″–24″	Greyish brown very shaly loam till grades into the shale bedrock; firm; porous; pH 5.3.

The profile varies considerably in depth. The grey A_2 horizon is frequently absent or it may occur as pockets in the profile. The amount of shale in the profile varies considerably and the soil is very acid throughout. There are a few places where the underlying parent material effervesces with acid, while the overlying soil is acid in reaction. One small area near East Stanbridge contains a quantity of small shells throughout the profile, but this is an isolated area and no others were found. The cultivated surface soil of the Shefford shaly loam is a brown mellow loam, often containing considerable shale.

Agriculture.—Most of the Shefford shaly loam is cleared and much of it is under cultivation, particularly those areas designated as 1.1, 1.2, 1.3, 2.2 and 2.3. The principal crops grown are hay, grain and potatoes. Hay and grain give fair to good yields and potatoes are a popular crop on this soil type, yielding 200 to 300 bushels per acre. The Shefford shaly loam is used extensively for orchards and seems to be excellently suited to this type of agriculture. Many well established orchards are to be seen in the vicinity of Dunham, Meigs Corners, Farnham Centre and St. Armand and many new plantings are being developed in other sections. Even in places where the bedrock is fairly close to the surface, the tree roots are able to penetrate the soft shale. Some difficulty is experienced with trees at the foot of slopes where drainage water accumulates and these areas should be avoided when planting trees.

Shefford Shaly Loam—Shallow Phase

About 9,728 acres of the Shefford shaly loam were mapped as the shallow phase. It occurs in association with the deeper loam, but occupies more rolling to hilly topography. In places bedrock outcrops occur and make these areas unsuitable for cultivation. There is somewhat more stone on the surface of the shallow phase, but it may be readily cleared without much difficulty. The profile varies from the deeper phase principally in depth and the amount of shale in the profile. Within a short distance it may vary from a very shaly loam to partially weathered disintegrated shale with very little definite profile development. This soil has some characteristics of residual soils. The whole profile is quite acid. Most of this phase is used for pasture, but some of the smoother areas have been planted to orchard and the trees seem to do well.

Milton Sandy Loam

The Milton sandy loam occurs in association with the Shefford soils and is developed from similar materials, but shows the influence of some red slate. It occupies an area of 28,620 acres, of which the greater part is in Missisquoi county. It is found on level to gently undulating topography, except for a few areas which have a rolling relief. The great proportion of the Milton sandy loam is not very stony, but there are some areas where there is enough stone to make clearing impractical. The natural vegetation consists chiefly of red maple, poplar and old field birch. A profile typical of the undisturbed Milton sandy loam is described below.

Horizon	*Depth*	*Description*
A_0–A_1	0″–1½″	Leaf litter; semi-decomposed organic matter and black sandy loam; often mucky in appearance; some slate fragments; pH 4.6.
A_2	1½″–6″	Dark greyish sandy loam; often has a pinkish cast; mottled with red and yellow patches; some slate fragments; pH 4.2.
B_1	6″–12″	Greyish to yellowish brown loam; highly mottled; firm; some red and black slate; pH 5.0.
B_2	12″–20″	Grey and yellow mottled sandy loam; mottled with bright red and yellow patches pH 5.4.
C	below 20″–22″	Coarse grey sandy loam to gravelly sandy loam till; highly mottled; firm; contains large pieces of angular red and black slate; pH 6.5.

In some places the Milton soils resemble the Mawcook soils described above. The Milton soils, however, have a characteristic mottling and tend to be slightly heavier in texture than the Mawcook soils. This mottling consists of small nodules and larger patches of weathered slate which due to poor drainage conditions produce a mixture of red, yellow, and blue colours throughout the profile. In the better drained places the B_1 horizon may be quite brown in colour and show no mottling, especially where the profile lies near that of the Shefford soils. Usually it is difficult to distinguish a B_2 horizon and the soil grades gradually through the B into the parent material. The profile is quite acid throughout, especially in the surface layers. When cultivated, the Milton soils have a greyish brown sandy loam surface soil to plough depth.

Agriculture.—The greater portion of the Milton sandy loam is not very stony and most of these areas are cleared and under cultivation. The stonier areas (3.1, 3.2 and 4.3) are used for pasture. Hay and grain are the chief crops grown and the soil seems to be well suited to these crops. Like the Shefford shaly loam, soil management is reflected in crop yields on this soil type. When properly handled the Milton sandy loam will produce 1 to 1½ tons of hay and about 35 bushels of oats per acre without fertilizer and these crops usually give better yields in dry years. Corn gives only a fair yield and seems to need nitrogen and improved drainage. Good yields of roots are obtained. The application of manure and a good crop rotation would greatly benefit crop production on this soil type. The pasture areas are generally poor and weedy, but may be improved with fertilizer.

B.—Soils of the St. Lawrence Plain Developed from Till

The till soils of the St. Lawrence Plain are developed from loam to clay loam material derived from slates, shale and limestone. The soils included in this group are the St. Sebastien, Henryville, Bedford, Ste. Brigide and Farmington soils.

The St. Sebastien soils are developed from loam to clay loam till derived from shale and slate. They are well drained, have an undulating relief and are quite free from surface stone. These soils are quite acid. They are largely cleared and under cultivation.

The Henryville soils are developed from loam to clay loam till derived mainly from slate and limestone. They tend to be quite shallow in places, but are well drained and quite fertile. They are particularly suited to the growing of clover and alfalfa and the shallower areas provide good pasture.

The Bedford soils are associated with the St. Sebastien and Henryville soils in poorly drained positions. They have a gently undulating relief and are fairly free of surface stone. The Bedford soils are not very acid due to the calcareous nature of their parent material. Some of the better drained areas are cleared and under cultivation.

The Ste. Brigide soils are developed from till derived from limestone material which has been considerably reworked by water. They occur on level to undulating topography which is quite free from surface stone and drainage is usually imperfect. In some places the Ste. Brigide soils lie adjacent to some of the heavier-textured water-deposited soils on the same type of topography and are difficult to distinguish from these soils. The Ste. Brigide soils are suitable for truck crops and tobacco and nearly all of this type of soil has been cleared.

Farmington soils are developed from a shallow till over limestone bedrock. They are usually very shallow and stony and are used chiefly for pasture. A detailed description of the soils developed from till on the St. Lawrence plain is given below.

St. Sebastien Shaly Loam and Shaly Clay Loam.

These soil types occur in southwestern Missisquoi county and occupy an area of 7,668 acres. They are developed from loam to clay loam till derived principally from shale and slate. The topography varies from gently undulating to undulating and both external and internal drainage are good. The St. Sebastien soils are associated with the Henryville soils and the poorly-drained Bedford soils described later. There is very little stone on the surface of the St. Sebastien soils. Native vegetation consists chiefly of maple, birch and beech. An undisturbed profile of the St. Sebastien shaly loam is described below:

Horizon	*Depth*	*Description*
A_0	0″–1½″	Leaf litter; roots, etc.
A_1	1½″–2½″	Greyish black loam; well developed crumb structure; friable; small shale fragments; pH 5.0.
A_2	2½″–4″	Greyish white sandy loam; usually absent; pH 4.9.
B_1	4″–15″	Yellowish brown shaly loam; loose and porous; numerous shale fragments in various stages of decomposition; pH 5.2.
B_2	15″–26″	Greyish yellow shaly loam; loose and porous; considerable shale and slate chips; pH 5.3.
C	below 26″–30″	Dark grey shaly loam to shaly clay loam till; firm; porous; considerable shale and slate fragments; large angular slaty pieces and occasional boulders; pH 5.2.

The leached A_2 horizon in this soil type is usually absent. The amount of shale in the profile varies considerably and there are some small areas which contain very few shale fragments in the profile. These areas usually have a clay loam texture and the profile is somewhat heavier throughout. St. Sebastien soils are quite acid, except where they lie near the Henryville soils. When cultivated the surface soil becomes a light brown shaly loam to shaly clay loam to plough depth.

Agriculture.—Large areas of the St. Sebastien soils are cleared and under cultivation. Hay and grain are the main crops grown, but there are substantial acreages of corn and potatoes. Yields are not high and range somewhat lower than on the Shefford soils. Hay yields ½ to 1 ton per acre, oats 25 to 35 bushels and potatoes 100 to 150 bushels per acre. Some buckwheat is also grown on the St. Sebastien soils and does better on the clay loam than on the loam. As a rule, corn does not give good returns. Clover seems to produce a good stand, but very little alfalfa is grown. A few small orchards have been planted on the shaly loam, but they do not seem to thrive so well as those on the Shefford shaly loam. Pastures on this soil type are usually very poor, but may be improved with fertilization.

Henryville Loam

The Henryville loam is found in Missisquoi county in association with the St. Sebastien and Bedford soils. It occupies an area of 2,688 acres west of Missisquoi Bay. The Henryville loam is developed from loam to clay loam till derived from underlying shaly and slaty calcareous rocks and somewhat resembles the St. Sebastien soils. The relief is usually undulating to rolling and both internal and external drainage are good. There are generally more stones on the surface than on the St. Sebastien soils, but not enough to interfere with cultivation. The uncleared areas are covered with a growth of maple, birch and beech.

The surface soil is a greyish brown shaly loam 4 to 6 inches deep, loose and friable and nearly neutral in reaction. This grades through a lighter coloured loam (pH 7.5) containing considerable slate and limestone fragment into the calcareous bedrock at a depth of 12 to 20 inches from the surface. Usually the soil will effervesce with acid a few inches below the surface. Occasional outcrops of the bedrock occur. The whole profile is open and porous and water penetrates easily. Near Clarenceville, the Henryville soils are so mixed with the Bedford soils that they have been mapped as a complex.

Agriculture.—A large proportion of the Henryville loam is cleared. Although the soil is quite shallow, it may be easily ploughed even when the bedrock is close to the surface, as the rock seems to be soft and easily broken. Usually the chief obstacles to cultivation are the outcrops. The principal crops grown are hay, grain and corn. Because of the lime content of the soil and its good natural drainage, alfalfa and clover grow exceptionally well on the Henryville loam. These crops do better on this soil type than on any other in the area. Alfalfa may be cut twice during the first year and yields about one ton per acre at each cutting. Corn does not seem to give very good yields, possibly because of moisture relationships. A large part of the Henryville loam, particularly the shallower areas, is used for pasture which is quite good and better than that on the St. Sebastien soils. Very little commercial fertilizer has been used on this soil, but it should give a good response.

Bedford Sandy Clay Loam

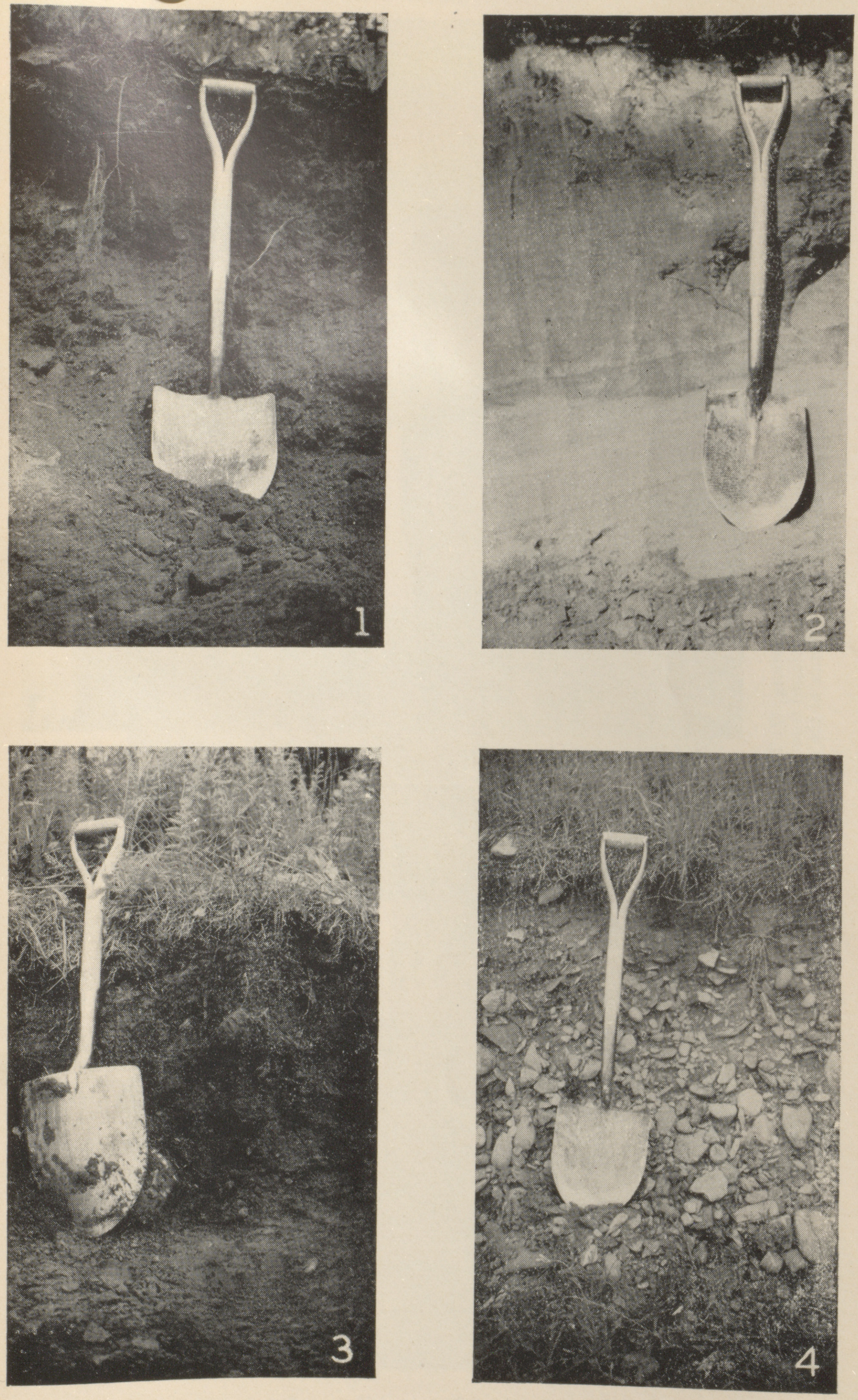
The Bedford sandy clay loam occurs mainly in Missisquoi county and occupies an area of 7,372 acres. This does not include small areas where the Bedford soils are so intimately mixed with the Henryville or St. Sebastien soils as to be mapped as a complex. The Bedford soils are developed from calcareous loam to clay loam till similar to that of the Henryville soils. The topography varies from gently undulating to undulating with some small areas having rolling relief. As a rule, drainage is poor, but surface drainage is somewhat better on the areas of rolling relief. There is usually not enough stone on the surface to interfere with cultivation. Natural vegetation consists chiefly of red maple, elm and birch on the better drained ridges and cedar in the poorly drained depressions. An undisturbed profile of the Bedford sandy clay loam is given below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–7″	Dark brown to black sandy clay loam to clay loam; mucky appearance in poorly drained areas; slate fragments; occasional limestone boulders; pH 5.6.
B_1	7″–20″	Yellowish grey sandy clay loam; mottled; firm; occasional boulders; occasionally effervesces with acid; pH 5.9.
B_2	20″–34″	Greyish yellow clay loam; mottled; numerous slate fragments and cobbles of limestone and sandstone; frequently effervesces with acid; occasional limestone boulders; pH 6.4.
C	below 34″–36″	Yellowish grey clay loam till; mottled; slate and limestone fragments and occasional boulders; pH 6.8.

The profile varies considerably in its stone content. The A_2 horizon is usually absent or so weakly developed as to be imperceptible. The profile somewhat resembles the Brompton soils in colour, but has a heavier texture, and is developed from different materials. Usually the soil will effervesce with acid at 20 to 25 inches below the surface. The surface soil is acid in reaction, but the soil becomes more nearly neutral with depth. When cultivated, the surface soil becomes a greyish brown sandy clay loam.

Agriculture.—A large proportion of the Bedford soils has been cleared but in some places, particularly the 3.2 areas, there is sufficient surface stone to make clearing unprofitable and these areas are mostly in bush.

The main crops grown are hay, grain, corn and potatoes. Where surface drainage is fairly good, hay and oats give satisfactory yields, but corn and potatoes are not well adapted to this soil type. Potatoes are often scabby, because of the lime content of the soil. Some good stands of wheat were observed on this soil type and where superphosphate had been used on oats, a considerable increase in yield was obtained. In most cases the cultivated areas are left in hay for long periods and then revert to pasture following which they are ploughed and sowed to grain or corn for two years. Pastures on this soil type are weedy and usually contain considerable spiraea or hardhack, but also have a fair amount of Canada blue grass and red fescue.



(1) Profile of a Brown Podsolic soil. Note absence of grey layer near surface. (2) Profile of a Podsol soil developed on well drained sandy material. (3) Profile of the Woodbridge loam. Note the compact greyish subsoil. (4) Profile of the Roxton slaty sandy loam. A poor dry soil containing numerous slate fragments and sandstone cobbles.

(1) Orchard on the Woodbridge loam near Frelighsburg. (2) The Milton sandy loam. A poorly drained soil associated with the Shefford soils. (3) The Racine sandy loam is developed from reworked till. It is very acid and has a wide variation in texture throughout the profile. (4) Some of the rough, stony land found in the surveyed area.

(1) Profile of St. Sebastien shaly loam. Note shaly fragments and absence of grey horizon near surface. (2) Topography of the Henryville loam. The soil on the knolls is very thin over Trenton slates and limestone but supports a good growth of alfalfa. (3) Pasture on Farmington stony loam. The limestone bedrock is close to the surface and protrudes in places.

(1) Ste. Rosalie clay loam. Note smooth topography and uniformity of oat crop. The field is one mile long. (2) St. Sebastien – Ste. Rosalie complex. Note patchy appearance of crop due to soil variability. (3) Suffield clay loam in foreground. Lighter patches of crop are due to sheet erosion.

Bedford Clay Loam

This soil type is associated with the Bedford sandy clay loam and occupies 1,292 acres. The topography varies from gently undulating to undulating and drainage is poor. There is not much stone on the surface of the clay loam and most of the land is covered with a vegetation consisting of red maple, birch and cedar.

The profile is similar to that of the sandy clay loam, but the surface soil is heavier in texture. The soil effervesces with acid at a depth of 20 to 26 inches below the surface. Practically none of this type is under cultivation and the cleared areas are mainly used for pasture. All local areas in hay or grain yield about the same as on the sandy clay loam.

Ste. Brigide Clay Loam

The Ste. Brigide clay loam occupies an area of 5,120 acres in western Missisquoi county. It is developed from sandy loam to clay loam till derived from calcareous slates of the Trenton formation together with some red Cambrian slates. The till has been considerably reworked by water and in some places there is very little stone in the profile or on the surface. The level to undulating topography is continuous with that of the water-deposited soils and is it often difficult to distinguish the limits of this soil type. The surface drainage is fairly good, but internal drainage is imperfect. Natural vegetation consists of maple, beech, birch and occasional elm. The profile described below is quite typical of the undisturbed Ste. Brigide soils.

Horizon	*Depth*	*Description*
A_0–A_1	0″–3″	Black to dark brown clay loam; crumb structure when dry; mucky when wet; contains some semi-decomposed organic material; pH 5.2.
A_2	usually absent	
B_1	3″–15″	Yellowish grey sandy clay loam; mottled; firm; some slate fragments; may have a pinkish cast; pH 6.2.
B_2	15″–22″	Greyish, mottled with rusty brown sandy clay loam; firm; frequently effervesces with acid; some slate and sandstone fragments; pH 6.8.
C	below 22″–25″	Dark grey to greyish brown silty clay loam; weak nutty structure; mottled; may have a pinkish cast; frequently effervesces with acid; pH 7.0.

The soil profile does not contain very much stone and it is often difficult to distinguish it from the heavy water-deposited soils with which it is sometimes associated. The surface soil tends to be somewhat acid but the subsoil is only slightly acid to neutral in reaction. The cultivated soil is greyish brown sandy clay loam to clay loam to plough depth. There are a few places where the surface soil is a loam in texture.

Agriculture.—Nearly all of this soil type has been cleared and most of it is under cultivation. The Ste. Brigide clay loam is suited to a wide variety of crops and is often used for truck crops and tobacco. Hay and grain seem to produce good yields on this soil type. Hay yields 1 to 1½ tons per acre, oats 30 to 35 bushels and corn 12 to 15 tons per acre and with fertilization these yields may be considerably increased, for the soil is quite responsive to fertilizer treatment.

The rotation used on this soil type varies with the type of farming, but generally consists of grain or corn for a year followed by hay for many years. Fertilizers used include 5-8-10 for tobacco, 4-8-10 on corn and potatoes and 2-12-6 on grain. Where tobacco is grown, all available manure is put on the tobacco crops. Recently this soil has been found to be suitable for sugar beets. Pastures on this soil type are fairly good and contain considerable white clover. The areas with strongly undulating topography are subject to some water erosion under hoed crops.

Ste. Brigide Sandy Loam

About 3,136 acres in the western half of Missisquoi county were mapped as the Ste. Brigide sandy loam. This soil is found on level to gently undulating topography and the surface drainage is usually fair, while the internal drainage is poor. The sandy loam is generally found near the edges of bog areas and the parent material seems to be reworked by the waters of former small glacial lakes. As a result the soil, and especially the subsoil, is very variable in texture. Pockets of clay and clay loam occur in the sandier subsoils, the whole varying from a sandy loam to a sandy clay loam. The cultivated surface soil is generally a sandy loam.

Agriculture.—Most of the Ste. Brigide sandy loam is cleared and is in hay or pasture. Some grain and corn are grown and on the better drained areas the yields are equal to those on the clay loam. On the poorer drained areas, crops are patchy, due to local variations in texture and drainage and are somewhat similar to those on the Rubicon soils described later.

Farmington Loam

The Farmington loam occurs in the vicinity of Phillipsburg in Missisquoi county and occupies 640 acres. It is developed from a loamy calcareous till which occurs as a thin mantle over limestone rock. The topography varies from level to broken and the drainage is generally good. The surface is usually quite stony and bouldery and rock outcrops are common. The profile is very shallow and consists of four to five inches of friable and mellow brown loam which is underlain by a yellowish brown stony loam containing considerable broken limestone fragments. At a depth of 20 to 26 inches the soil merges with the limestone bedrock, but in many areas there are only four to five inches of soil over the limestone rock.

The Farmington loam in the surveyed area is usually too shallow for crop production, and is mainly used for pasture. The pastures provide good grazing during moist seasons but during the dry summer months the pastures suffer from drought.

C.—Soils of the Appalachian Area Developed from Water-Deposited Materials.

The soils in the Appalachian area developed from water-deposited materials include the Colton, St. Francis, Knowlton, Rougemont, Sheldon, Suffield, Milby and undifferentiated alluvial soils. They are all well drained, except the latter two types and some of them (Colton, St. Francis and Knowlton) may have excessive drainage.

The Colton soils are developed from sandy and gravelly outwash on broad terraces, which have an undulating to rolling relief. They contain considerable gravel and the deposits are usually stratified. Most of the Colton soils are cleared. They have low natural fertility and moisture-holding capacity hence need organic matter and fertilizer to produce crops successfully.

The St. Francis soils are developed from sands on broad outwash plains and contain little gravel. They have a slightly better moisture-holding capacity than the Colton soils and are slightly more fertile, but also require fertilizers and organic matter for crop production. They have been used for potato growing with good results.

The Knowlton soils are developed from coarse, poorly sorted, sandy, gravelly and cobbly outwash material in kames and eskers. They are excessively drained and are little used for agricultural purposes. The cleared areas are used mainly for pastures, although small, favourably located areas have been used successfully for the production of cultivated crops after the application of organic matter and fertilizer.

The Rougemont soils are developed on gravelly beaches and terraces of the

Champlain Sea. They have a fair moisture-holding capacity and are especially suitable for orchards and are used extensively for this purpose.

The Sheldon soils occur on terraces along the river valleys where alluvial sand has been deposited over lacustrine clay. The depth of the sand over the clay varies from 20 inches to 5 feet and there is consequently a variation in moisture conditions. The Sheldon soils usually hold adequate moisture for crop production and most of the land is cleared and cultivated. Hay and grain are the main crops grown. The Sheldon soils are subject to severe erosion especially if hoed crops are planted on the steeper slopes.

The Suffield soils are developed from lacustrine silts and clays on river terraces. They are quite fertile and are extensively cultivated, but are easily eroded by water unless strict erosion control measures are practised.

The Milby soils occur along the valley floors and are developed from recent alluvial deposits. They are usually fairly well drained, but there are areas which have variable drainage due to the variation in the depth to the water-table. When well drained, the Milby soils are suitable for growing most of the crops adapted to the surveyed area but they are often flooded in the spring and are subject to late and early frosts.

The areas mapped as "alluvial soils-undifferentiated" include recent alluvial deposits of sand, gravel and cobbly material along the stream courses. They are usually poorly drained and are mostly unsuitable for cultivation.

The water-deposited soils are described in detail in the following pages:

Colton Sandy Loam

The Colton sandy loam is found mainly along the Missisquoi river valley in eastern Brome county and occupies an area of 2,800 acres. It is developed from water-deposited sands and gravels, principally of granitic and gneissic origin. The topography varies from fairly level terraces to undulating or rolling where the terraces have been eroded. Due to their open, porous nature, the Colton soils have rapid drainage and are often excessively drained. In general, the Colton soils are quite free from surface stone and have a natural vegetation consisting chiefly of old field birch and pine. The profile of a virgin Colton sandy loam is described below.

Horizon	*Depth*	*Description*
A_0	$0''$–$\frac{1}{2}''$	Loose needles; leaf litter, etc.
A_1	$\frac{1}{2}''$–$1''$	Black sandy loam; crumb structure; sometimes powdery; pH 5.5.
A_2	$1''$–$5''$	Grey fine sandy loam; weak platy structure; friable; some gravel pH 5.4.
B_1	$5''$–$18''$	Light brown sandy loam, weakly granular; loose and friable; some fine gravel; pH 5.6.
B_2	$18''$–$30''$	Yellowish to greyish brown sandy loam to coarse sandy loam granular; moderately firm; some gravel present; pH 5.8.
C	below $30''$–$35''$	Greyish sand and gravel; becomes stratified with depth; occasional granite and gneissic cobbles; pH 5.8.

The leached A_2 layer is very patchy and is not observed in all profiles, probably because a large proportion of this soil type has been cleared or disturbed at one time or another. Occasionally there is considerable gravel in the B horizons and such soils have a very low moisture-holding capacity. When cultivated, the surface becomes a brown friable sandy loam to plough depth.

Agriculture.—The Colton soils may be easily cleared and cultivated, but the chief drawbacks to crop production are the lack of moisture, as these soils dry out very rapidly, and the low fertility. Consequently only small areas of this type have been planted to crops. When manure and fertilizers are used the soil is well suited to the production of potatoes, corn, small fruits and truck crops, but without fertilizer the yields are very low. The supply of organic matter must be maintained for successful crop production as it helps to hold the moisture supply and the applied fertilizers. Due to the open nature of these soils, the effects of fertilizers soon disappear, and this must be taken into account when planning crop production. Some areas of Colton sandy loam on rolling relief are not suitable for crop production due to the severe wind erosion which takes place when the soil is cleared. Possibly the use of windbreaks would make these areas usable.

St. Francis Sandy Loam

The St. Francis sandy loam occupies a total of 14,611 acres and is found in all three counties of the surveyed area, but has its largest acreage in Shefford county. It is developed from outwash sands derived from a variety of materials and it is found mainly on broad fairly level terraces, but some areas have an undulating or gently rolling topography. In Brome county it may be found associated with the Knowlton soils described later. Drainage varies from good to excessive, although these soils tend to hold moisture somewhat better than the Colton soils. There are a few areas around Roxton Falls where boulders occur on the surface, but generally the St. Francis sandy loam is free from stone. On the uncleared areas the natural vegetation consists chiefly of maple, birch, pine and some poplar. The profile described below is fairly typical of the virgin St. Francis soils.

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Black sandy loam; mixed with leaf litter, needles, and semi-decomposed organic matter; loose; friable; pH 4.1.
A_2	2″–4″	Grey fine sand; structureless or single grain; usually very thin or patchy; pH 4.6.
B_1	4″–12″	Dark brown to reddish brown loamy coarse sand; loose; occasional gravel; pH 4.8.
B_2	12″–30″	Yellowish brown sand; loose; occasional gravel; pH 5.1.
C	below 30″–32″	Grey coarse sand, firm, occasional gravel; pH 4.7.
D		Coarse sand and gravel to a depth of 10-30 feet; usually not stratified.

This soil type seems to be less well developed than the Colton soils and the A_2 horizon is sometimes difficult to find. In the vicinity of Brome and Cowansville the surface soil approaches a fine sandy loam and has a better moisture-holding capacity than in the St. Francis soils farther north around Roxton Falls and Lawrenceville. There is very little gravel in the profile and the sand is frequently very deep. The profile is extremely acid throughout and the acidity does not appear to diminish with depth as is the case with other soils of the area. When cultivated, the surface soil becomes a light brown mellow sandy loam to plough depth.

Agriculture.—Fairly large areas of the St. Francis sandy loam are cleared, but only a few scattered areas are under cultivation. The principal crops grown are hay, grain, corn and potatoes. Crop yields are generally low, hay yields ½ to ¾ ton and oats about 25 bushels per acre, if no manure or fertilizer is used. These yields can be greatly increased by proper fertilization. Potatoes seem to grow very well on this soil type, expecially on the fine sandy loam which retains more moisture than the average sandy loam. Excellent yields are obtained on this type particularly when 4-8-10 fertilizer is used. Corn averages 8 to 10 tons per acre on the same soil. Generally the practice is to leave the fields in hay for long periods and then follow this with grain or potatoes. Any rotation which permits the use of farm manure and green manuring crops and the addition of commercial fertilizers will make this soil type very productive. Some care must be taken to prevent wind erosion with intertilled crops. There appears to be little water erosion on this soil type.

Knowlton Gravelly Sandy Loam

This soil type is found mainly in Brome and to a lesser extent in Shefford and Missisquoi counties and it occupies a total area of 11,545 acres. It is developed from poorly sorted gravelly outwash derived from a mixture of slate, schist, sandstone and igneous rocks. The topography varies from rolling to kamey, the predominating forms being kames and eskers, but there are a few areas which have undulating relief. Drainage is generally very rapid and varies from good to excessive, but small poorly-drained areas in the depressions between the gravelly ridges are included. The trees on this soil type consist chiefly of birch, pine and spruce. The Knowlton gravelly sandy loam is described in detail below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–1½″	Black sandy loam and semi-decomposed organic matter; some gravel fragments; pH 5.0.
A_2	1½″–2″	Greyish white sandy loam; occurs in pockets; often absent; structureless; loose and porous; some gravel pH 5.1.
B_1	2″–8″	Brown gravelly sandy loam; loose; porous; fragments of schist, slate and sandstone; pH 5.3.
B_2	8″–22″	Greyish brown gravelly sandy loam; loose; open and porous; occasional sandstone cobbles; pH 5.2.
C	below 22″–26″	Greyish gravelly sandy loam; loose and porous; cobbles of slate and sandstone; some igneous material; pH 5.5.
D		Mixed gravel and grey sand to a depth of 10-30 feet; some boulders.

The A_2 horizon of this soil is variable and usually is found in pockets. The profile is very open and porous in nature and does not hold the moisture very well. Gravel is present in all horizons and increases with depth. Where it has been cultivated the surface soil becomes a light brown gravelly sandy loam to plough depth.

Agriculture.—Most of the Knowlton gravelly sandy loam is cleared, but usually its rapid drainage combined with the kamey topography makes it unsuitable for cultivation. In a few places, particularly near Sweetsburg, good crops of alfalfa, corn, oats and potatoes have been grown on this soil type, when manure and fertilizer were used. On the untreated land hay yields about ½ ton per acre and oats 20 to 25 bushels per acre on the average. The larger part of this soil type is used for pasture which is very poor. The use of farm manure or green manuring crops to increase the organic matter and the moisture-holding capacity is a practical necessity in the Knowlton soils.

Rougemont Gravelly Loam

The Rougemont gravelly loam occurs in all three counties of the surveyed area and occupies a total of 2,970 acres. It is developed from a variety of materials which were deposited in the form of beaches by the water of the ancient Champlain Sea. These beaches have been deposited generally along the slopes of the hills, but subsequent erosion has given them an undulating to rolling relief. Drainage varies from good to excessive on this soil type. In a few places, there is considerable stone on the surface, usually in the form of boulders, but generally there is not enough stone to seriously interfere with cultivation. The forest vegetation consists chiefly of maple, beech, birch and pine. The profile of the gravelly loam is described below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Dark brown to black gravelly loam; some semi-decomposed organic material; occasional sandstone cobbles; pH 4.5.
B_1	2″–8″	Reddish brown gravelly loam; loose and porous; gravel composed of slate, sandstone and igneous rock fragments; both angular and water rounded; occasional cobbles; pH 5.1.
B_2	8″–28″	Dark yellowish brown gravelly loam; open; porous; gravel coarser than in B_1; occasional boulders; pH 5.4.
C	below 28″–30″	Yellowish brown gravel; cobbles and boulders of igneous rocks; open and porous; pH 6.0.

It is usually difficult to find an A_2 horizon in this soil type, but it may be observed occasionally in pockets. The depth of the profile varies considerably and it is quite acid throughout, although not so acid as some of the other soils of the area. The cultivated surface soil is a dark brown gravelly loam to plough depth.

Agriculture.—A large part of this soil type has been cleared. It is very well suited to orcharding and many of the best orchards in the province are located on this soil type. Within the surveyed area, however, very little of the Rougemont soils have been planted to orchard and most of it is used for pasture or ordinary farm crops. When not fertilized, yields of hay and grain are low. One farmer has found that applying manure every two years produced hay yields of 2 to 2½ tons per acre. With phosphate fertilization, corn will produce 10 to 12 tons per acre and oats 40 to 45 bushels per acre. Potatoes yields of 250 to 300 bushels per acre are not uncommon when a 2-12-10 fertilizer is used. In some places alfalfa and clover have been grown with considerable success and seem to withstand winter killing very well.

Rougemont Gravelly Sandy Loam

This soil type is associated with the loam in Brome and Missisquoi counties. It occupies a total area of 1,235 acres and has undulating relief. There is very little stone in the surface of the gravelly sandy loam, but it usually has more rapid drainage than the loam. The profile differs from that of the loam in being sandy and containing less gravel throughout.

The sandy loam is not so well suited to crop production as the loam, because of its lighter texture and rapid drainage which causes it to dry out quickly. Small areas of grain and potatoes are grown on this type, but yields are low unless manure and fertilizer are used.

Sheldon Sandy Loam

The Sheldon sandy loam occurs to a limited extent in Brome and Missisquoi counties, where it occupies areas of 1,645 and 812 acres respectively. It is developed from alluvial sands deposited over lacustrine clay on terraces along the river valleys. It usually has a sloping topography and stones and boulders are absent or very scarce. Both internal and external drainage are good, but the soil is able to hold adequate moisture for crop production. The natural vegetation consists of maple, birch, spruce and poplar. A description of a typical undisturbed profile of the Sheldon sandy loam is given below:

Horizon	*Depth*	*Description*
A_0	0″–½″	Leaf litter, roots, etc.
A_1	½″–1″	Black to dark brown sandy loam; weak crumb structure; pH 5.4.
A_2	1″–2″	Grey sandy loam; structureless; friable; pH 5.3.
B_1	2″–9″	Dark brown to reddish brown sandy loam to loam; granular; friable; porous; pH 5.5.
B_2	9″–24″	Light yellowish brown sandy loam; firm; friable; porous; occasional small stones; pH 5.8.
D	below 24″–30″	Grey silty clay to clay; weak nuciform structure; plastic when wet frequently calcareous at great depths; pH 6.5.

The texture of the surface soil often varies over short distances from a sandy loam to a fine sandy loam or a light loam, but the sandy loam is the most common. The depth of the sandy deposit over clay varies considerably. While the average is about 24 inches, it may in some instances be only 12 to 15 inches and in other cases as much as 3 to 4 feet. The thickness of the underlying clay deposit may also vary considerably. Exposures in the vicinity of Frelighsburg indicate that the thickness of the clay in that area varies from 10 to 30 feet. The clay subsoil generally effervesces with acid at a depth of 4 to 6 feet from the surface. The whole profile is quite acid, but not so much as the Colton or St. Francis soils. When cultivated the surface becomes a yellow light brown sandy loam.

Agriculture.—Practically all of the Sheldon sandy loam has been cleared of its original forest cover. Due to the extensive clearing and cultivation and the sloping topography, considerable damage has been caused on this soil type by sheet and gulley erosion. The largest area of severally eroded Sheldon soil occurs near Highwater in Brome county, where only about ten per cent of the Sheldon soil is now suitable for cultivation. On the smoother undulating topography, erosion has been less severe and the land is more extensively cultivated at present. Careful soil and crop management practices are required on this soil type in order to restrict and prevent erosion damage.

The Sheldon soils have a better moisture-holding capacity and a higher state of fertility than the Colton or St. Francis soils, especially if excessive run-off is prevented.

In the ordinary farm rotation without commercial fertilizers, hay yields ¾ to 1 ton per acre and oats 25 to 30 bushels per acre. Corn and potatoes are well adapted to the smoother phases of this soil type. The addition of lime and organic matter in the form of barnyard manure or green manure, will considerably improve the productivity of this soil. These soils also respond readily to commercial fertilizers.

Suffield Clay Loam

The Suffield clay loam is found in all three counties of the surveyed area and occupies a total of 22,310 acres. It is developed from clay loam to silt loam material deposited by water as terraces along the river valleys. The topography generally slopes toward the valley floor and may vary from level to rolling, along the sides of the valley. External drainage is good, but internal drainage varies from good to slightly imperfect. The surface is practically free from stone except in a few small areas in Shefford county. Natural vegetation consists chiefly of maple. A description of a profile of the Suffield clay loam is given below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Grey brown clay loam; weak crumb structure sticky when wet; friable when dry; pH 4.5.
A_2	2″–4″	Dark grey silty clay loam; friable weak platy structure; pH 4.9.
B	4″–20″	Greyish brown silt loam to clay; weak nuciform structure; slightly mottled; pH 5.6.
C	below 20″–24″	Brownish grey clay; massive to weak nuciform structure; plastic when wet; friable when dry; pH 5.9.

The profile usually varies considerably in the proportion of silt in the horizons and is very often a silt loam to silty clay loam. In some cases the structure is better developed than others, but this seems to depend on organic matter and drainage conditions. The surface soil is quite acid, but the lower horizons diminish in acidity with depth. The cultivated soil has a greyish brown surface which becomes quite grey on drying.

Agriculture.—Nearly all of the Suffield clay loam is cleared and used for agricultural purposes. The more level areas are suitable for a variety of crops and hay, grain, corn, potatoes and truck crops are grown. Hay yields 1 to 1½ tons per acre and oats 35 to 40 bushels per acre, while corn produces 12 to 15 tons per acre and potatoes give good yields, but not so good as on the Shefford soils. Fertilizers used on this soil type include 4-8-10, 2-12-10 and 2-12-6. Manure greatly increases hay yields and a need for nitrogen and organic matter seems to be indicated. When lime is used, good stands of clover are obtained, but not much alfalfa has been grown on this soil type. The farmers on this soil type appear to favour a short rotation of one year grain, one year roots and two years hay. In some cases, the roots are omitted. Pasture is usually good and the soils on rolling topography seem to be better suited to grazing. One of the main problems on this soil is erosion. On slopes over five per cent, erosion is usually severe when hoed crops are grown. Considerable sheet and gully erosion takes place on the more rolling topography, hence the use of this phase for pasture is a wise practice. There is slight sheet erosion on the gently sloping and smoother phases, but this may be controlled by crop management.

Suffield Loam

Associated with the Suffield clay loam is a fairly level area near Cowansville of 730 acres in which the surface soil is a loam in texture. It differs from the clay loam in colour and texture and is usually not so well drained. The surface is practically free from stones and the uncleared areas are covered with maple, pine and tamarack.

Agriculture.—Very little of the Suffield loam is cleared and the cleared areas are used mainly for pasture, which seems to furnish good grazing. Although drainage is not so good as in the clay loam, the Suffield loam has about the same crop value and possibly more of it should be used for this purpose.

Milby Sandy Loam

The Milby sandy loam occupies an area of 4,845 acres, most of which is in Brome and Missisquoi counties. It is developed from recently deposited alluvial material along the valley floors and has a level to gently undulating topography. The soil is usually fairly well drained but imperfectly drained areas occur where the water-table is held fairly high. It is associated with the Milby silt loam, which is imperfectly to poorly drained. The surface is free of stone. The native vegetation consists of pine, willow, spruce, poplar and red maple trees.

The surface is composed of 5 to 8 inches of brown sandy loam, which is underlain by a light brown, slightly mottled coarse sandy loam to a depth of 26 to 30 inches. Occasionally there is a grey, leached sandy loam layer 2 to 3 inches from the surface. At a depth varying from 26 to 30 inches from the surface the soil becomes a grey, coarse sand, mottled with rusty brown, which is quite firm in places. Sometimes this layer is tightly cemented and holds up the moisture, in which case the soil is poorly drained. There are a few places where the soil contains a quantity of gravel. Included with this type are small areas in which the surface soil is a loam in texture and the subsoil, a fine sandy loam. These areas have a better moisture-holding capacity than the sandy loam.

Agriculture.—Most of the Milby sandy loam is cleared and some of it is under cultivation. Hay yields 1 to 1½ tons per acre and oats 30 to 35 bushels per acre and the better-drained areas are suitable for corn, potatoes and market garden crops. In some places this soil type is subject to flooding in the spring or whenever the river rises high enough to overflow its banks. Most of these areas have been left in hay.

Milby Silt Loam

The Milby silt loam is associated with the sandy loam and occurs in all three counties occupying a total of 11,731 acres. It is developed from silty and fine sandy materials deposited by the rivers along the valley floor. It has a level to very gently undulating topography and is imperfectly to poorly drained. Practically no stones are found on the surface. The uncleared areas are covered with red maple, cedar willow and poplar. The profile of the Milby silt loam is described as follows:

Horizon	Depth	Description
A	0″–8″	Dark brown to black silt loam; contains some semi-decomposed organic material; often mucky when wet; pH 4.8.
B	8″–20″	Grey loam to silt loam; frequently mottled; occasional patches of sand; pH 5.4.
C	below 20″–26″	Dark grey silt loam; mottled; massive; no stones, pH 4.5.

In some places this soil resembles the level phases of the Suffield clay loam, but is not so well drained.

Agriculture.—Considerable areas of the Milby silt loam are cleared and clearing is easily accomplished. The main crops grown on the cultivated areas of this soil type are hay, grain, and some corn. On the better-drained areas, hay yields 1 to 1½ tons per acre, oats 35 to 40 bushels and corn 8 to 10 tons per acre. The larger proportion of this soil type is usually too wet for best success with corn, potatoes or roots. Very little fertilizer has been applied, but farm manure has been used in some places. Hay occupies the largest acreage and the cleared areas are usually left in hay for long periods.

Alluvial Soils-Undifferentiated

These soils occur in all three counties and occupy a total area of 7,609 acres. They occupy level to depressional areas along the stream courses and are usually poorly drained. There is very little stone on the surface, but occasional boulders are seen. Natural vegetation consists of spruce, alder, willow, and some cedar. The surface layer is generally a mucky, black loam which is underlain at a depth of 8 to 10 inches by a coarse sand. This sand is generally mixed with gravel, cobbles and occasional boulders to a depth of 18 to 20 inches but, in some places the substratum contains much silt and occasional clay patches, mixed with gravel and cobbles. No definite profile is developed in this type and practically none of it is under cultivation in the surveyed area, except for some small local gardens.

D.—Soils of the St. Lawrence Plain Developed From Water-Deposited Materials

A large percentage of the soils on the St. Lawrence Plain have developed from sands, silts and clays deposited by water in the bed of the ancient Champlain Sea. The soils in this class include the Ste. Sophie, Rubicon, St. Damase, Yamaska, Richelieu, Iberville and Ste. Rosalie series.

The Ste. Sophie, Rubicon and St. Damase soils are developed from sandy materials which have been deposited over the Champlain clay. The Ste. Sophie and Rubicon soils generally occur in close association. The former is generally found on gentle knolls and is well drained, whereas the Rubicon soils are found on a smoother overall topography which contains considerable micro-relief, i.e. small gentle depressions and knolls. The drainage of the latter soils is generally impeded, although in the gentle depressions it may be poor and on the small knolls fairly good. The depth of the sand over the clay varies considerably but is generally somewhat greater in the Ste. Sophie (average depth about 5 feet) than in the Rubicon (average depth 3 to 4 feet) soils. In the case of the Ste. Sophie soils there are often indications that the sand may have been blown about by wind to a considerable extent. The St. Damase soils are developed from shallow deposits of sand over clay, the depth of which may vary from a few inches to one or two feet. The topography generally is undulating and the drainage is imperfect. Nearly all of the Ste. Sophie, Rubicon and St. Damase soils are cleared. Crop yields are low unless fertilizer is used and on the Rubicon and St. Damase soils crops are spotty because of the variable drainage.

The Yamaska, Richelieu and Iberville soils are developed from alluvio-lacustrine clay loam to silty clay deposits. The former two occur on level to gently undulating topography and have imperfect drainage, while the Iberville soils are generally found in depressional flats and are poorly drained. The Yamaska and Richelieu soils are quite fertile and are practically all cleared and under cultivation. The Iberville soils require drainage for successful crop production. The Ste. Rosalie soils are developed from clay deposits of the Champlain Sea. They have a level to gently undulating topography and are imperfectly drained. They are highly productive soils and suitable for a wide variety of crops and are practically all cleared and under cultivation.

The water-deposited soils of the St. Lawrence Plain are discussed in detail below.

Ste. Sophie Sand

The Ste. Sophie sand occurs in scattered areas in all three counties and occupies a total of 7,970 acres, the largest proportion of which occurs in Shefford county. It is developed from loose sandy material, of mixed origin, which has been washed over the Champlain clay to various depths. Generally the depth of the sand is about five feet but occasionally sand pits twenty feet deep may be seen. There are some areas where the depth of sand is less than five feet.

The topography is generally undulating with irregular depressions and rounded knolls. In some instances this soil type has a broken, dune topography which is evidence that some of the sand has been blown about by wind after its original deposition. Due to its porosity, the Ste. Sophie sand has rapid internal drainage, causing the soil to be droughty. In some depressional areas, however, where the sand is shallow over the clay substratum, drainage is restricted and a high water-table may occur in such positions. Such areas would be mapped as Rubicon sand in a detailed survey. A typical profile of the Ste. Sophie sand is described below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–1″	Black sandy loam and semi-decomposed organic matter; loose and friable; pH 4.5.
A_2	1″–4″	Grey fine sand; occasional gravel fragments; structureless; loose and porous; pH 4.3.
B_1	4″–10″	Reddish brown sand; single grain structure; occasional gravel; occasionally forms a hardpan; pH 5.0.
B_2	10″–25″	Light yellowish brown sand; loose and structureless; some gravel; pH 5.4.
C	below 25″–30″	Grey coarse sand; some gravel; occasionally weakly stratified; pH 5.8.

The extent of leaching and the depth of the A_2 horizon vary considerably in the Ste. Sophie sand. On the dryer knolls, especially in the dune areas, the A_2 horizon is very thin, while on the smoother or depressional areas, it is generally deeper. The amount of organic matter on the surface also varies considerably with the topographic positions, being less on the dry knolls and more in the depressional areas.

In some places, where the A_2 horizon is thick the B horizon becomes indurated and tends to form a hardpan. The soil is very acid throughout.

Agriculture.—Most of the Ste. Sophie sand is cleared. Like the Colton soils, it is usually too dry for success with cultivated crops. Moisture runs through the soil rapidly and the open and loose nature of the soil makes it subject to wind erosion. Organic matter in the form of farm manure will greatly improve this soil type and this should be supplemented with commercial fertilizers for successful crop production.

When properly managed, the Ste. Sophie sand is suitable for corn, potatoes, tobacco and truck crops. Small orchards are frequently seen on this soil type, but the trees grow very slowly and require considerable care during the first years of growth. Apparently they do well once they are started.

Rubicon Sandy Loam (Ste. Amable Sandy Loam)

The Rubicon sandy loam occurs in all three counties and occupies an area of 39,646 acres. This soil also occurs in a number of other counties on the St. Lawrence Plain where it has been mapped as the St. Amable Series. It occurs in association with the Ste. Sophie soils, occupying the smoother and somewhat lower positions on the St. Lawrence Plain. The Rubicon soils are developed from sandy water-deposited material washed over the Champlain clay similar to the Ste. Sophie soils. The depth of the sand is somewhat shallower than in the case of the Ste. Sophie soils and it usually varies from three to five feet. The overall topography of the Rubicon soils is nearly level, but many small depressions and knolls occur within short distances, which gives the soil a gently undulating micro-relief.

The surface and internal drainage of the Rubicon sandy loam vary considerably. Surface drainage is good on the knolls, but poor in the depressions. The internal drainage generally is slow, due to the influence of the underlying clay. A water-table is usually found above the clay during the wet periods of the year. The Rubicon soils contain very little stone either on the surface or in the profile. Natural vegetation consists mainly of spruce, birch and occasional pine. A typical profile of the undisturbed Rubicon sandy loam is given below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Black sandy loam; some semi-decomposed organic matter; loose; friable; mucky when wet; pH 4.2.
A_2	2″–5″	Grey sandy loam; structureless; loose and porous; pH 5.5.
B_1	5″–12″	Yellowish brown to dark brown coarse sandy loam; firm; pH 6.2.
B_2	12″–22″	Grey and yellow sandy loam; mottled; firm; pH 6.5.
C	below 22″–24″	Grey coarse sandy loam; mottled with rusty brown patches; occasional clay patches; pH 6.5.
D		Grey clay.

The depth of the A_2 horizon varies considerably. The extent of mottling in the subsoil varies with the internal drainage of the soil. On the small knolls very little mottling is observed in the subsoil, while in the depressions, mottling is more severe and comes closer to the surface. In some places the B_1 horizon may be indurated. The soil is usually quite acid in the surface, but becomes more nearly neutral with depth. On the knolls, the cultivated surface soil is greyish brown to yellowish brown in colour, while in the depressions where the A_2 horizon is usually thicker, the cultivated surface soil is distinctly grey and in a few very wet spots it may be black in colour. This mixture of colours of the cultivated surface soil is characteristic of the Rubicon sandy loam.

Agriculture.—Large areas of the Rubicon soils have been cleared. In general, the Rubicon sandy loam is a cold soil, but the better drained areas are suitable for agricultural purposes. The value of the soil is considerably decreased by the variation in drainage caused by its relief and this variation is reflected in the crops, which tend to be spotty. In spite of this difficulty, large areas are in grain and hay, but yields are low unless fertilizer is used. Hay yields about ¾ ton per acre, oats 25 to 30 bushels and corn 10 to 12 tons per acre. On the dryer areas, potatoes yield 250 to 300 bushels per acre, but roots do not seem to give large yields.

The Rubicon sandy loam shows marked response to applications of lime and fertilizers. Crop yields are considerably increased by the use of complete fertilizers such as 4-8-10 or 2-12-10 which are commonly used on the Rubicon soils. Fields are usually left in hay for long periods and the yields become very low, hence a shorter rotation would benefit this soil type. There is moderate sheet erosion on the knolls, but this could be reduced by careful management and crop planning. Pastures on this soil type are poor and weedy and furnish very little feed.

Rubicon Fine Sandy Loam

Associated with the Rubicon sandy loam in Shefford and Missisquoi counties is an area mapped as Rubicon fine sandy loam. It occupies a total of 9,568 acres. The topography is nearly level and there are no knolls and depressions such as are found on the sandy loam. Consequently, drainage conditions are more uniform over a wide area, but the general drainage is imperfect.

The profile is somewhat similar to that of the Rubicon sandy loam, but the sand is finer. Mottling occurs in the subsoil, but it is found in all profiles observed and is not variable as in the sandy loam.

The more uniform drainage conditions permit more even crops to be grown and consequently, larger yields per acre are obtained on these soils than on the Rubicon sandy loam. Corn, hay and grain give better yields on the fine sandy loam than on the sandy loam.

St. Damase Sandy Loam

This soil type occurs in Missisquoi county and covers an area of 3,738 acres. It is developed from sands, similar to the Rubicon soils, which have been deposited by water in a thin layer over the Champlain clay. The depth of the sand is much shallower than that in the Rubicon soils and generally varies from 4 to 30 inches with an average of 10 to 15 inches. The topography of the St. Damase soils resembles that of the Rubicon soils, but the knolls and depressions are not so pronounced and take the form of small undulations in the nearly level topography. Surface drainage is usually fairly good, but the internal drainage is slow and imperfect. There is practically no stone on the surface or in the profile. Natural vegetation consists of maple, beech, hemlock and birch. A description of a typical profile of the St. Damase sandy loam is given below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–2½″	Greyish black sandy loam; loose; friable; some semi-decomposed organic matter; mucky when wet; pH 4.3.
A_2	2½″–4″	Grey sand; usually patchy and may be absent; pH 4.7.
B	4″–12″	Greyish brown sandy loam to sandy clay loam; becomes heavier with depth; mottled; pH 5.2.
C	below 12″–14″	Dark brown clay to clay loam grading into grey clay at variable depth; mottled; pH 5.7.

The surface layer in the slight depressions is often mucky in appearance and the A_2 horizon is deeper here also. On the better-drained places, however, the A_2 may be only weakly developed. The depth and texture of the profile varies and in many cases the B horizon has a sandy clay texture directly under the surface The surface soil is acid, but the clay substratum is neutral to alkaline. The cultivated surface soil is a greyish brown sandy loam. A large part of the St. Damase sandy loam is cleared and cultivation of this soil is comparatively easy. The main crops are hay and grain, but yields are only fair. Due to the variable nature of the texture and drainage of these soils, crop yields are spotty, but more even than on the Rubicon sandy loam. Hay (usually timothy and red top) yields ¾ to 1 ton per acre and oats 25 to 30 bushels per acre. Corn is not well adapted to this soil type because of drainage conditions. On the better-drained areas, potatoes are grown rather extensively with considerable success and fairly large yields are obtained. The St. Damase sandy loam shows marked response to lime applications and it was observed that the use of 2-12-6 fertilizer on grain resulted in earlier ripening. Much of this soil type has been left in hay for many years and the fields are run down. Drainage, rotation of crops and correct fertilizer practices should make this soil type a good crop soil. Pastures are generally poor, but respond well to fertilizer treatment.

Yamaska Silt Loam

The Yamaska silt loam is found in all three counties where it occupies a total area of 17,632 acres. It is developed from alluvio-lucustrine clay loam to silt loam deposits and somewhat resembles the Richelieu soils with which it is sometimes associated. The topography of the Yamaska silt loam varies from nearly level to gently undulating and it is usually found along the present river courses of the St. Lawrence Plain. The surface drainage is usually fair but the internal drainage is imperfect and in some depressions it may be poor. There are no stones on this soil type. Natural vegetation consists of maple, ash, and elm trees, but these are usually scattered and no heavy stands occur on this soil type. The profile of the undisturbed Yamaska silt loam is described below:

Horizon	*Depth*	*Description*
A_0–A_1	0″–2″	Dark grey to black silt loam; weak crumb structure; no stones; pH 4.0.
A_2	2″–6″	Dark grey silt loam; pH 4.3.
B_1	6″–15″	Dark grey to yellowish brown silt loam; firm; massive; mottled; pH 5.9.
B_2	15″–30″	Dark grey silty clay loam; mottled; firm; pH 6.0.
C	below 30″–32″	Greyish and yellowish clay loam; mottled; firm; pH 6.0.

The profile does not usually show any structural characteristics except in a few places, where it develops a weak nuciform structure in the lower horizons. In the small depressions the surface layer is thicker and decidedly mucky in appearance and the A_2 horizon is thicker also. The profile is quite acid especially in the surface. When cultivated, the surface soil becomes a greyish black to light greyish brown silty loam to plough depth.

Agriculture.—Nearly all of the Yamaska silt loam is cleared and used for agricultural purposes. It is suitable for a wide variety of crops, particularly vegetables, flax and sugar beets, but hay and grain occupy the largest acreage. Hay yields 1 to 2 tons per acre, oats 35 to 40 bushels, corn 10 to 12 tons and potatoes 200 to 250 bushels per acre on this soil type. The Yamaska silt loam is ploughed more often in Shefford county than in the other counties. Crop rotation usually consists of one year grain, one year roots and two to five years hay. The application of farm manure gives increased yields and benefits soil tilth and moisture conditions. The fertilizers used on this soil type include 4-8-10 for hoed crops and 2-12-6 for grain. There is slight sheet erosion on this soil type and severe gully erosion near the rivers. The soil needs careful handling with hoed crops in order to prevent too much sheet washing of the surface soil.

Yamaska Loam and Fine Sandy Loam

Associated with the Yamaska silt loam is a small area in Missisquoi county of 128 acres in which the surface soil is a loam to a fine sandy loam in texture. This area is slightly better drained than the silt loam, but the profile is similar, except in the texture of the surface soil. The Yamaska loam and fine sandy loam have about the same crop value as the silt loam.

Richelieu Clay Loam

The Richelieu clay loam is found mainly in western Missisquoi county and occupies an area of 6,566 acres. It is developed from alluvio-lacustrine silty clay loam to clay deposits and is somewhat similar to the Yamaska soils. It usually has a nearly level to gently undulating topography with a gentle slope towards the Richelieu River. Like the Yamaska soils, surface drainage varies with topographic difference, but the internal drainage is imperfect and usually poor in depressional areas. The surface is generally free from stone, although a few scattered boulders may occur in some places. There are no large stands of trees on this soil type and natural vegetation consists of a few scattered elm and maple trees. A description of a profile of typical undisturbed Richelieu clay loam follows.

Horizon	*Depth*	*Description*
A_0–A_1	0″–6″	Grey brown clay loam; usually a well developed crumb structure; friable; pH 5.7.
A_2	very patchy	Usually absent.
B_1	6″–20″	Greyish silty loam to clay loam; mottled; massive; plastic when wet pH 6.3.
B_2	20″–30″	Grey brown clay loam; weak nuciform structure; mottled; pH 7.0.
C	below 30″	Grey clay; mottled with rusty brown patches; massive; pH 7.1.

The presence of an A_2 horizon in this soil type is infrequent and is only found in the better drained well developed and little disturbed profiles. In many places the Richelieu soils resemble the Yamaska soils, but have better developed horizons, are less acid and are usually heavier in texture. The soil is acid in the surface, but the subsoil is neutral to slightly alkaline in reaction. The cultivated surface soil is a dark greyish brown clay loam to plough depth. A small area has been mapped as the Richelieu fine sandy loam. The surface texture of this soil is somewhat lighter than that of the clay loam and the internal drainage is slightly better, but otherwise the profile is the same.

Agriculture.—Practically all the Richelieu clay loam in the surveyed area is cleared and under cultivation. It is suitable for a variety of crops including hay, grain, corn, potatoes, flax and sugar beets. Hay yields 1 to 1½ tons per acre and oats about 35 to 40 bushels per acre. Corn, roots and potatoes also give good yields on this soil type. The rotation used on this soil type usually consists of one year hoed crops, one year grain and two or three years hay. Where fertilizer is used, the 2-12-6 for grain and 4-8-10 for hoed crops are commonly applied. Applications of lime are needed on this soil type in practically all cases for best results especially for legumes. The Richelieu fine sandy loam seems to be slightly better suited to potatoes and roots than the clay loam, hay and grain give about the same yields. Pastures are only fair and tend to become very dry during the summer months.

Iberville Clay Loam

This soil type occurs on level to depressional areas associated with the Richelieu and Ste. Rosalie soils. It occupies an area of 2,012 acres in western Missisquoi county. The external drainage varies from imperfect to poor and the internal drainage is usually poor, especially in the small depressions. The surface is practically free from stones and there are only scattered elm and maple trees. The surface soil of 6 to 10 inches is a black clay loam mucky in appearance when wet, but it has a well developed crumb structure when dry. This is underlain by a grey, mottled silty clay to clay to a depth of 40 to 50 inches below the surface. Generally this soil type shows no distinct horizon development. The subsoil has a massive structure and is usually plastic when wet.

The Iberville clay loam is suitable for crops only where drainage is better than average or where it has been improved artificially and on these areas some hay and grain are grown. Such areas are small, however, and in a single field, there are often patches where hay growth is stunted or replaced by sedges, due to poor drainage conditions. In some fields it was observed that oats were only about a foot high at maturity and the grain was not developed. A lack of nitrogen seems to be evident everywhere on this soil type, but this may possibly be overcome by better drainage conditions, which will enable the micro-organisms to become more active.

Ste. Rosalie Clay Loam

The Ste. Rosalie clay loam is found in Missisquoi county where it occupies an area of 11,764 acres. It is developed from lacustrine-marine clays deposited by the Champlain Sea. The overall topography may be described as level, but the micro relief consists of long gentle knolls which usually are hardly noticeable, but which somewhat affect local drainage conditions. The surface drainage varies from fairly good on the tops of these gentle knolls to imperfect on the more level areas. Internal drainage is usually imperfect. There are no stones on the surface of this soil type. Very little of the natural vegetation still remains on the Ste. Rosalie soils and this consists of scattered elm and maple trees. A description of a typical profile of the Ste. Rosalie clay loam is given below.

Horizon	*Depth*	*Description*
A	0″–6″	Greyish brown to black clay loam; crumb structure; pH 5.4.
B	6″–20″	Grey clay to clay loam; weak nuciform structure; sometimes massive; slightly mottled; may have a pinkish tinge; pH 6.7.
C	below 20″–24″	Dark grey to yellowish grey clay; nuciform to massive structure; mottled; pH 7.0.

The amount of mottling in this soil type varies with the drainage conditions. On the gentle knolls, the B horizon is often greyish brown in colour and very little mottling is evident, while on flat or depressional areas there is strong mottling below the ploughed layer. In most cases it was found that the surface soil was quite acid, but the subsoil is neutral to slightly alkaline in reaction. In some places the Ste. Rosalie clay loam occurs as narrow strips between ridges of the St. Sebastien and Henryville soils with which it forms a complex. The cultivated surface soil is a greyish brown clay loam.

Agriculture.—Most of the Ste. Rosalie clay loam has been cleared and is under cultivation. It is one of the most fertile soils in the area and it is suitable for most of the common farm crops which are adapted to the region. Most of the land is devoted to mixed and dairy farming for which purposes it is well suited. Hay produces generally 1 to 2 tons per acre, depending to some extent on the length of time the field has been down to hay, and oats yield on the average 30 to 40 bushels per acre. Oats are often grown as a mixed crop with barley and wheat. Corn does not do as well as on some of the drier soils, but yields 12 to 15 tons per acre, roots do also fairly well. Sugar beets and flax are well adapted to this soil type but potatoes are not so well suited to this soil type as to the lighter-textured soils of the area.

Successful crop production on the Ste. Rosalie soils depends a great deal on soil management. Ploughing, cultivation and seeding operations should be carried out at optimum moisture conditions. If the soil is handled when too wet, poor physical conditions of the soil are brought about which may last throughout the season. On the other hand, if the soil is too dry, it is difficult to handle and it remains cloddy until it is broken up by frost action.

The provision of drainage outlets and surface drains is also important on this soil type. Ploughing the land in narrow strips and the establishment of broad crowns or ridges has also been successful in many cases. The installation of tile drains where outlets are available will not only remove surplus water, but will also promote the formation of better structure in the subsoil and thus make the soil more porous.

The common rotation usually consists of one year hoed crops, one year grain and two to three years of hay, the last year of hay often being used for pasture depending on the amount of permanent pasture available on the farm. The pastures on the Ste. Rosalie clay loam are usually fair to good during the early part of the season, but they usually suffer from drought during the dry summer months. Fertilizer treatments and applications of lime usually give fair to good responses on the soil type.

Ste. Rosalie Clay Loam—Calcareous Phase

About 1300 acres have been mapped as the calcareous phase of the Ste. Rosalie clay loam. The main difference between this phase and the ordinary

Ste. Rosalie soils is the calcareous nature of the subsoil. The clay subsoil often has lenses or bands of reddish brown and brown clay alternating with the grey clay and in some cases the entire subsoil is reddish brown. Both the reddish brown and the grey clay are calcareous. The topography and drainage conditions of the calcareous phase are very similar to that of the ordinary clay loam. The surface soil is often somewhat darker than in the ordinary clay loam. Occasional ice rafted boulders are found on the surface.

The agricultural adaptability and fertility of the calcareous phase is similar to that of the Ste. Rosalie clay loam.

Ste. Rosalie Loam

The Ste. Rosalie loam occurs on ridgetops slightly above the level of the other Ste. Rosalie soils. It occupies an area of 640 acres west of Missisquoi Bay. Surface drainage is usually good, but internal drainage is imperfect and there are occasional boulders on the surface. Much of this soil is covered with maple and elm trees.

The surface soil is a brown loam to a depth of 6 to 8 inches and grades into a greyish brown mottled loam to silty loam subsoil. The C horizon, which is usually reached at a depth of 10 to 20 inches is a grey clay loam to clay with a massive structure. The soil is fairly acid in the surface, but neutral in reaction in the subsoil.

Hay yields 1 to 1½ tons per acre and oats 30 to 35 bushels per acre. Corn also seems to produce good crops. The soil seems to be very productive, but most of the land is at present in woods.

Ste. Rosalie Heavy Clay Loam

About 1,900 acres of the Ste. Rosalie soils were mapped as a "heavy clay loam" type. This type has a somewhat heavier texture in the upper horizons than the clay loam. It generally is found in flat to depressional areas between ridges of St. Sebastien soils and is imperfectly to poorly drained. The surface soil generally is somewhat darker than in the clay loam and often is somewhat mucky.

Agriculture.—Most of this soil is in bush consisting of red maple, elm, ash, willow and alder. Some cleared fields in which drainage conditions have been improved are used for hay, pasture and grain.

E.—Miscellaneous Soils

This group includes soils which do not fall into the general classification scheme. The members of this group are the Iron Hill gravel, rough stony land, muck, peat, swampy land and soil complexes.

The Iron Hill gravel is a shallow stony soil developed from syenitic gravel. It occurs on rough, broken topography and it is either in forest or is used chiefly for pasture.

Rough stony land includes areas with steep slopes or too much stone to be fit for agricultural purposes. Fortunately most of these areas are in forest.

Some of the muck areas are fairly well drained and suitable for the growing of cash crops, although they are not much used for this purpose at the present time. The peat areas are poorly drained and often swampy and are not suitable for agricultural purposes.

Swampy land includes areas of shallow organic accumulations on which water stands most of the year.

In places where two soil types were intimately mixed, the whole was mapped as a complex. These complexes have undulating to gently rolling relief, with the well drained member on the ridges and the imperfectly or poorly drained member in the hollows. The members of the complex are not necessarily developed from the same materials. The complexes mapped in the surveyed area include the Milton-Shefford complex, the Henryville-Bedford complex, the Henryville-Ste. Rosalie complex and the St. Sebastien -Ste. Rosalie complex.

These miscellaneous soils are discussed in detail below.

Iron Hill Gravel

The Iron Hill gravel is found only in Brome county and occupies an area of 1,318 acres around Brome mountain. The soil is developed from coarse gravel formed by the disintegration of syenitic material. The relief is usually rolling or broken by outcrops and the surface is very stony. Both internal and external drainage are good to excessive. Generally, no definite profile is developed on this material but in a small area near Brome Pond, the material is partly weathered to form a dark brown loam to a depth of four to five inches which is underlain by broken rock fragments and angular gravel, which grades into the syenitic bedrock. This type is used chiefly for rough pasture.

Rough Stony Land

Rough stony land occupies a total area of 122,203 acres or 13 per cent of the surveyed area. Areas mapped as rough stony land are broken by outcrops, contain many stones and boulders or are so shallow that they are unsuitable for agricultural purposes. Fortunately most of these areas are in forest and should remain so, since they generally occupy the higher slopes where the clearing of timber would result in severe erosion of the more valuable land on the lower slopes.

Muck

The muck soils of the area occur chiefly in Shefford and Missisquoi counties and occupy a total area of 2,906 acres. They occupy depressional areas in the surrounding mineral soils and are usually poorly drained. The natural vegetation on these soils consists principally of cedar, tamarack, spruce and birch. The muck soils consists of fairly well decomposed organic material such as wood remains, sedges and grasses and vary in depth from 24 to 60 inches. The upper 10 to 15 inches of this is well decomposed, black and friable, but the lower part of the profile varies from medium well decomposed to poorly decomposed peaty material. About half of the muck soils were mapped as shallow muck in which the organic material is less than 18 inches deep. These areas are perhaps slightly better decomposed than the deeper areas, although in some places they are not so well drained.

The mucks are not used for intensive cultivation, although they are well suited to truck crops and the largest tracts are in hay or pasture. Some small acreages of corn, grain and potatoes are grown also. Hay yields a fair crop, but grain tends to lodge, because of the excessive supply of nitrogen which is common in these organic soils. The natural supply of phosphorus and potash is very low in these soils and the high nitrogen content needs to be balanced by applications of phosphate and potash in order to grow successful crops. The fertilizer applications commonly recommended for mineral soils do not give the same results on muck soils and judgement should be used when fertilizing crops on this soil type. Pastures are poor on the muck soils as the tramping of the cattle destroys the sod. Most of the muck soils in the area could be more profitably used than at present.

Peat

Peat soils occur in all three counties, occupying an area of 20,537 acres. They consist of semi-decomposed organic material in depressional areas and are poorly drained. They are covered with a growth of wire birch and black spruce trees and sphagnum moss. The depth of these peat deposits varies from 20 inches to 12 or 15 feet. There has been considerable surface burning in many places and on some of the shallower areas hay is grown, but the yields are low. Very little of the peat soil is used for agricultural purposes.

Swampy Land

Areas mapped as swampy land occupy 25,088 acres, scattered throughout all three counties of the surveyed area. These areas consist of thin accumulations of organic material in depressions which are poorly drained and which are covered with water during wet periods. In some cases the water is held up by the underlying bedrock, while in others, a compact till holds up the water, which is prevented from draining away by the nature of the surrounding topography. Practically all of these areas are covered with cedar, spruce, and poplar trees and are not used for agriculture.

Soil Complexes

Milton-Shefford Complex

This soil complex covers an area of 33,555 acres in Brome and Missisquoi counties. It includes mixed areas of the two types in which either the Milton soils or the Shefford soils are dominant. The topography varies from nearly level to undulating. Surface and internal drainage is good on the knolls occupied by the Shefford soils and only fair on the Milton soils. Most of the stone in this complex is found on the Milton soils, but generally there is not enough to interfere with cultivation. On areas where the Shefford soils are dominant, some shale rock outcrops occur. Natural vegetation consists of maple, birch, poplar and cedar. The profiles of these types have already been described and all variations between the two types are found in the complex.

Agriculture.—Most of the areas in which the Milton soils are dominant are cleared, while those in which the Shefford soils are dominant are mostly in bush or rough pasture. It is often difficult to utilize these soils to best advantage, particularly on the individual farm where there may be only a small acreage of each. On some farms the Shefford soils are planted to orchard, hay or grain and the Milton soils are used for pasture. On others, dominance of the Milton soils requires a major proportion of the crops to be grown on this type. In general, hay and grain are more productive on the Milton soils, while potatoes, hoed crops, corn or orchard are better suited to the shaly ridges. This advantage is utilized by some farmers on this soil complex.

Henryville-Bedford Complex

The Henryville-Bedford complex occupies an area of 1,702 acres in Missisquoi county. The topography varies from undulating to gently undulating and in places a series of knolls breaks the relief. The Henryville soils are dominant in the complex and occur as eroded shaly knolls which are high in lime. Drainage varies from good on the knolls to imperfect or poor on the more level topography. There is not much stone on the surface and nearly all the area is under cultivation, the largest area being near Clarenceville. Hay, grain, and pasture are the chief uses of the complex. Hay and grain give good yields. The shaly limestone knolls of the Henryville soils support an excellent growth of alfalfa and clover. Pastures are usually very good on this complex and have a good growth of nutritive grass species.

Henryville-Ste. Rosalie Complex

The Henryville-Ste. Rosalie complex occupies an area of 640 acres in Missisquoi county. The Ste. Rosalie soils are found as nearly level narrow tongues between the Henryville soils which occupy the knolls and give the whole complex an undulating relief. In some places the Ste. Rosalie soils are quite extensive and may be planted to separate crops, but usually these two types are so intimately mixed as to require mutual cropping practices. The Ste. Rosalie soils have a better moisture-holding capacity than the Henryville soils and may produce better yields in dry years. This complex has a fairly high crop value due to its content of lime.

St. Sebastien-Ste. Rosalie Complex

This complex occurs in southwest Missisquoi county and covers an area of 896 acres. The St. Sebastien soils predominate in the complex. The heavy Ste. Rosalie soils are found between the ridges of the St. Sebastien soils and maintain their profile characteristics right up to the edge of the slaty ridges where the St. Sebastien soils begin. Drainage on the Ste. Rosalie soils is imperfect, but the St. Sebastien soils are well drained.

Practically all of this complex is cleared and under cultivation. Hay and grain are the chief crops grown and these give good yields on the Ste. Rosalie areas, but are thin on the St. Sebastien soils. In places where the types are very mixed, a single crop is sown on both types and this results in a patchy crop. The complex has a crop value somewhat less than either soil type alone, except where large areas of the Ste. Rosalie soils lie between the ridges.

The stonier areas are used for pasture, which is quite good as alfalfa seems to grow well on the small knolls of the St. Sebastien soils and the Ste. Rosalie soils support a good growth of grasses.

VI. LAND USES AND AGRICULTURAL METHODS

Within the surveyed area only 89 per cent of the land is occupied and of this 45 per cent or 372,446 acres is improved, the remainder being in woods, natural pasture or swamp. A larger proportion of the land is cleared and cultivated in the western part of the area where the soils are generally more fertile than in the eastern part. Dairying or mixed farming is the most important agricultural enterprise, followed by fruit growing, poultry raising and market gardening.

Most of the well-drained soils of the area have favourable texture and structure for good root penetration, adequate drainage and fair to good moisture-holding capacity, except the outwash soils, which are usually excessively drained. Generally, however, the imperfectly drained, heavier-textured soils are more fertile. On a large percentage of the soils of the upland developed from till, stoniness and drainage are limiting factors in the production of cultivated crops.

The soils of the area differ widely in their natural fertility, but most of the soils respond to fertilization and are capable of being built up and maintained in a fairly productive state. Some of the soils are especially suitable for the production of certain crops, such as the Shefford and Rougemont soils for orchard, the Yamaska, Ste. Rosalie and Richelieu soils for sugar beets and flax and the Ste. Brigide soils for truck crops and tobacco. It is recognized, that the heavier-textured soils are most productive for such crops as hay and grain. The lighter-textured soils are not so productive but better suited to such crops as potatoes, market garden crops and small fruits. Practically all of the soils of the area have acid surface soils, but the soils of the St. Lawrence plain tend to become neutral or slightly alkaline in reaction with depth.

The main crops grown in the area include hay, grain, corn, potatoes, roots, sugar beets and apples. Throughout most of the area hay consists of clover, timothy and redtop, but in the western part of the area some alfalfa is grown, particularly on the Henryville soils. In many cases land has been left in continuous hay for long periods and such fields have a poor stand and the soil is depleted by continuous cropping. After two years the seeded grasses begin to be replaced by less desirable plants such as couch grass, Kentucky blue grass, redtop, red fescue, poverty grass and other weeds. A shorter rotation and the use of fertilizer is the best treatment for these fields.

Grain consists chiefly of oats with small acreages of flax, wheat, barley and buckwheat. Several varieties of oats are grown including Banner, Vanguard, Cartier and Mabel and different varieties are favoured in different sections. Although the Banner oat seems to be the most popular, the Vanguard and Mabel should be preferred. A new variety—the Roxton seems to be especially suited to the area. Some barley (O.A.C. 21 and Charlottetown 80) and wheat are grown, but are only of local importance. There appears to be an increasing acreage devoted to the growing of flax, particularly on the heavier-textured Yamaska, Ste. Rosalie and Richelieu soils, which also have been found to be very suitable for the growing of sugar beets. Corn is grown for silage, particularly on the heavier soils in the western part of the area. Potatoes are grown mainly on the lighter-textured till soils of the upland such as the Shefford soils or on the sandy outwash soils such as the Colton or St. Francis soils. Apple growing is carried on rather extensively on the Rougemont and Shefford soils and to considerable extent on the Woodbridge soils.

Commercial fertilizers and lime are used extensively on many of the farms in the western part of the area, but in the eastern part of the area their use is not so general. With the exception of the Henryville soils, lime is needed on practically all the soils of the area and hay crops show quite marked response to liming. Most farmers recognize the need for lime, but this amendment is not used as extensively as it should be in the area. Most of the commercial fertilizers are ready mixed but some unmixed chemical fertilizers are also used. The mixtures commonly used for potatoes are 4-8-10 and 2-12-10, for corn 4-8-10, for grain 2-12-6, for tobacco 5-8-10 and for pastures 0-16-6. Many farmers apply manure to their hay fields, but when the supply is limited it is applied to hoed crops.

Most farmers in the area realize that a crop rotation is an essential part of good farming and some form of rotation is practised on the better farms, particularly in the western part of the area. On the soils of the St. Lawrence plain a five-year rotation is usually followed consisting of hoed crops 1 year, grain 1 year, hay 2 years and pasture 1 year. Where a permanent pasture is established on the farm, the rotation is reduced to 4 years. On the soils of the Appalachian Upland, the fields are often left much longer in hay. In places where market garden crops are grown, crops are rotated so that the same crop is not grown on the same field too often.

Since dairying is the most important agricultural enterprise more attention should be given to pasture management throughout the area. On most of the unimproved pasture land the growth of small trees, hardhack and other shrubs does not give the grass a fair chance. Proper fertilization and grazing management would greatly increase the carrying capacity of the pastures.

The well-drained soils developed from glacial till include the Ascot, Berkshire, Blandford, Roxton, Racine, Shefford, St. Sebastien, Henryville and Farmington soils. The Ascot and Berkshire soils are used chiefly for pasture after the bush has been cleared off and only small areas are under cultivation. Hay and grain give low yields and manure and fertilizer are needed for successful production. Usually stoniness and rough topography prohibit the cultivation of these types. The Blandford soils are the most extensive of the upland soils and are suited to a variety of crops. They appear to be good grass soils and the stonier areas make good pasture. Some alfalfa is grown on these soils, but does not maintain a stand. Possibly liming may correct this. On the soils of the Racine and Roxton series stoniness is a factor which determines the amount of land under cultivation. A greater part of these soils is suitable only for pasture, which varies from fair to poor. Hay, grain, and corn give low yields, but results are better on the Racine than on the Roxton soils. In places the Roxton soils are suitable for orchard, but they tend to dry out rapidly and this factor must be taken into consideration before planting. Both of these types require organic matter and they also respond well to phosphate fertilization.

The Shefford soils are nearly all under cultivation and hay, grain, corn and potatoes are the principal crops grown. A large proportion of this type is devoted to orchard and large well established orchards are found in the vicinity of Cowansville, Dunham, Meigs Corner and St. Armand. The St. Sebastien soils are suited to the production of hay, grain, corn and potatoes, but yields are lower than on the Shefford soils. The Henryville soils grow alfalfa particularly well, due to the influence of the lime in the parent rock, but they are generally unsuited to hoed crops because of relief and shallowness. Pastures are weedy, but contain a large proportion of good grasses and white clover. The Farmington soils are very shallow over bedrock and are used chiefly for pasture.

The imperfectly- or poorly-drained soils developed from till include the Magog, Brompton, Mawcook, Woodbridge, Peru, Milton, Ste. Brigide and Bedford Series. The Magog, Brompton, Mawcook, Milton and Peru soils are poorly-drained and are used chiefly for pasture, but there are some cleared areas on these soils which are planted to hay and grain. Stoniness and drainage are important factors which restrict the use of these soils, although large areas which have been cleared are now reverting to scrubby bush. The Woodbridge soils have an imperfectly-drained subsoil due to the presence of a hardpan at a depth of 15 to 20 inches below the surface. They are used extensively for orchards in the vicinity of Frelighsburg with fairly good results especially if the drainage is improved. Apple trees planted on these soils often suffer from a deficiency of magnesium, which may be corrected to some extent with proper fertilization. It is recommended that the soil be treated with finely ground dolomitic limestone before the new plantings are made. Where the deficiency is apparent in established orchards, the application of magnesium sulphate at the rate of five pounds per tree, together with dolomitic limestone at the rate of 2 tons per acre is recommended. (10). The Woodbridge soils make fairly good pasture expecially when treated with phosphatic fertilizers. The steeper slopes of this soil are subject to water erosion unless good grass cover is provided. The Ste. Brigide and Bedford soils are imperfectly to poorly-drained and are used chiefly for hay and grain. The Ste. Brigide soils are also used for truck crops and tobacco. Cigar tobacco is grown successfully and other crops such as corn, potatoes, cabbage, cauliflower and turnips give good yields on this soil.

The light-textured soils developed from water-deposited materials include the Colton, St. Francis, Knowlton, Rougemont, Sheldon, Ste. Sophie, Rubicon and St. Damase soils. The Colton, St. Francis, Ste. Sophie, Knowlton, and Sheldon soils have good to excessive drainage and are more suitable for corn and hoed crops than for hay or grain, but in any case the yields are low. Manure or some form of organic matter is needed in these soils to hold the moisture and fertilizers must be used for successful crop production. The Rougemont soils which are developed on old terraces of the Champlain Sea are especially suited to orchard and are used for this purpose. Their value for cultivated crops is low, unless manure and fertilizers are used.

The Rubicon and St. Damase soils have imperfect drainage and drainage conditions vary within comparatively short distances. They produce reasonably good crops of hay and grain, but the crops tend to be spotty due to variable drainage. Lime and organic matter are needed on these soils.

The heavy-textured soils developed from water-deposited materials include the Ste. Rosalie, Yamaska, Richelieu, Iberville and Suffield soils. The first three are imperfectly drained and used chiefly for hay, grain, corn and roots. Crop yields vary with management and fertilizer practices and management is an important factor in crop production on these soils. These soils have also been found to be suitable for flax and sugar beets. Fields are usually left in hay for long periods which exhaust their fertility, but in recent years shorter rotations are coming into use. Pastures on these soils vary from fair to good, but they tend to become dry in the summer and must be supplemented with some form of green feed such as corn or oats. The Iberville soils are poorly drained. Improved drainage is necessary before crops can be grown successfully on this soil type.

The Suffield soils are suited to a variety of crops and most of these soils are under cultivation. Crops grown include hay, oats, corn, roots and potatoes. Due to the susceptibility to erosion, great care must be taken when hoed crops are grown on these soils and it is better to confine the production of these crops to the more level areas and to leave the rolling land in hay and pasture. Manure greatly increases hay yields on these soils and good stands of clover are obtained when lime is used. One year roots, one year grain and two years hay is a common rotation on the Suffield soils.

A large proportion of land in the surveyed area is better adapted to forest than cultivated crops because of stoniness, poor drainage or relief. More attention should be given to this phase of agriculture. The farm woodlot can become a valuable source of farm income, since it utilizes the poorest land on the farm and gives returns not otherwise available from farm crops.

In many cases the forested land occupies the higher slopes and is effective in controlling the run-off of surface water, thus preventing the erosion of more valuable land below it. It also acts as an effective flood control. Selective cutting and fire prevention should be practised in order to prevent erosion damage to the more valuable soils.

VII. CROP ADAPTATION AND LAND USE CAPABILITY

The foregoing discussions of the individual soils shows that the productivity of the soils and consequently their general capability to provide a living for the operator vary greatly in the surveyed area. The productivity of the land depends on a number of factors, such as, general climatic conditions, the soil type, its inherent fertility, ease of tillage, susceptibility and extent of erosion, drainage relief and stoniness and the management practices which are in use. To the above factors must be added the adaptability of the soil to crops, as it is well known that some soils are more suited to certain crops than others. Some soils are well suited to a number of crops, while other soils may be well suited to only one or two crops. Thus the kind of crops grown, or the use which is made of the land will greatly influence the capability of the land to produce satisfactory crops. The productivity or capability of the land has an important bearing on the farm income and consequently on land values, but the latter is also greatly affected by such factors as location in respect to transportation facilities and markets, general price levels of farm produce and the preferences of individuals for certain locations and certain types of farming.

In Table VII an attempt has been made to rate the soils in regard to their suitability for the general farm crops grown in the area. The ratings are based on information obtained from farmers, agronomes and others, on such experimental results as are available for the area and on observations made by the surveyors in the field. The most common soil management practices were considered when rating the soils. By the use of more intensive soil management practices, as is the case on some of the better farms, a given soil may be more productive than indicated in the table, on the other hand, under poor management some soils may not do as well as indicated in the table. The ratings good, fair and poor are

CROP ADAPTABILITY AND USE CAPABILITY CLASSES

SOIL TYPES	Hay	Oats	Corn	Roots	Potatoes	Orchard	Pastures	
CLASS I								
Ste. Rosalie clay loam	G	G	F	G	F	—	FG	Good crop land, suited to dairying and general farming.
Richelieu clay loam	G	G	F	G	F	—	FG	
Yamaska silt loam	FG	G	FG	G	FG	—	FG	
CLASS II								
Suffield clay loam	FG	G	FG	FG	FG	—	G	Fair to good agricultural land for general farming.
Sheldon sandy loam	F	G	G	F	G	—	F	
St. Brigide clay loam	G	G	FG	FG	FG	—	G	
St. Brigide sandy loam	F	G	F	F	G	—	F	
Ste. Rosalie loam	F	G	FG	—	—	—	FG	
Milby sandy loam	FG	FG	F	F	G	—	F	
Milby silt loam	FG	FG	F	—	G	—	F	
Blandford loam	FG	FG	G	F	G	F	FG	
Shefford shaly loam	FG	FG	G	—	G	G	F	
CLASS III								
St. Sebastien shaly loam	FP	F	FG	—	FG	—	P	Fair agricultural land for general farming.
Henryville loam	F	F	—	—	—	—	G	
Rougemont gravelly loam	P	F	FG	—	FG	G	FP	
Racine sandy loam	P	F	FG	—	G	F	FP	
Woodbridge loam	F	FG	FG	—	F	FG	F	
Brompton loam	F	FG	FP	F	F	—	FP	
Magog loam	F	FG	P	F	F	—	FP	
Milton sandy loam	F	FG	F	F	F	—	F	
Mawcook sandy loam	FP	F	P	—	—	—	F	
Bedford sandy clay loam	FG	FG	—	F	—	—	F	
St. Damase sandy loam	F	FG	F	FP	G	FP	FP	
Rubicon fine sandy loam	F	FG	F	F	FG	—	FP	
Ste. Rosalie heavy clay loam	F	F	P	—	P	—	F	
CLASS IV.								
Ascot sandy loam	P	FP	F	FP	F	—	P	Poor to fair agricultural soils for general farming.
Roxton slaty sandy loam	P	P	—	—	—	F	P	
Berkshire loam	FP	F	F	FP	F	—	F	
Blandford shaly loam	FP	F	F	FP	F	—	F	
Blandford sandy loam	FP	F	F	—	F	—	F	
Knowlton gravelly sand loam	P	P	F	P	FG	—	FP	
Colton sandy loam	P	P	F	P	F	—	P	
St. Francis sandy loam	FP	FP	F	FP	G	FP	FP	
Ste. Sophie sand	P	P	FP	P	F	FP	P	
Rubicon sandy loam	P	P	F	FP	FG	—	P	
Iberville clay loam	F	F	P	—	P	—	F	
Peru loam	P	FP	P	—	P	—	FG	
CLASS V.								
Iron Hill Gravel	—	—	—	—	—	—	FP	Submarginal agricultural land best suited to forestry. Some muck areas can be developed for market gardening.
Farmington stony loam	—	—	—	—	—	—	F	
Rough stony land	—	—	—	—	—	—	FP	
Muck	—	—	—	—	—	—	P	
Peat	—	—	—	—	—	—	P	

G—Good
F—Fair
FG—Fair to Good
FP—Fair to Poor
P—Poor
— Insufficient information, mostly unsuitable.

relative to the soils of this area. A soil which is rated as good for a certain crop in this area, may only be considered as fair for the same crop in another part of Canada and vice versa.

The soils have been grouped into five capability classes for general farming on the basis of their rating. In establishing these classes all common farm crops were considered. This grouping, therefore, cannot be applied to specialized types of farming. Thus a good soil for general farm crops may only be fair for specialized potato growing and vice versa.

The rating and grouping of the soils is only tentative and is based mainly on the judgement of the surveyors, farmers and others. It is possible that, as more accurate information becomes available, some of the ratings will have to be changed. Furthermore, more general adoption of improved soil management practices may also greatly change the grouping and rating of the soils.

Soils of Land Capability Class I.

The soils of land Class I occupy approximately 36,000 acres or 3.9 per cent of the area most of which is cleared and under cultivation. These soils are particularly well suited to dairying and general farming as they produce good yields of grain, hay and pasture under average conditions and corn does well also during the drier years. These soils are also well suited to roots and sugar beets. The natural fertility of these soils is good but responses can be obtained from fertilizers and lime. The maintenance of a good physical condition is very important in these soils as crop yields can be readily reduced if the land is handled when too wet or too dry. Due to the heavy textures and smooth topography, the drainage is generally imperfect and the provisions of artificial drains is generally beneficial.

Soils of Land Capability Class II.

The soils of this land class occupy about 155,000 acres or 16.8 per cent of the area. They are considered as fair to good agricultural land for general farming purposes. The soils in Class II have been rated lower than the soils of Class I due to one or more of the following characteristics, lower natural fertility, more broken topography, susceptibility to erosion, stoniness or poor drainage. The soils of this class are somewhat more diversified in their general appearance and in their adaptability than the soils in Class I.

The Suffield and Sheldon soils, while productive and easy to work are subject to sheet and gully erosion and as a result the more sloping areas should be restricted to pastures, hay and some grain. The Ste. Brigide soils and the Ste. Rosalie loam are fairly well suited to the growing of general farm crops and the former are also well adapted to truck crops and tobacco. The Milby soils, while quite fertile are subject to periodic flooding. This applies particularly to those areas which lie in the lower positions. The Blandford and Shefford soils are considerably lower in their natural fertility than the other soils of this class, but they generally have a good physical condition and are fairly well suited to a wider variety of crops. The Shefford soils are well adapted to apple orchards. All the soils of this group are responsive to good management such as the use of manure, fertilizers and lime.

Soils of Land Capability Class III.

The soils of this class occupy about 280,000 acres or 30.3 per cent of the area. They may be rated as fair agricultural soils, for general farming purposes, although some soils are suited for specific farm crops. The soils of Class III are generally less fertile than the soils of Class I and II. In addition, other factors such as stoniness topography and poor drainage also limit the productivity of these soils. Considerable areas of land occupied by soils of this class are in forest.

The St. Sebastien, Henryville, Rougemont and Racine soils have good to excessive drainage but steep topography and excessive stoniness often limit the use of these soils for general farming purposes. The Rougemont soils are particularly well suited to orchards and as most of these soils are used for this purpose they probably should be rated with the best soils of the area. The Woodbridge soils have an imperfectly drained subsoil. They produce fair general farm crops and in the more favourable locations, where drainage conditions have been improved, they produce good apple trees. The Brompton, Magog, Milton, Mawcook and Bedford soils are imperfectly to poorly drained and in addition stoniness is often a problem on these soils. The St. Damase sandy loam, the Rubicon fine sandy loam and the Ste. Rosalie heavy clay loam are stone free but their drainage is imperfect to poor.

Soils of Land Capability Class IV.

The soils of Class IV occupy approximately 253,000 acres or 27.3 per cent of the area. They are considered as poor land for general farm purposes although they may rate as fair to good for certain crops. The low rating is the result of poor natural fertility and one or more of the following factors, excessive or poor drainage, rough topography and excessive stoniness. Large areas of this class are in forest or permanent pastures.

The Ascot, Roxton, Berkshire and Blandford soils generally are low in fertility, often have a very rough topography and may be excessively stony or shallow. The cultivated fields are often small and broken. The Knowlton, Colton, St. Francis and Ste. Sophie soils have a low natural fertility and are generally excessively drained. The Rubicon sandy loam has a low natural fertility and has variable drainage usually resulting in uneven and spotty crops. The Iberville and Peru soils are poorly drained and the latter is frequently too stony for successful cultivation.

Soils of Land Capability Class V.

The soils of this class occupy approximately 173,000 acres or almost 18.7 per cent of the area. This land is commonly not suited for general farming purposes and most of it is in forest or permanent pasture. Small areas of the more favourably located and better drained muck are suited for market garden crops, but very little of the land is used for this purpose. The Iron Hill and Farmington soils are shallow over bedrock and are used mainly for pasture or forest, but there are small patches of the Farmington that are used for hay or garden crops. The rough stony land is mostly forested and should remain so, since it is confined mainly to the higher slopes and the forest cover helps prevent water erosion of the more valuable land on the lower slopes. The peat areas are unsuitable for crop production.

VIII. DISCUSSION OF ANALYTICAL DATA

The physical and chemical composition of the major soil types of the area is given in Table II of the Appendix. Only the principal soil types were analysed and, where possible, samples of virgin uncultivated profiles were taken. In order to obtain some information of the effects of cultivation on the surface soils, composite cultivated surface samples were taken in some cases and their analyses appear in the table with the corresponding soil type. A brief discussion of the principal nutrients found in these soils is given below:

Reaction.—All of the soils in the surveyed area have acid surface soils, while the reaction of the subsoils varies considerably. Generally the soils of the Champlain Plain have mildly acid to neutral subsoil and the well drained soils on the upland have acid subsoils. Liming is beneficial on most of the soils of the area.

Nitrogen.—The soils vary greatly in their nitrogen content both in the surface and in its distribution throughout the profile. In general the nitrogen content of the heavier-textured soils is moderately high at the surface and low throughout the rest of the profile, whereas in the lighter-textured soils, especially the podsol soils, it is high in the surface due to the leaf mold, and in the B_1 horizon. The nitrogen content of the leached A_2 horizon is generally low.

Phosphorus.—The soils vary widely in their content of total phosphorus and this element also varies greatly in its availability in the various soils. The heavier-textured soils are generally better supplied with this element. Of the soils developed from till, the Woodbridge, Milton and Brompton soils contain more phosphorus than the other soils. In the surface soils throughout the area the variation in phosphorus content seems to be related to the organic-matter content and it is probable that much of the phosphorus is in organic form. All of these soils respond to phosphate fertilization.

Potash.—All of the samples analysed were well supplied with total potash, but the Suffield, Richelieu, Ste. Rosalie, Yamaska, Bedford, St. Damase, Ste. Brigide, Rubicon, St. Francis, St. Sebastien and Woodbridge soils were better supplied than the others. Availability of this element varied widely between soil types and within the same soil type.

Calcium.—Calcium content varied widely in the soils. Those best supplied with calcium were the Ste. Rosalie, Yamaska, Rubicon and Ste. Brigide, although the surface layers of most of the soils were low in this element and liming is essential for successful crop production.

Magnesium.—This element is in good supply in all the soils with the exception of the Woodbridge, St. Francis, Mawcook, Brompton and Blandford soils. The Woodbridge soils show a deficiency of this element for the growth of apple trees.

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TABLE I.
ACREAGE AND DISTRIBUTION OF THE SOIL TYPES

TOTAL	MISSISQUOI	BROME	SHEFFORD

TABLE I.

ACREAGE AND DISTRIBUTION OF THE SOIL TYPES

SOIL TYPES	SHEFFORD		BROME		MISSISQUOI		TOTAL	
	Acres	%	Acres	%	Acres	%	Acres	%
Ascot sandy loam 3.3			6841.6	2.17			6841.6	0.75
Ascot sandy loam 3.4 — shallow phase			5254.4	1.65			5254.4	0.57
			12096.0	3.82			12096.0	1.32
Bedford sandy clay loam 1.1					883.2	0.35	883.2	0.09
Bedford sandy clay loam 2.1	499.2	0.14			992.0	0.39	1491.2	0.16
Bedford sandy clay loam 2.2					3302.4	1.33	3302.4	0.35
Bedford sandy clay loam 2.3					588.8	0.23	588.8	0.06
Bedford sandy clay loam 3.2					1107.2	0.44	1107.2	0.12
Bedford clay loam 1.2					864.0	0.34	864.0	0.09
Bedford clay loam 2.1					428.8	0.17	428.8	0.05
	499.2	0.14			8166.6	2.25	8665.6	0.92
Berkshire loam 3.4	2176.0	0.61	2208.0	0.68			4384.4	0.47
Berkshire loam 3.5 — shallow phase			10758.4	3.31			10758.4	1.22
	2176.0	0.61	12966.4	3.99			15146.4	1.69
Blandford loam 2.2	1420.8	0.40	160.0	0.05	1081.6	0.44	2662.4	0.28
Blandford loam 2.3	8268.8	2.31	3456.0	1.06	1504.0	0.59	13228.8	1.43
Blandford loam 2.4	9068.8	2.53	2809.6	0.86			11878.4	1.29
Blandford loam 3.2	6105.6	1.70	371.2	0.10			6476.8	0.71
Blandford loam 3.3	3142.4	0.78	10252.8	3.27	544.0	0.58	12939.2	1.45
Blandford loam 3.4	5753.6	1.60	2233.6	0.67	486.4	0.19	8473.6	0.92
	33760.0	9.32	19283.2	6.01	3616.0	1.80	56659.2	6.08
Blandford shallow loam 2.2					864.0	0.34	864.0	0.09
Blandford shallow loam 2.3	1081.6	0.30	780.8	0.23	108.8	0.04	1971.2	0.21
Blandford shallow loam 3.3			13324.8	4.08	4940.8	1.98	18265.6	1.98
Blandford shallow loam 3.4	30374.4	7.46	38393.6	12.17	10771.2	4.68	79539.2	8.63
Blandford shallow loam 3.5			1164.8	0.35			1164.8	0.12
Blandford sandy loam 2.2	3948.8	1.10					3948.8	0.42
Blandford gravelly loam 3.3			140.8	0.04			140.8	0.02
Blandford gravelly loam 3.4	153.6	0.04	172.8	0.05			326.4	0.03
	35558.4	8.90	53977.6	16.92	16684.8	7.04	106220.8	11.50

TABLE I. (continued)

ACREAGE AND DISTRIBUTION OF THE SOIL TYPES

SOIL TYPES	SHEFFORD		BROME		MISSISQUOI		TOTAL	
	Acres	%	Acres	%	Acres	%	Acres	%
Brompton sandy loam 2.1	2668.8	0.74					2668.8	0.29
Brompton sandy loam 2.2	844.8	0.24	121.6	0.03	595.2	0.24	1561.6	0.17
Brompton sandy loam 3.1	358.4	0.10	1811.2	0.58	1408.0	0.57	3577.6	0.38
Brompton sandy loam 3.2	29427.2	8.21	8083.2	2.56	1561.6	0.63	39072.0	4.24
Brompton sandy loam 3.3	140.8	0.04					140.8	0.02
Brompton sandy loam 3.4	256.0	0.07	1292.8	0.41			1548.8	0.17
Brompton gravelly loam 3.E			332.8	0.10			332.8	0.04
	33696.0	9.40	11641.6	3.68	3564.8	1.44	48902.4	5.31
Colton sandy loam 0.0			480.0	0.14			480.0	0.05
Colton sandy loam 0.1			153.6	0.04			153.6	0.02
Colton sandy loam 0.2			32.0	0.01			32.0	0.01
Colton sandy loam 1.2			51.2	0.01			51.2	0.01
Colton sandy loam 1.3			1686.0	0.51			1686.0	0.18
Colton sandy loam 3E			403.2	0.11			403.2	0.04
			2806.0	0.82			2806.0	0.31
Farmington loam 3.1					640.0	0.25	640.0	0.07
					640.0	0.25	640.0	0.07
Henryville loam 1.2					2016.0	0.83	2016.0	0.22
Henryville loam 2.2					672.0	0.27	672.0	0.07
					2688.0	1.10	2688.0	0.29
Iron Hill gravel 3.3			998.4	0.30			998.4	0.11
Iron Hill gravel 3.4			320.0	0.10			320.0	0.03
			1318.4	0.40			1318.4	0.14
Iberville clay loam 0.1					947.2	0.38	947.2	0.10
Iberville clay loam 1.1					1062.4	0.42	1062.4	0.11
					2009.6	0.80	2009.6	0.21

Knowlton gr. sandy loam 1.2			1683.2	0.52	1056.0	0.42	2739.2	0.29
Knowlton gr. sandy loam 1.2a	313.6	0.09	2624.0	0.82			2937.6	0.31
Knowlton gr. sandy loam 2.2a	742.4	0.21	4870.4	1.54			5612.8	0.61
Knowlton gr. sandy loam 2.3	256.0	0.07					256.0	0.03
	1312.0	0.37	9177.6	2.88	1056.0	0.42	11545.6	1.24
Magog loam 2.2			102.4	0.02			102.4	0.01
Magog loam 3.1			224.0	0.68			224.0	0.02
Magog loam 3.2			620.8	0.18			620.8	0.07
Magog loam 3.3			1804.8	0.55			1804.8	0.19
			2752.0	1.43			2752.0	0.29
Mawcook sandy loam 2.1			467.2	0.13			467.2	0.05
Mawcook sandy loam 2.2	1196.8	0.33					1196.8	0.13
Mawcook sandy loam 3.1	5760.0	1.61	806.4	0.24			6566.4	0.71
Mawcook sandy loam 3.2	14624.0	4.08					14624.0	1.59
Mawcook gr. sandy loam 2.1	153.6	0.04					153.6	0.02
	21734.4	6.06	1273.6	0.37			23608.0	2.50
Milby silt loam 0.0	4537.6	1.27	6124.8	1.95	1068.8	0.43	11737.2	1.26
Milby sandy loam 0.1					2220.8	0.90	2220.8	0.24
Milby sandy loam 0.0	147.2	0.04	1542.4	2.41	934.4	0.38	2624.0	0.28
	4684.8	1.31	7667.2	2.36	4224.0	1.71	16576.0	1.78
Milton sandy loam 1.1					966.4	0.39	966.4	0.10
Milton sandy loam 2.1	1184.0	0.33	1753.6	0.53	8268.8	3.32	11206.4	1.22
Milton sandy loam 2.2	2099.2	0.58	1804.8	0.55	7884.8	3.17	11788.8	1.28
Milton sandy loam 3.1	1356.8	0.38					1356.8	0.15
Milton sandy loam 3.2	1824.0	0.51	576.0	0.17			2400.0	0.26
Milton sandy loam 4.3	902.4	0.25					902.4	0.10
	7366.4	2.05	4134.4	1.25	17120.0	6.88	28620.8	3.11
St. Sebastien shaly loam 1.1					281.6	0.11	281.6	0.03
St. Sebastien shaly loam 1.2					2220.8	0.90	2220.8	0.24
St. Sebastien shaly loam 2.2					5164.8	2.08	5164.8	0.56
					7667.2	3.09	7667.2	0.83

TABLE I. (continued)

ACREAGE AND DISTRIBUTION OF THE SOIL TYPES

SOIL TYPES	SHEFFORD		BROME		MISSISQUOI		TOTAL	
	Acres	%	Acres	%	Acres	%	Acres	%
Peru loam 3.2, 2.3			352.0	0.11	2777.6	1.12	3129.6	0.33
Peru loam 3.3			620.8	0.18	307.2	0.12	928.0	0.10
Peru loam 3.4			96.0	0.03	2137.6	0.84	2233.6	0.24
			1068.8	0.32	5222.4	2.08	6291.2	0.67
Racine sandy loam 2.1	3027.2	0.84					3027.2	0.32
Racine sandy loam 2.2	2099.2	0.58	1689.6	0.52			3788.8	0.40
Racine sandy loam 2.4			883.2	0.26			883.2	0.09
Racine sandy loam 3.1	1241.6	0.34					1241.6	0.13
Racine sandy loam 3.2	27545.6	7.68	10592.0	3.34			38137.6	4.15
Racine sandy loam 3.3	6131.2	1.71	2041.6	0.64			8172.8	0.88
Racine sandy loam 3.4	1369.6	0.38	1248.0	0.38			2617.6	0.28
Racine sandy loam 4.2 Shallow phase	20550.4	5.72	96.0	0.03			20646.4	2.21
Racine sandy loam 4.3	1760.0	0.49					1760.0	0.19
Racine sandy loam 4E	128.0	0.04					128.0	0.01
	63852.8	16.36	16550.4	5.17			80403.2	8.66
Roxton slaty sandy loam 2.1	128.0	0.04					128.0	0.01
Roxton slaty sandy loam 2.2	5798.4	1.62					5798.4	0.64
Roxton slaty sandy loam 2.3	467.2	0.13					467.2	0.05
Roxton slaty sandy loam 3.2	11417.6	3.19			569.6	0.17	11987.2	1.30
Roxton slaty sandy loam 3.3	6540.8	1.83					6540.8	0.71
	24352.0	6.81			569.6	0.17	24921.6	2.71
Richelieu clay loam 0.0	512.0	0.14			2048.0	0.83	2560.0	0.27
Richelieu clay loam 1.1, 1.2					1004.8	0.40	1004.8	0.11
Richelieu clay loam 0.1					3001.6	1.21	3001.6	0.32
	512.0	0.14			6054.4	2.44	6566.4	0.70
Rougemont gravelly sandy loam 1.2			531.2	0.16	704.0	0.29	1235.2	0.13
Rougemont gravelly sandy loam 2.2	1760.0	0.49	345.6	0.10			2105.6	0.23
Rougemont gravelly sandy loam 3.3	864.0	0.24					864.0	0.09
	2624.0	0.73	876.8	0.26	704.0	0.29	4204.8	0.45

	2624.0	0.73	876.8	0.26	704.0	0.29	4204.8	0.45

Rubicon sandy loam 0.1	7929.6	2.21	3008.8	0.92			10937.6	1.19
Rubicon sandy loam 0.2	8499.2	2.37	7582.8	2.41	8576.0	3.44	24658.0	2.66
Rubicon sandy loam 1.2					4051.2	1.63	4051.2	0.43
Rubicon fine sandy loam 0.0	6368.0	1.78					6368.0	0.68
Rubicon fine sandy loam 0.1					3200.0	1.29	3200.0	0.34
	22796.8	6.36	10590.8	3.34	15827.2	6.36	49214.8	5.30
Shefford shaly loam 1.1					140.8	0.06	140.8	0.02
Shefford shaly loam 1.2					1792.0	0.72	1792.0	0.19
Shefford shaly loam 1.3					755.2	0.30	755.2	0.08
Shefford shaly loam 2.2	3974.4	1.11	6643.2	2.10	10899.2	4.34	21516.8	2.33
Shefford shaly loam 2.3	3737.6	1.04	921.6	0.28	8953.6	3.56	13612.8	1.48
Shefford shaly loam 2.4					806.4	0.32	806.4	0.09
Shefford shaly loam 3.2	3686.4	1.03	1267.8	0.39	268.8	0.11	5223.0	0.57
Shefford shaly loam 3.3 } Shallow phase	640.0	0.37	1734.4	0.53	1107.2	0.45	3481.6	0.37
Shefford shaly loam 3.4					1024.0	0.40	1024.0	0.11
	12038.4	3.55	10567.0	3.30	25747.2	10.26	48352.6	5.24
Sheldon sandy loam 0.2			332.8	0.10	352.0	0.14	684.8	0.07
Sheldon sandy loam 0.3			128.0	0.04	460.8	0.18	588.8	0.06
Sheldon sandy loam 0.E			1184.0	0.36			1184.0	0.13
			1644.8	0.50	812.8	0.32	2457.6	0.26
Suffield clay loam 0.0	524.8	0.15	51.2	0.02	1267.2	0.51	1843.2	0.20
Suffield clay loam 0.1	1606.4	0.45	2105.6	0.64	3148.8	1.26	6860.8	0.74
Suffield clay loam 0.2	1683.2	0.47	921.6	0.27			2604.8	0.28
Suffield clay loam 0.3	1228.8	0.34	4384.0	1.40	3116.8	1.26	8729.6	0.94
Suffield clay loam 2.0	332.8	0.09					332.8	0.04
Suffield clay loam 0.E	332.8	0.09	723.2	0.21			1056.0	0.11
Suffield clay loam 1.1			883.2	0.26			883.2	0.09
Suffield loam 0.1					729.6	0.30	729.6	0.08
	5708.8	1.59	9068.8	2.80	8262.4	3.33	23040.0	2.48
Ste. Brigide clay loam 1.1					2336.0	0.95	2336.0	0.25
Ste. Brigide clay loam 1.2					2784.0	1.13	2784.0	0.30
Ste. Brigide sandy loam 1.1					3136.0	1.27	3136.0	0.34
					8256.0	3.35	8256.0	0.89
St. Damase sandy loam 0.0					748.8	0.30	748.8	0.08
St. Damase sandy loam 0.1					2310.4	0.94	2310.4	0.25
St. Damase sandy loam 1.1					678.4	0.26	678.4	0.07
					3737.6	1.40	3737.6	0.40

TABLE I. (continued)

ACREAGE AND DISTRIBUTION OF THE SOIL TYPES

SOIL TYPES	SHEFFORD		BROME		MISSISQUOI		TOTAL	
	Acres	%	Acres	%	Acres	%	Acres	%
St. Francis sandy loam 0.0	281.6	0.08					281.6	0.03
St. Francis sandy loam 0.1	5369.6	1.50	32.0	0.01	76.8	0.03	5478.4	0.60
St. Francis sandy loam 0.2	1356.8	0.38	1862.4	0.57	2323.2	0.94	5542.4	0.60
St. Francis sandy loam 0.3	953.6	0.26	1267.2	0.38			2220.8	0.24
St. Francis sandy loam 1.2	25.6	0.01					25.6	0.01
St. Francis sandy loam 2.2	198.4	0.05					198.4	0.02
St. Francis sandy loam 0.E	864.0	0.24					864.0	0.09
	9049.6	2.52	3161.6	0.96	2400.0	0.97	14611.2	1.59
Ste. Sophie sand 0.1	1139.2	0.32					1139.2	0.12
Ste. Sophie sand 0.2	4723.2	1.32	851.2	0.27	966.4	0.39	6540.8	0.71
Ste. Sophie sand 0.3, 1.2					288.0	0.11	288.0	0.03
	5862.4	1.64	851.2	0.27	1254.4	0.50	7968.0	0.86
Ste. Rosalie clay loam 0.0	128.0	0.04			10444.8	4.19	10572.8	1.13
Ste. Rosalie clay loam 0.1					1190.4	0.49	1190.4	0.13
Ste. Rosalie heavy clay loam 0.0					1104.8	0.41	1104.8	0.11
Ste. Rosalie heavy clay loam 1.1					819.2	0.32	819.2	0.09
Ste. Rosalie loam 0.1, 2.1					640.0	0.26	640.0	0.07
	128.0	0.04			14199.2	5.67	14327.2	1.53
Woodbridge loam 2.4			1075.2	0.32	614.4	0.24	1689.6	0.18
Woodbridge loam 3.3	851.2	0.24			160.0	0.06	1011.2	0.11
Woodbridge loam 3.4	5587.2	1.56	7571.2	2.39	5516.8	2.21	18675.2	2.03
Woodbridge shallow loam 3.4					953.6	0.39	953.6	0.10
	6438.4	1.80	8646.4	2.71	7244.8	2.90	22329.6	2.42

Yamaska silt loam 0.0	15865.6	4.42	83.2	0.02	64.0	0.02	16012.8	1.71
Yamaska silt loam 0.1					1619.2	0.65	1619.2	0.17
Yamaska loam 0.1					128.0	0.05	128.0	0.01
	15865.6	4.42	83.2	0.02	1811.2	0.72	17760.0	1.89
Milton-Shefford								
Milton-Shefford complex 2.2			704.0	0.22	29145.6	11.66	29849.6	3.23
Shefford-Milton complex 2.2			2278.4	0.70	896.0	0.36	3174.4	0.34
Shefford-Milton complex 3.2			531.2	0.15			531.2	0.06
St. Sebastien-Ste. Rosalie								
St. Sebastien-Ste. Rosalie complex 0.1					192.0	0.08	192.0	0.02
St. Sebastien-Ste. Rosalie complex 1.1					704.0	0.28	704.0	0.08
Henryville-Ste. Rosalie								
Henryville-Ste. Rosalie complex 1.2					640.0	0.25	640.0	0.07
Henryville-Bedford								
Henryville-Bedford complex 1.2					1555.2	0.62	1555.2	0.17
Henryville-Bedford complex 1.E					147.2	0.06	147.2	0.02
			3513.6	1.07	33280.0	13.31	36793.6	3.99
Muck	1068.8	0.30					1068.8	0.11
Muck shallow	64.0	0.02			1772.8	0.32	1836.8	0.20
	1132.8	0.32			1772.8	0.32	2905.6	0.31
Peat	11980.8	3.34	1657.6	0.50	6720.0	2.69	20358.4	2.20
Peat shallow	51.2	0.01	128.0	0.03			179.2	0.02
	12032.0	3.35	1785.6	0.53	6720.0	2.69	20537.6	2.22
Alluvial soils undifferentiated	1875.2	0.52	4772.4	1.52	960.0	0.39	7609.6	0.82
Swampy land	9804.8	2.73	4217.6	1.35	11065.6	4.45	25088.0	2.72
Rough stony land	22220.8	6.20	88251.2	27.72	11731.2	4.72	122203.0	13.17
Military area					2112.0	0.85	2112.0	0.23
Lakes	1516.8	0.42	11584.0	3.66	12774.4	5.13	25875.2	2.82
TOTAL OF TABLE	358598.4	100.0	316851.2	100.0	249350.4	100.0	924800.0	100.0

TABLE II

ANALYSES OF SOIL SAMPLES — CHEMICAL AND PHYSICAL COMPOSITION

	CHEMICAL ANALYSES															PHYSICAL ANALYSES				
						Available												100%		
Horizon	Depth in Ins.	Loss on Ignition %	Moisture %	pH	Lime req. lb. CaO p/Ac.	K_2O ppm	P_2O_5 ppm	Total N %	Total P_2O_5 %	Total K_2O %	Total CaO %	Total MgO %	Total SiO_2 %	Total Al_2O_3 %	Total Fe_2O_3 %	Gravel 1mm %	Sand 1-.05 mm %	Silt .05 .005 mm%	Clay .005 mm %	Fine Clay .002 mm %
BEDFORD SANDY CLAY LOAM																				
A..........	0– 7	9.23	2.92	5.6	2968	74	18	0.32	(a 0.15	1.90	1.26	1.80	69.5	13.53	7.05	12	46.4	30.4	23.2	18.4
									b 0.16	2.09	1.38	1.98	71.1	15.09	7.48					
B_1.........	7–20	3.36	1.35	5.9	742	25	53	0.10	(a 0.11	2.25	1.40	2.15	69.8	15.30	7.31	24	52.8	23.6	23.6	19.2
									b 0.11	2.32	1.45	2.22	72.2	15.84	7.55					
B_2.........	20–34	1.19	1.31	6.3	371	34	178	0.07	(a 0.13	2.35	1.73	1.55	69.3	15.92	7.75	7	46.8	31.6	21.6	19.2
									b 0.14	2.38	1.76	1.57	70.0	16.09	7.82					
C..........	34–	1.32	1.15	6.6	....	50	535	0.06	(a 0.18	2.39	1.47	1.66	70.7	16.16	6.88	21	47.2	27.2	25.6	19.2
									b 0.18	2.42	1.49	1.68	71.5	16.44	6.96					
BLANDFORD SANDY LOAM																				
A (c).......	0– 6	9.64	2.70	4.8	4384	84	8	0.37								20	51.2	37.4	11.4	7.2
A_0-A_1......	1– 2	36.51	5.32	4.0	14616	484	32	1.23	(a 0.24	1.19	0.81	0.78	51.6	8.40	3.23	3	59.2	36.8	4.0	
									b 0.39	1.80	1.22	1.24	81.1	13.21	5.10					
A_2.........	2– 3	4.02	1.04	4.0	2923	59	7	0.17	(a 0.07	1.92	0.70	0.71	79.1	11.67	4.51	1	53.2	36.0	10.8	5.2
									b 0.07	1.98	0.74	0.74	81.5	12.18	4.70					
B_1.........	3–10	7.81	3.08	4.3	5115	46	9	0.22	(a 0.27	1.56	1.06	1.00	69.2	15.45	6.15	6	57.2	38.0	4.8	1.8
									b 0.29	1.70	1.16	1.19	75.1	16.77	6.69					
B_2.........	10–26	2.01	1.47	5.1	730	26	12	0.08	(a 0.21	2.03	1.45	1.24	73.8	17.59	6.05	12	63.2	32.4	4.4	1.8
									b 0.21	2.06	1.47	1.26	75.2	18.00	6.19					
C..........	26–	0.68	0.60	5.3	365	10	18	0.05	(a 0.11	1.63	1.67	1.22	76.1	15.28	5.15	16	67.2	26.4	6.4	4.0
									b 0.17	1.64	1.68	1.23	76.6	15.38	5.20					
BROMPTON STONY SANDY LOAM																				
A_0-A_1.....	0–10	28.12	7.38	5.2	5846	127	10	0.88	(a 0.25	1.08	1.44	1.26	46.6	15.93	5.40	..	53.6	36 4	10.0	5.8
									b 0.35	1.49	1.99	1.71	64.4	21.90	7.50					
A_2.........	10–15	1.54	0.28	5.6	365	11	62	0.05	(a 0.16	1.56	1.37	1.29	74.6	14.83	6.16	39	65.6	24.4	10.0	7.2
									b 0.16	1.58	1.39	1.31	75.8	15.03	6.26					
B..........	15–24	0.52	0.29	6.4	365	12	194	0.05	(a 0.17	1.85	1.60	1.15	75.8	15.37	5.26	21	51.6	34.4	14.0	8.8
									b 0.17	1.86	1.61	1.16	76.1	15.41	5.29					
C..........	24–	0.46	0.30	6.6	....	10	240	0.05	(a 0.18	2.00	1.67	1.14	75.0	15.52	6.00	19	53.6	34.4	12.0	10.8
									b 0.18	2.00	1.68	1.15	75.4	15.58	6.04					

MAWCOOK SANDY LOAM																				
A (c)......	0– 6	4.18	1.31	4.5	2192	54	36	0.16								21	54.2	38.4	7.4	6.2
A_1........	0– 2	21.20	5.70	3.8	12423	316	68	0.80	(a 0.27	1.34	0.78	1.00	57.4	15.50	2.88	10	54.6	35.0	10.4	....
									b 0.35	1.70	0.98	1.27	72.8	20.43	2.92					
A_2........	2– 8	1.44	0.50	4.4	1461	8	8	0.05	(a 0.05	1.73	1.20	0.94	77.3	15.63	4.02	14	72.4	12.8	14.8	10.8
									b 0.06	1.76	1.22	0.96	78.5	15.86	4.08					
B..........	8–22	0.97	0.77	5.8	730	8	42	0.05	(a 0.10	2.04	1.37	1.31	73.0	16.50	6.20	9	68.0	14.0	18.0	13.8
									b 0.10	2.06	1.39	1.32	73.9	16.65	6.27					
C..........	22–	0.54	0.36	6.3	....	7	48	0.02	(a 0.09	2.31	1.50	1.31	74.9	15.18	6.43	33	92.8	3.3	3.9	2.9
									b 0.09	2.32	1.51	1.31	75.2	15.24	6.47					
MILBY SILT LOAM																				
A (x).......	0–10	10.29	2.13	4.8	2923	113	45	0.42	(a 0.38	1.13	1.22	1.66	64.8	17.07	4.50	..	23.6	56.4	20.0	10.8
									b 0.38	1.26	1.37	1.86	72.2	19.17	5.03					
B..........	10–20	2.78	0.58	5.4	1461	17	39	0.08	(a 0.18	2.05	1.40	1.50	72.4	16.30	4.02	..	49.6	32.4	18.0	11.8
									b 0.19	2.11	1.44	1.55	74.4	16.78	4.15					
C..........	20–	2.79	0.58	4.3	1461	46	25	0.10	(a 0.17	1.27	1.42	1.43	72.6	16.22	3.66	..	27.6	56.4	16.0	10.8
									b 0.18	1.31	1.48	1.57	74.7	16.70	3.77					
MILTON SANDY LOAM																				
A (c)......	0– 6	10.36	1.72	5.0	2192	51	19	0.24								18	50.0	30.0	20.0	17.6
A_0-A_1......	0–1½	30.50	5.79	4.6	11692	232	18	1.02	(a 0.31	1.43	0.88	0.90	52.0	13.87	2.82	3	52.0	31.0	17.0	14.6
									b 0.45	2.13	1.27	1.30	74.8	19.90	4.05					
A_2.........	1½– 6	4.18	0.75	4.2	2192	38	18	0.09	(a 0.10	2.01	0.64	1.07	72.2	20.26	3.66	15	51.0	20.0	29.0	26.0
									b 0.10	2.10	0.67	1.12	75.4	21.20	3.82					
B..........	6–14	1.83	0.81	5.4	365	39	43	0.04	(a 0.13	1.39	0.97	1.48	70.0	18.69	5.68	21	50.0	25.0	25.0	20.2
									b 0.13	1.44	0.99	1.51	71.4	19.08	5.79					
C..........	14–	1.71	0.73	6.7	....	56	240	0.04	(a 0.16	2.10	1.30	1.61	69.0	19.64	6.25	26	48.0	24.0	28.0	23.6
									b 0.17	2.14	1.33	1.64	70.2	19.96	6.37					
MILTON SANDY LOAM																				
A_0-A_1......	0– 1	58.20	11.52	5.1	8904	691	332	2.16	(a 0.53	0.86	2.13	1.19	27.6	7.86	1.45	4	57.6	34.4	8.0	6.2
									b 1.26	2.03	5.04	2.81	65.3	18.55	3.44					
A_2.........	1– 6	3.77	1.05	4.9	1484	53	9	0.10	(a 0.07	2.20	0.63	1.40	72.3	15.62	3.96	23	39.2	28.8	32.0	28.0
									b 0.07	2.29	0.66	1.45	75.0	16.25	4.10					
B..........	6–20	2.35	0.38	5.4	371	50	91	0.08	(a 0.11	2.68	0.80	1.36	71.7	15.81	5.88	25	47.0	29.0	24.0	19.6
									b 0.12	2.74	0.81	1.39	73.3	16.04	6.14					
C..........	20–	2.03	0.31	5.6	371	27	293	0.07	(a 0.20	2.56	1.23	1.37	71.6	17.37	4.65	32	49.2	28.8	22.0	17.6
									b 0.21	2.61	1.25	1.40	73.1	17.70	4.74					
ST. SEBASTIEN SHALY LOAM																				
A (c).......	0–16	12.00	2.55	6.0	742	251	178	0.42								27	54.0	26.4	19.6	15.2
A_1.........	0–1½	10.60	2.65	5.0	5194	392	18	0.34	(a 0.12	1.84	0.98	1.37	68.2	11.26	4.99	10	41.6	28.8	29.6	23.2
									b 0.13	2.06	1.10	1.53	76.5	12.66	5.59					
A_2.........	1½– 3	2.23	1.28	4.9	4452	52	11	0.09	(a 0.06	1.80	0.70	0.93	79.6	9.64	5.37	32	45.2	29.2	25.6	21.2
									b 0.06	1.83	0.72	0.95	81.3	9.86	5.48					
B_1.........	3–15	4.70	3.01	5.2	2226	37	5	0.09	(a 0.06	2.05	1.30	1.66	70.1	14.47	7.22	66	63	21.2	15.6	13.2
									b 0.07	2.15	1.37	1.74	72.9	15.17	7.58					
B_2.........	15–26	2.94	1.31	5.3	1484	49	7	0.07	(a 0.09	2.23	1.17	1.77	69.0	15.23	7.28	52	61.6	22.8	15.6	13.2
									b 0.09	2.29	1.21	1.83	71.2	15.73	7.48					
C..........	26–	2.18	0.85	5.2	1484	28	37	0.06	(a 0.13	2.57	1.03	1.59	71.0	16.62	5.25	54	53.6	26.4	20.0	15.6
									b 0.13	2.62	1.06	1.63	72.4	17.06	5.36					

A (c) Composite cultivated sample, layer not belonging to profile below.
A (x) Cultivated layer, belonging to profile.

(a) Expressed as % of oven-dried soil.
(b) Expressed as % of minerals constituents only.

TABLE II (continued)

ANALYSES OF SOIL SAMPLES — CHEMICAL AND PHYSICAL COMPOSITION

	CHEMICAL ANALYSES															PHYSICAL ANALYSES				
						Available												100%		
Horizon	Depth in Ins.	Loss on Igni-tion %	Mois-ture %	pH	Lime req. lb. CaO p/Ac.	K_2O ppm	P_2O_5 ppm	Total N %	Total P_2O_5 %	Total K_2O %	Total CaO %	Total MgO %	Total SiO_2 %	Total Al_2O_3 %	Total Fe_2O_3 %	Gra-vel 1mm %	Sand 1-.05 mm %	Silt .05 .005 mm %	Clay .005 mm %	Fine Clay .002 mm %
RICHELIEU CLAY LOAM																				
A (x).......	0– 8	11.35	4.05	5.7	2226	129	82	0.36	(a 0.31	2.30	1.69	2.12	61.2	16.35	4.31	..	24.0	30.8	35.2	26.4
									b 0.33	2.59	1.90	2.39	69.1	18.43	4.87					
B_1.........	8–20	3.62	2.76	6.3	371	93	215	0.06	(a 0.17	2.60	1.63	2.03	66.8	16.22	6.74	..	34.0	27.2	38.8	32.0
									b 0.18	2.70	1.69	2.12	69.3	16.85	7.00					
B_2.........	20–30	3.62	2.90	7.0	....	123	562	0.05	(a 0.26	2.83	1.67	1.92	66.1	17.54	5.95	..	26.4	32.8	40.8	34.4
									b 0.27	2.94	1.73	2.00	68.5	18.31	6.17					
C..........	30–	3.92	2.35	7.1	....	177	865	0.05	(a 0.29	3.03	1.69	2.44	64.5	17.75	6.75	..	20.4	30.4	49.2	40.0
									b 0.30	3.15	1.76	2.55	67.1	18.52	7.06					
ROXTON SLATY SANDY LOAM																				
A_0-A_1.......	0– 1	45.95	7.60	3.9	16071	474	27	1.62	(a 0.46	0.90	0.68	0.89	40.4	7.82	4.02	10	56.0	40.0	4.0	....
									b 0.56	1.66	1.26	1.64	74.6	14.00	7.44					
A_2.........	1– 3	7.32	2.04	4.0	6577	109	8	0.39	(a 0.08	1.19	0.98	0.87	72.2	11.80	5.67	38	43.6	34.2	22.2	16.8
									b 0.08	1.28	1.06	1.05	78.4	12.77	6.12					
B_1.........	3– 8	10.45	4.61	4.6	4384	36	6	0.35	(a 0.13	1.66	0.91	1.17	64.4	15.03	6.46	38	56.8	34.6	8.6	5.0
									b 0.15	1.85	1.02	1.32	71.8	16.90	7.25					
B_2.........	8–18	4.99	2.29	5.0	2192	34	7	0.13	(a 0.12	1.69	0.78	1.45	70.6	16.47	5.06	45	55.8	33.6	10.6	4.8
									b 0.13	1.80	0.83	1.54	74.4	17.57	5.40					
C..........	18–	3.09	1.58	5.1	730	24	12	0.09	(a 0.10	2.02	1.15	1.44	72.8	16.48	6.22	65	62.4	27.4	10.2	....
									b 0.11	2.09	1.19	1.49	73.8	17.01	6.43					
ROXTON SLATY SANDY LOAM																				
A (c).......	0– 6	12.50	3.14	4.8	3654	135	10	0.45	......	....	....	....	....	.....	....	68	60.4	28.4	11.2	....
A_0-A_1......	0– 2	18.30	4.70	5.1	4384	157	11	0.72	(a 0.23	1.96	1.08	1.17	59.3	14.14	5.85	11	35.0	54.4	10.6	8.2
									b 0.28	2.41	1.32	1.40	72.5	17.23	7.24					
B_1.........	2–10	7.16	2.64	5.1	2192	19	10	0.22	(a 0.23	1.95	0.72	1.57	64.7	18.24	7.53	77	73.4	20.0	6.6	....
									b 0.24	2.11	0.77	1.69	69.8	19.69	8.12					
B_2.........	10–20	6.30	2.25	5.5	2192	26	8	0.19	(a 0.18	2.00	0.78	1.26	68.9	16.85	6.74	57	54.4	38.0	7.6	4.4
									b 0.19	2.13	0.84	1.35	73.6	18.06	7.20					
C..........	20–	6.96	2.50	5.4	1461	27	13	0.28	(a 0.33	2.10	0.75	1.90	62.3	19.48	7.84	85	....	....	....	....
									(b 0.36	2.27	0.81	2.05	67.0	19.94	8.45					

RACINE SANDY LOAM																				
A (c).......	0- 6	10.30	2.24	5.9	1461	42	39	0.33								32	62.2	28.2	9.6	....
A_0-A_1......	0- 2	34.70	6.13	4.1	12423	137	8	0.78	(a 0.17	0.46	0.50	0.77	54.8	6.45	4.63	6	66.6	25.8	7.6	....
									b 0.17	0.69	0.76	1.17	83.6	9.88	7.10					
A_2..........	2-2½	2.37	0.94	4.7	5115	26	5	0.07	(a 0.04	0.82	0.34	0.52	87.0	8.71	5.05	12	66.2	21.0	12.8	9.0
									b 0.04	0.84	0.34	0.53	89.1	8.92	5.18					
B_1..........	2½- 8	11.01	4.04	4.4	5846	35	4	0.19	(a 0.10	0.89	0.63	0.91	67.7	14.02	9.98	29	63.4	28.6	8.0	6.0
									b 0.11	0.98	0.70	1.05	75.0	15.39	11.25					
B_2..........	8-22	2.21	0.96	4.7	730	16	6	0.05	(a 0.08	1.53	0.94	1.32	74.5	16.59	6.58	31	77.8	18.8	3.4	2.0
									b 0.08	1.57	0.96	1.35	76.1	17.05	6.67					
C..........	22-	0.95	0.39	4.8	....	8	18	0.05	(a 0.13	1.22	1.21	1.31	77.7	13.91	5.66	40	80.2	16.8	3.0	1.4
									b 0.13	1.23	1.21	1.32	78.5	14.00	5.74					
RACINE SANDY LOAM																				
A (c).......	0- 6	13.25	3.53	4.6	4384	325	13	0.41								19	45.0	43.2	11.8	9.6
A_0-A_1......	0-1½	43.32	7.01	3.7	27194	269	25	1.78	(a 0.29	1.15	0.64	0.80	47.4	9.54	3.17	3	62.0	30.0	8.0	
									b 0.55	2.00	1.14	1.41	74.7	16.31	5.84					
A_2..........	1½-2½	6.46	1.58	3.7	8038	17	7	0.16	(a 0.06	1.26	0.40	0.66	77.8	11.76	3.95	12	37.0	42.0	21.0	12.2
									b 0.07	1.36	0.43	0.70	83.0	12.61	4.22					
B_1..........	2½- 6	16.37	5.35	3.9	11692	76	6	0.35	(a 0.15	1.58	0.56	1.16	59.7	14.83	8.82	17	47.0	46.8	6.2	
									b 0.19	1.90	0.68	1.40	71.5	17.46	10.70					
B_2..........	6-22	5.90	1.90	4.5	2192	10	7	0.12	(a 0.17	1.88	0.98	1.32	67.5	18.29	5.34	24	43.0	43.6	13.4	8.2
									b 0.18	2.00	1.05	1.41	72.0	19.54	5.68					
C..........	22-	2.52	0.78	4.8	730	6	16	0.05	(a 0.12	2.38	1.07	1.45	71.9	17.14	5.54	25	49.0	35.0	16.0	11.2
									b 0.13	2.47	1.10	1.49	73.7	17.59	5.68					
YAMASKA SILT LOAM																				
A (c).......	0- 6	7.71	2.37	4.6	5115	151	30	0.20								3	34.2	47.8	18.0	13.2
A_1..........	0- 2	27.88	5.83	4.0	13154	247	18	0.80	(a 0.27	1.62	0.85	0.79	55.0	12.71	2.22	..	43.2	51.0	5.8	
									b 0.38	2.30	1.18	1.10	76.2	17.47	3.15					
A..........	2- 6	2.20	0.79	4.3	2192	45	20	0.09	(a 0.07	2.08	1.57	0.97	76.0	15.81	3.37	..	38.0	53.6	8.4	5.2
									b 0.08	2.13	1.61	0.99	77.6	16.14	3.45					
B_1..........	6-15	1.72	1.21	5.9	730	60	110	0.06	(a 0.20	2.28	1.95	1.52	72.2	17.56	5.04	..	30.8	49.2	20.0	17.2
									b 0.20	2.32	1.99	1.57	73.3	17.92	5.13					
B_2..........	15-30	1.09	1.79	6.0	365	70	280	0.08	(a 0.19	1.80	2.03	1.73	71.7	17.97	5.04	..	26.0	49.8	24.2	18.8
									b 0.19	1.82	2.05	1.75	72.4	18.22	5.09					
C..........	30-	2.12	1.33	6.0	...	98	360	0.04	(a 0.21	2.23	2.09	1.83	69.3	18.20	5.42	..	27.4	48.0	24.6	20.2
									b 0.21	2.25	2.11	1.85	70.0	18.50	5.48					
RUBICON SANDY LOAM																				
A (c).......	0- 6	5.61	0.96	4.9	2192	49	11	0.17								..	69.0	23.8	7.2	3.8
A_0..........	0-1½	44.18	7.82	4.2	13885	281	14	1.64	(a 0.31	1.13	0.76	0.85	41.8	9.20	1.96	..	59.0	35.4	5.6	2.2
									b 0.59	2.00	1.40	1.52	74.1	16.24	3.46					
A_2..........	1½- 7	1.01	0.60	5.5	730	9	45	0.08	(a 0.12	1.65	1.94	1.00	75.5	16.18	2.50	..	48.0	42.0	10.0	8.0
									b 0.12	1.66	1.96	1.01	76.5	16.35	2.53					
B_1..........	7-12	1.13	0.73	6.2	..	18	104	0.03	(a 0.17	2.10	2.01	1.14	72.4	16.46	4.87	..	52.0	37.0	11.0	9.0
									b 0.17	2.13	2.03	1.15	73.2	16.61	4.92					
B_2..........	12-22	0.56	0.70	6.5	..	44	138	0.02	(a 0.19	1.92	2.01	1.37	73.7	15.64	4.12	..	44.6	48.4	7.0	6.0
									b 0.20	1.94	2.02	1.38	74.2	15.70	4.15					
C..........	22-	0.76	0.48	7.2	..	57	140	0.02	(a 0.20	2.32	2.14	1.58	72.0	16.45	4.90	..	58.9	32.9	8.2	7.2
									b 0.21	2.35	2.15	1.59	72.6	16.56	4.93					

A (c) Composite cultivated sample, layer not belonging to profile below.
A (x) Cultivated layer, belonging to profile.

(a) Expressed as % of oven-dried soil.
(b) Expressed as % of minerals constituents only.

TABLE II (continued)

ANALYSES OF SOIL SAMPLES — CHEMICAL AND PHYSICAL COMPOSITION

Horizon	Depth in Ins.	Loss on Igni-tion %	Mois-ture %	pH	Lime req. lb. CaO p/Ac.	Available K_2O ppm	Available P_2O_5 ppm	Total N %	Total P_2O_5 %	Total K_2O %	Total CaO %	Total MgO %	Total SiO_2 %	Total Al_2O_3 %	Total Fe_2O_3 %	Gra-vel 1mm %	Sand 1-.05 mm %	Silt .05 .005 mm %	Clay .005 mm %	Fine Clay .002 mm %
																		100%		
ST. DAMASE SANDY LOAM																				
A (c)	0- 6	5.23	1.00	4.8	710	48	37	0.16								3	71.6	17.6	10.8	10.8
A_1	0-2½	16.17	3.75	4.3	41130	256	41	0.48	(a 0.26	1.96	1.10	0.75	63.3	12.57	2.97	2	61.6	21.2	17.2	10.8
									b 0.31	2.35	1.31	0.89	75.6	15.01	3.55					
A_2	2½- 4	2.89	1.08	4.7	3710	32	21	0.08	(a 0.06	2.17	1.06	0.57	75.7	12.28	3.76	5	71.6	15.2	13.2	10.8
									b 0.06	2.23	1.10	0.59	77.7	12.80	3.87					
B	4-12	2.22	0.97	5.2	1484	56	27	0.04	(a 0.09	2.21	1.17	1.28	69.7	14.98	7.30	3	53.6	22.2	24.2	16.4
									b 0.09	2.26	1.20	1.31	71.3	15.32	7.52					
C or D	12-24	3.47	3.35	5.7	371	172	645	0.04	(a 0.14	3.60	1.44	2.45	61.3	20.86	7.30	1	15.6	18.0	66.4	56.8
									b 0.15	3.86	1.48	2.53	63.5	21.58	7.57					
ST. FRANCIS SANDY LOAM																				
A (c)	0- 6	9.55	2.30	5.7	1401	64	13	0.13								2	67.4	27.4	5.2	
A_0-A_1	1½-3½	33.45	4.78	4.0	14616	292	20	1.11	(a 0.16	1.12	0.66	0.57	53.3	8.63	2.76	3	65.6	30.4	4.0	4.0
									b 0.28	1.67	1.00	0.85	80.3	13.05	4.02					
A_2	3½- 4	1.33	0.42	4.0	2192	24	6	0.08	(a 0.03	0.92	0.47	0.33	85.6	9.45	2.96	4	64.6	27.0	8.4	4.4
									b 0.03	0.93	0.47	0.33	86.8	9.72	3.00					
B_1	4-10	12.18	4.74	4.5	6577	95	5	0.25	(a 0.15	1.38	0.87	0.63	63.9	16.34	5.41	4	70.4	27.0	2.6	
									b 0.17	1.56	1.00	0.73	72.8	18.54	6.19					
B_2	10-18	5.10	2.13	4.8	2192	17	6	0.11	(a 0.12	0.75	1.19	0.79	72.2	16.39	4.24	16	72.4	26.0	1.6	0.8
									b 0.13	0.80	1.25	0.83	76.1	17.34	4.48					
C	18-	0.71	0.43	5.0	730	10	8	0.05	(a 0.12	1.53	1.43	1.19	76.3	13.55	6.03	18	88.6	9.8	1.6	0.8
									b 0.12	1.54	1.44	1.20	77.0	13.63	6.09					
ST. FRANCIS SANDY LOAM																				
A_1	0- 6	7.60	2.33	5.5	2923	58	6	0.19	(a 0.09	1.43	0.95	0.67	74.5	10.99	6.12	1	83.7	10.9	5.4	2.6
									b 0.10	1.55	1.03	0.73	80.6	11.98	6.64					
A_2	6-16	1.01	0.29	5.5	730	12	2	0.03	(a 0.05	1.36	0.80	0.39	85.6	9.27	4.08	..	85.7	10.6	3.7	2.2
									b 0.05	1.36	0.80	0.39	85.6	9.27	4.08					
B_1	16-22	9.15	5.17	5.2	3654	14	3	0.16	(a 0.13	1.59	1.05	0.91	64.8	16.63	7.84	..	87.1	9.7	3.2	2.4
									b 0.14	1.76	1.16	1.00	71.3	18.11	8.67					
B_2	22-32	1.22	0.59	5.2	730	18	6	0.03	(a 0.11	1.41	1.13	1.20	75.5	12.94	6.62	..	96.1	3.2	0.7	0.4
									b 0.11	1.43	1.15	1.22	76.5	13.11	6.70					
C	32-	0.47	0.28	5.0	365	6	12	0.03	(a 0.13	2.00	1.73	1.00	76.3	12.70	6.17	..	94.1	5.2	0.7	0.5
									b 0.13	2.01	1.74	1.00	76.7	12.72	6.20					

ST. FRANCIS SANDY LOAM

ST. FRANCIS SANDY LOAM																				
A_1	0–2	14.62	2.68	4.1	7420	150	32	0.62	(a 0.16	1.77	1.09	0.58	68.5	8.54	4.92	..	72.4	21.2	6.4	4.4
									b 0.19	2.07	1.27	0.68	80.3	9.96	5.78					
A_2	2–4	2.42	0.55	4.6	2226	5	7	0.10	(a 0.07	2.10	1.06	0.70	78.2	9.59	6.54	..	79.2	11.6	9.2	7.2
									b 0.07	2.15	1.09	0.71	80.1	9.81	6.72					
B_1	4–12	6.59	2.91	4.8	4452	8	5	0.13	(a 0.11	2.10	1.19	0.68	70.7	11.36	6.65	..	82.2	10.6	7.2	6.0
									b 0.12	2.15	1.28	0.74	75.9	12.52	7.13					
B_2	12–30	2.24	0.55	5.1	1484	8	11	0.05	(a 0.10	2.30	1.40	0.91	73.5	12.36	7.04	..	91.0	5.6	3.4	3.0
									b 0.10	2.35	1.46	0.95	75.1	13.15	7.20					
C	30–	0.44	0.03	4.7	742	14	25	0.03	(a 0.12	2.50	1.42	1.13	74.3	12.67	6.41	..	96.8	1.8	1.4	1.0
									b 0.12	2.51	1.43	1.14	74.6	12.75	6.43					
STE. ROSALIE CLAY LOAM																				
A (x)	0–10	5.93	1.40	5.4	1484	73	87	0.16	(a 0.13	2.13	1.47	1.09	69.4	15.39	4.55	4	43.6	32.0	24.4	20.8
									b 0.14	2.26	1.57	1.16	73.7	16.43	4.84					
B	10–24	3.44	1.54	6.7	..	60	794	0.06	(a 0.17	2.51	1.81	1.81	65.9	18.02	4.61	4	27.2	28.0	44.8	38.8
									b 0.18	2.60	1.88	1.88	68.2	18.74	4.78					
C	24–	2.84	1.20	8.0	..	130	251	0.04	(a 0.19	2.63	2.84	2.30	65.8	17.10	6.29	5	23.6	31.6	44.8	36.8
									b 0.19	2.70	2.93	2.37	67.5	17.68	6.45					
SHEFFORD SHALY LOAM																				
A (c)	0–6	16.95	3.34	5.5	2192	185	9	0.46								53	48.8	38.2	13.0	....
A_1	0–2	16.72	3.70	4.9	5115	152	7	0.57	(a 0.19	1.45	0.80	1.29	62.4	13.67	5.89	22	42.6	44.6	44.8	6.4
									b 0.23	1.76	0.96	1.56	75.4	14.65	7.12					
B_1	2–8	10.25	3.34	5.1	4384	25	8	0.27	(a 0.16	1.25	0.93	1.63	63.1	17.74	6.95	48	38.4	47.6	13.0	6.8
									b 0.18	1.40	1.04	1.83	70.5	19.96	7.81					
B_2	8–22	5.36	2.21	5.2	2192	20	8	0.22	(a 0.11	2.16	0.82	1.92	66.6	16.35	6.94	55	43.4	40.4	16.2	8.4
									b 0.12	2.21	0.86	2.04	70.4	17.35	7.33					
C	22–	1.95	0.79	5.3	365	9	25	0.05	(a 0.12	1.89	0.80	1.70	71.9	14.75	6.48	35	47.4	31.4	21.2	11.4
									b 0.12	1.91	0.82	1.73	73.2	15.04	6.61					
SUFFIELD CLAY LOAM																				
A (x)	0–7	9.77	2.01	4.5	4452	122	32	0.32	(a 0.16	2.61	0.51	1.56	62.8	15.49	7.43	..	24.8	47.2	28.0	22.0
									b 0.18	2.89	0.56	1.73	69.4	17.05	8.24					
A_2	7–12	3.86	0.75	4.9	2226	76	37	0.06	(a 0.16	2.98	0.66	1.76	65.9	17.27	7.55	..	19.2	40.8	40.0	34.0
									b 0.17	3.10	0.69	1.83	68.4	18.00	7.85	..				
B	12–20	3.44	1.49	5.6	742	93	249	0.06	(a 0.18	3.05	0.84	1.75	64.1	18.76	7.76	..	16.8	30.8	52.4	41.6
									b 0.18	3.16	0.87	1.81	66.3	19.40	8.10					
C	20–	3.95	1.82	5.9	742	99	471	0.05	(a 0.18	3.29	0.87	1.75	61.4	21.59	7.63	..	13.2	24.4	62.4	54.0
									b 0.19	3.42	0.91	1.81	64.0	22.63	7.94					

A (c) Composite cultivated sample, layer not belonging to profile below.
A (x) Cultivated layer, belonging to profile.

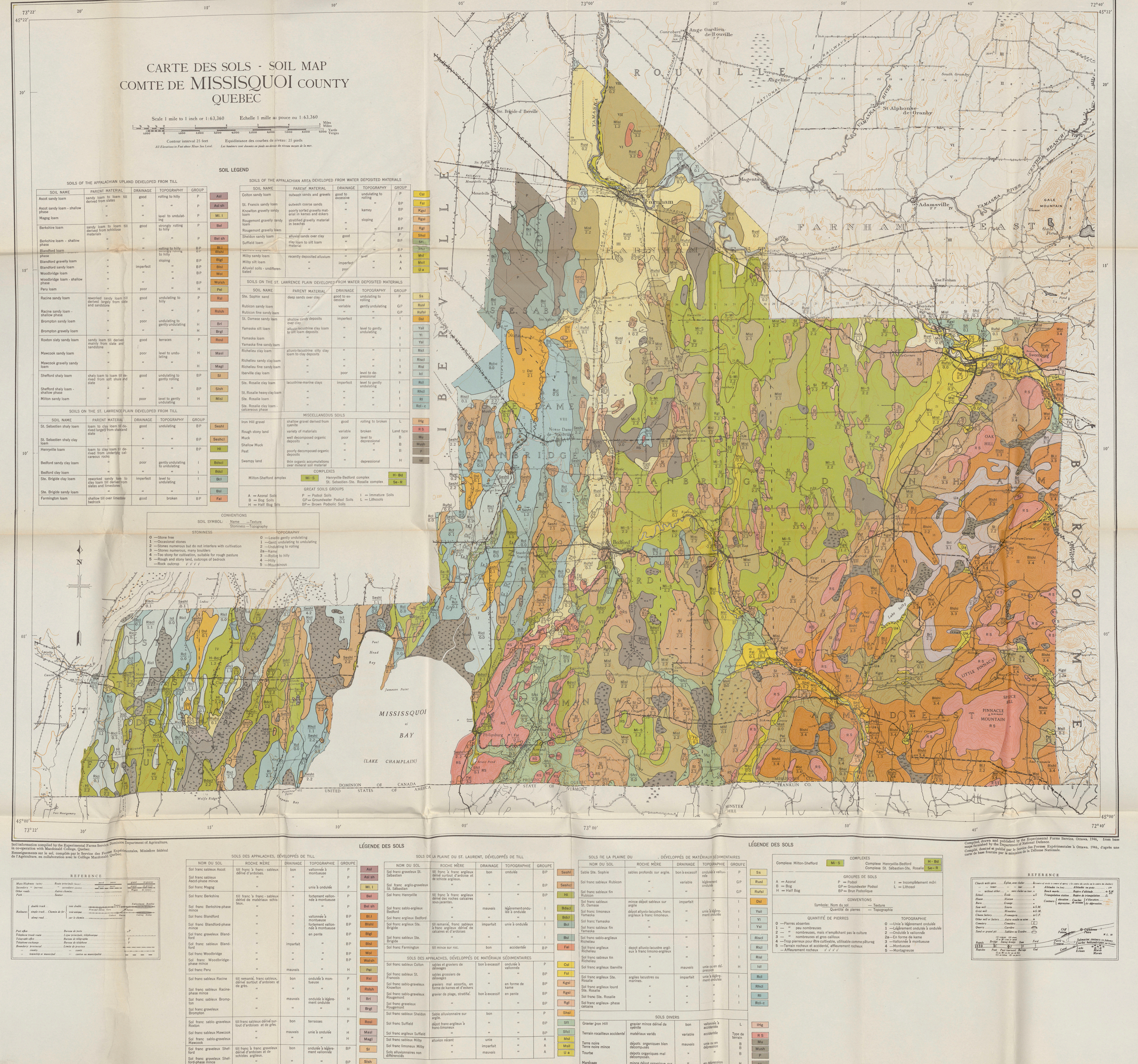
(a) Expressed as % of oven-dried soil.
(b) Expressed as % of minerals constituents only.

TABLE II (Concluded)

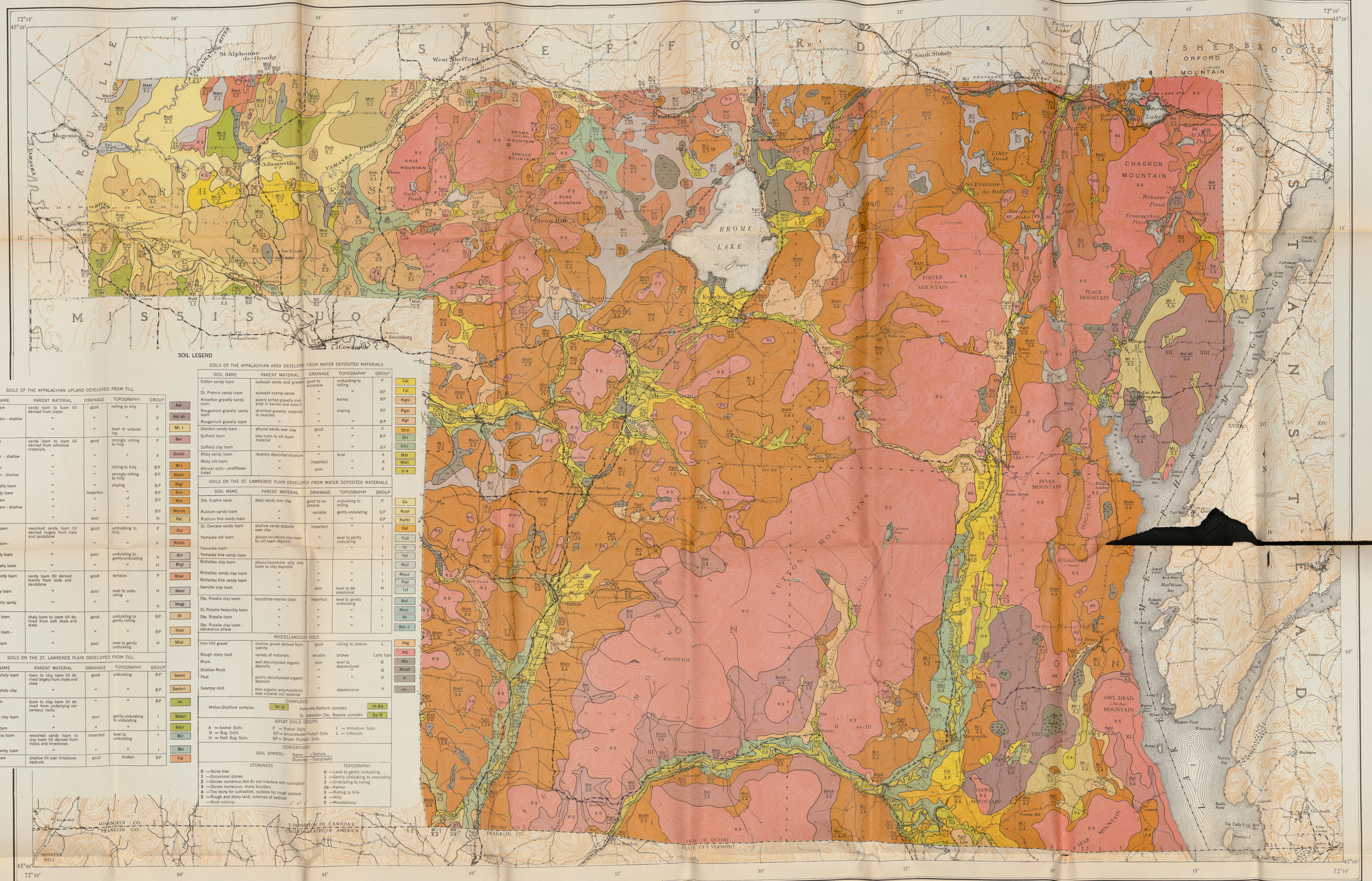
ANALYSES OF SOIL SAMPLES — CHEMICAL AND PHYSICAL COMPOSITION

	CHEMICAL ANALYSES															PHYSICAL ANALYSES				
						Available											100%			
Horizon	Depth in Ins.	Loss on Ignition %	Moisture %	pH	Lime req. lb. CaO p/Ac.	K_2O ppm	P_2O_5 ppm	Total N %	Total P_2O_5 %	Total K_2O %	Total CaO %	Total MgO %	Total SiO_2 %	Total Al_2O_3 %	Total Fe_2O_3 %	Gravel 1mm %	Sand 1-.05 mm %	Silt .05 .005 mm%	Clay .005 mm %	Fine Clay .002 mm %
WOODBRIDGE LOAM																				
A_1..........	1- 2	22.40	4.42	4.1	10231	193	18	0.69	(a 0.20	1.25	0.80	0.45	58.3	13.28	3.57	17	50.0	38.4	11.6	....
									b 0.26	1.59	1.03	0.57	74.4	17.16	4.40					
B_1..........	2- 8	11.70	3.83	4.9	5115	87	9	0.37	(a 0.22	1.97	0.69	1.10	60.6	18.42	4.96	21	40.4	50.0	9.6	....
									b 0.25	2.24	0.79	1.26	68.8	20.79	5.53					
B_2..........	8-15	2.69	1.18	5.2	1461	43	8	0.10	(a 0.14	1.90	0.87	0.84	74.2	15.29	4.72	27	70.4	22.0	7.6	5.4
									b 0.15	1.95	0.90	0.86	76.1	15.74	4.86					
C..........	15–	1.15	0.39	5.2	730	14	34	0.03	(a 0.12	1.92	1.07	0.99	75.0	16.33	4.10	29	56.0	35.4	8.6	6.4
									b 0.12	1.95	1.08	1.00	75.9	16.49	4.16					
WOODBRIDGE LOAM																				
A_1..........	1- 3	13.93	2.86	4.8	5194	251	46	0.51	(a 0.22	2.37	0.71	1.00	61.2	14.08	7.00	22	42.4	45.6	12.0	6.2
									b 0.23	2.75	0.83	1.16	71.2	16.40	8.13					
B_1..........	3-12	5.43	1.57	4.8	3710	56	18	0.14	(a 0.14	2.44	0.54	1.05	67.6	15.57	7.76	36	46.0	42.0	12.0	9.2
									b 0.15	2.58	0.59	1.14	71.5	17.43	8.10					
B_2..........	12-22	4.07	0.96	5.1	2226	29	23	0.08	(a 0.11	2.42	0.73	1.25	69.0	16.05	7.39	43	48.0	37.0	15.0	10.2
									b 0.12	2.52	0.76	1.30	72.0	16.75	7.70					
C..........	22–	2.18	0.19	5.8	742	53	89	0.04	(a 0.14	3.35	0.79	1.48	67.9	17.61	7.15	59	47.6	35.0	17.4	12.2
									b 0.14	3.43	0.81	1.51	69.4	17.94	7.32					

(a) Expressed as % of oven-dried soil.
(b) Expressed as % of minerals constituents only.


CARTE DES SOLS - SOIL MAP
COMTE DE MISSISQUOI COUNTY
QUEBEC
Scale 1 mile to 1 inch or 1:63,360
Echelle 1 mille au pouce ou 1:63,360
Contour interval 25 feet
Equidistance des courbes de niveau: 25 pieds
All Elevations in Feet above Mean Sea Level.
Les hauteurs sont données en pieds au-dessus du niveau moyen de la mer.
SOIL LEGEND
SOILS OF THE APPALACHIAN AREA DEVELOPED FROM WATER DEPOSITED MATERIALS
MISSISQUOI BAY
(LAKE CHAMPLAIN)
DOMINION OF CANADA
UNITED STATES OF AMERICA
ROUVILLE
FARNHAM EAST
Farnham
Bedford
Philipsburg
Wolfe Ridge
Province Point
Chapman Bay
Fort Montgomery
PINNACLE MOUNTAIN
45°00′
73°22′
72°40′
Soil information compiled by the Experimental Farms Service, Dominion Department of Agriculture, in co-operation with Macdonald College, Quebec.
Renseignements sur le sol, compilés par le Service des Fermes Expérimentales, Ministère fédéral de l'Agriculture, en collaboration avec le Collège Macdonald, Québec.
LÉGENDE DES SOLS
SOLS DES APPALACHES, DÉVELOPPÉS DE TILL
REFERENCE
Compiled, drawn and published by the Experimental Farms Service, Ottawa, 1946, from base maps furnished by the Department of National Defence.
Compilé, dessiné et publié par le Service des Fermes Expérimentales à Ottawa, 1946, d'après une carte de base fournie par le ministère de la Défense Nationale.

COMTE DE BROME COUNTY
QUEBEC



SOIL LEGEND

SOILS OF THE APPALACHIAN UPLAND DEVELOPED FROM TILL

SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Ascot sandy loam	sandy loam to loam till derived from slates	good	rolling to hilly	P	Asl
Ascot sandy loam - shallow phase	"	"	"	P	Asl sh
Magog loam	"	"	level to undulating	P	Ml. l
Berkshire loam	sandy loam to loam till derived from schistose materials	good	strongly rolling to hilly	P	Bel
Berkshire loam - shallow phase	"	"	"	P	Belsh
Blandford loam	"	"	rolling to hilly	BP	Bl.l
Blandford loam - shallow phase	"	"	strongly rolling to hilly	BP	Blshl
Blandford gravelly loam	"	"	sloping	BP	Blgl
Blandford sandy loam	"	imperfect	"	BP	Blsl
Woodbridge loam	"	"	"	BP	Wol
Woodbridge loam - shallow phase	"	"	"	BP	Wolsh
Peru loam	"	poor	"	H	Pel
Racine sandy loam	reworked sandy loam till derived largely from slate and sandstone	good	undulating to hilly	P	Rsl
Racine sandy loam - shallow phase	"	"	"	P	Rslsh
Brompton sandy loam	"	poor	undulating to gently undulating	H	Brl
Brompton gravelly loam	"	"	"	H	Brgl
Roxton slaty sandy loam	sandy loam till derived mainly from slate and sandstone	good	terraces	P	Rosl
Mawcook sandy loam	"	poor	level to undulating	H	Masl
Mawcook gravelly sandy loam	"	"	"	H	Magl
Shefford shaly loam	shaly loam to loam till derived from soft shale and slate	good	undulating to gently rolling	BP	Sl
Shefford shaly loam - shallow phase	"	"	"	BP	Slsh
Milton sandy loam	"	poor	level to gently undulating	H	Misl

SOILS ON THE ST. LAWRENCE PLAIN DEVELOPED FROM TILL

SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
St. Sebastien shaly loam	loam to clay loam till derived largely from shale and slate	good	undulating	BP	Seshl
St. Sebastien shaly clay loam	"	"	"	BP	Seshcl
Henryville loam	loam to clay loam till derived from underlying calcareous rocks	"	"	BP	Hl
Bedford sandy clay loam	"	poor	gently undulating to undulating	I	Bdscl
Bedford clay loam	"	"	"	I	Bdcl
Ste. Brigide clay loam	reworked sandy loam to clay loam till derived from slates and limestones	imperfect	level to undulating	I	Bcl
Ste. Brigide sandy loam	"	"	"	I	Bsl
Farmington loam	shallow till over limestone bedrock	good	broken	BP	Fal

SOILS OF THE APPALACHIAN AREA DEVELOPED FROM WATER DEPOSITED MATERIALS

SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Colton sandy loam	outwash sands and gravels	good to excessive	undulating to rolling	P	Csl
St. Francis sandy loam	outwash coarse sands	"	"	BP	Fsl
Knowlton gravelly sandy loam	poorly sorted gravelly material in kames and eskers	"	kamey	BP	Kgsl
Rougemont gravelly sandy loam	stratified gravelly material in beaches	"	sloping	BP	Rgsl
Rougemont gravelly loam	"	"	"	BP	Rgl
Sheldon sandy loam	alluvial sands over clay	good	"	P	Shsl
Suffield loam	clay loam to silt loam material	"	"	BP	Sfl
Suffield clay loam	"	"	"	BP	Sfcl
Milby sandy loam	recently deposited alluvium	"	level	A	Msl
Milby silt loam	"	imperfect	"	A	Msil
Alluvial soils - undifferentiated	"	poor	"	A	U a

SOILS ON THE ST. LAWRENCE PLAIN DEVELOPED FROM WATER DEPOSITED MATERIALS

SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Ste. Sophie sand	deep sands over clay	good to excessive	undulating to rolling	P	Ss
Rubicon sandy loam	"	variable	gently undulating	GP	Rusl
Rubicon fine sandy loam	"	"	"	GP	Rufsl
St. Damase sandy loam	shallow sandy deposits over clay	imperfect	"	I	Dsl
Yamaska silt loam	alluvio-lacustrine clay loam to silt loam deposits	"	level to gently undulating	I	Ysil
Yamaska loam	"	"	"	I	Yl
Yamaska fine sandy loam				I	Ysl
Richelieu clay loam	alluvio-lacustrine silty clay loam to clay deposits	"	"	I	Ricl
Richelieu sandy clay loam	"	"	"	I	Riscl
Richelieu fine sandy loam	"	"	"	I	Risl
Iberville clay loam	"	poor	level to depressional	H	Icl
Ste. Rosalie clay loam	lacustrine-marine clays	imperfect	level to gently undulating	I	Rcl
St. Rosalie heavy clay loam	"	"	"	I	Rhcl
Ste. Rosalie loam	"	"	"	I	Rl
Ste. Rosalie clay loam - calcareous phase	"	"	"	I	Rcl-c

MISCELLANEOUS SOILS

SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Iron Hill gravel	shallow gravel derived from syenite	good	rolling to broken	L	IHg
Rough stony land	variety of materials	variable	broken	Land type	RS
Muck	well decomposed organic deposits	poor	level to depressional	B	Mu
Shallow Muck	"	"	"	B	Mush
Peat	poorly decomposed organic deposits	"	"	B	P
Swampy land	thin organic accumulations over mineral soil material	"	depressional	H	

COMPLEXES

Milton-Shefford complex — Mi-S
Henryville-Bedford complex — H-Bd.
St. Sebastien-Ste. Rosalie complex — Se-R

GREAT SOILS GROUPS

A = Azonal Soils
B = Bog Soils
H = Half Bog Soils
P = Podsol Soils
GP = Groundwater Podsol Soils
BP = Brown Podsolic Soils
I = Immature Soils
L = Lithosols

CONVENTIONS

SOIL SYMBOL: Name —Texture / Stoniness —Topography

STONINESS

0 —Stone free
1 —Occasional stones
2 —Stones numerous but do not interfere with cultivation
3 —Stones numerous, many boulders
4 —Too stony for cultivation, suitable for rough pasture
5 —Rough and stony land, outcrops of bedrock
—Rock outcrop .... ✓ ✓ ✓

TOPOGRAPHY

0 —Level to gently undulating
1 —Gently undulating to undulating
2 —Undulating to rolling
2a—Kamey
3 —Rolling to hilly
4 —Hilly
5 —Mountainous

Soil information compiled by the Experimental Farms Service, Dominion Department of Agriculture, in cooperation with Macdonald College, Quebec.
Renseignements sur le sol, compilés par le Service des Fermes Expérimentales, Ministère fédéral de l'Agriculture, en collaboration avec le Collège Macdonald, Québec.

LÉGENDE DES SOLS

SOLS DES APPALACHES, DÉVELOPPÉS DE TILL

NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sol franc sableux Ascot	till franc à franc - sableux dérivé d'ardoises.	bon	vallonnée à montueuse	P	Asl
Sol franc sableux Ascot-phase mince	"	"	"	P	Asl sh
Sol franc Magog	"	"	unie à ondulée	P	Ml. l
Sol franc Berkshire	till franc à franc - sableux dérivé de matériaux schisteux	"	fortement vallonnée à montueuse	P	Bel
Sol franc Berkshire-phase mince	"	"	"	P	Belsh
Sol franc Blandford	"	"	vallonnée à montueuse	BP	Bl.l
Sol franc Blandford-phase mince	"	"	fortement vallonnée à montueuse	BP	Blshl
Sol franc graveleux Blandford	"	"	en pente	BP	Blgl
Sol franc sableux Blandford	"	imparfait	"	BP	Blsl
Sol franc Woodbridge	"	"	"	BP	Wol
Sol franc Woodbridge-phase mince	"	"	"	BP	Wolsh
Sol franc Peru	"	mauvais	"	H	Pel
Sol franc sableux Racine	till remanié, franc sableux, dérivé surtout d'ardoises et de grès.	bon	ondulée à montueuse	P	Rsl
Sol franc sableux Racine-phase mince	"	"	"	P	Rslsh
Sol franc sableux Brompton	"	mauvais	ondulée à légèrement ondulée	H	Brl
Sol franc graveleux Brompton	"	"	"	H	Brgl
Sol franc sablo-graveleux Roxton	till franc sableux dérivé surtout d'ardoises et de grès,	bon	terrasses	P	Rosl
Sol franc sableux Mawcook	"	mauvais	unie à ondulée	H	Masl
Sol franc sablo-graveleux Mawcook	"	"	"	H	Magl
Sol franc graveleux Shefford	till franc à franc graveleux dérivé d'ardoise et de schistes argileux.	bon	ondulée à légèrement vallonnee	BP	Sl
Sol franc graveleux Shefford-phase mince	"	"	"	BP	Slsh
Sol franc sableux Milton	"	mauvais	unie à légèrement ondulée	H	Misl

SOLS DE LA PLAINE DU ST. LAURENT, DÉVELOPPÉS DE TILL

NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sol franc graveleux St. Sébastien	till franc à franc argileux dérivé surtout d'ardoise et de schiste argileux.	bon	ondulée	BP	Seshl
Sol franc argilo-graveleux St. Sébastien	"	"	"	BP	Seshcl
Sol franc Henryville	till franc à franc argileux dérivé des roches calcaires sous-jacentes.	"	"	BP	Hl
Sol franc sablo-argileux Bedford	"	mauvais	légèrement ondulée à ondulée	I	Bdscl
Sol franc argileux Bedford	"	"	"	I	Bdcl
Sol franc argileux Ste. Brigide	till remanié, franc sableux à franc argileux dérivé de calcaires et d'ardoises	imparfait	unie à ondulée	I	Bcl
Sol franc sableux Ste. Brigide	"	"	"	I	Bsl
Sol franc Farmington	till mince sur roc.	bon	accidentée	BP	Fal

SOLS DES APPALACHES, DÉVELOPPÉS DE MATÉRIAUX SÉDIMENTAIRES

NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sol franc sableux Colton	sables et graviers de délavages	bon à excessif	ondulée à vallonnée	P	Csl
Sol franc sableux St. Francois	sables grossiers de délavages	"	"	BP	Fsl
Sol franc sablo-graveleux Knowlton	graviers mal assortis, en forme de kames et d'eskers	"	en forme de kame	BP	Kgsl
Sol franc sablo-graveleux Rougemont	gravier de plage, stratifié.	bon à excessif	en pente	BP	Rgsl
Sol franc graveleux Rougemont	"	"	"	BP	Rgl
Sol franc sableux Sheldon	Sable alluvionnaire sur argile.	bon	"	P	Shsl
Sol franc Suffield	dépot franc-argileux à franc-limoneux	"	"	BP	Sfl
Sol franc argileux Suffield	"	"	"	BP	Sfcl
Sol franc sableux Milby	alluvion récent	unie	"	A	Msl
Sol franc limoneux Milby	"	imparfait	"	A	Msil
Sols alluvionnaires non différenciés	"	mauvais	"	A	U a

SOLS DE LA PLAINE DU ST. LAURENT, DÉVELOPPÉS DE MATÉRIAUX SÉDIMENTAIRES

NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sable Ste. Sophie	sables profonds sur argile.	bon à excessif	ondulée à vallonnée	P	Ss
Sol franc sableux Rubicon	"	variable	légèrement ondulée	GP	Rusl
Sol franc sableux fin Rubicon	"	"	"	GP	Rufsl
Sol franc sableux St. Damase	mince dépot sableux sur argile	imparfait	"	I	Dsl
Sol franc limoneux Yamaska	dépot alluvio-lacustre, franc argileux à franc limoneux.	"	unie à légèrement ondulée	I	Ysil
Sol franc Yamaska	"	"	"	I	Yl
Sol franc sableux fin Yamaska	"			I	Ysl
Sol franc argileux Richelieu	dépot alluvio-lacustre argileux à franc limono-argileux	"	"	I	Ricl
Sol franc sablo-argileux Richelieu	"	"	"	I	Riscl
Sol franc sableux fin Richelieu	"	"	"	I	Risl
Sol franc argileux Iberville	"	mauvais	unie ou en dépression	H	Icl
Sol franc argileux Ste. Rosalie	argiles lacustres ou marines.	imparfait	unie à légèrement ondulée	I	Rcl
Sol franc argileux lourd Ste. Rosalie	"	"	"	I	Rhcl
Sol franc Ste. Rosalie	"	"	"	I	Rl
Sol franc argileux- phase calcaire	"	"	"	I	Rcl-c

SOLS DIVERS

NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Gravier Iron Hill	gravier mince dérivé de syénite	bon	vallonnée à accidentée	L	IHg
Terrain rocailleux accidenté	materiaux variés	variable	accidentée	Type de terrain	R S
Terre noire	dépots organiques bien décomposés	mauvais	unie ou en dépression	B	Mu
Terre noire mince				B	Mush
Tourbe	dépots organiques mal décomposés.	"	"	B	P
Marécage	mince dépot organique sur sol minéral.	"	en dépression	H	

COMPLEXES

Complexe Milton-Shefford — Mi-S
Complexe Henryville-Bedford — H Bd.
Complexe St. Sébastien-Ste, Rosalie — Se - R.

GROUPES DE SOLS

A = Azonal
B = Bog
H = Half Bog
P = Podsol
GP = Groundwater Podsol
BP = Brun Podsolique
I = Incomplètement mûri
L = Lithosol

CONVENTIONS

Symbole: Nom du sol — Texture / Quantité de pierres — Topographie

QUANTITÉ DE PIERRES

0 —Pierres absentes
1 — " peu nombreuses
2 — " nombreuses, mais n'empêchant pas la culture
3 — " nombreuses et gros cailloux
4 —Trop pierreux pour être cultivable, utilisable comme pâturage
5 —Terrain rocheux et accidenté, affleurement rocheux
— Affleurement rocheux .... ✓ ✓ ✓

TOPOGRAPHIE

0 —Unie à légerement ondulée
1 —Légèrement ondulée à ondulée
2 —Ondulée à vallonnée
2a—En forme de kame
3 —Vallonnée à montueuse
4 —Montueuse
5 —Montagneuse

Compiled, drawn and published by the Experimental Farms Service, Ottawa, 1946, from base maps furnished by the Department of National Defence.
Compilé, dessiné et publié par le Service des Fermes Expérimentales à Ottawa, 1946, d'après une carte de base fournie par le ministère de la Défense Nationale.

REFERENCE

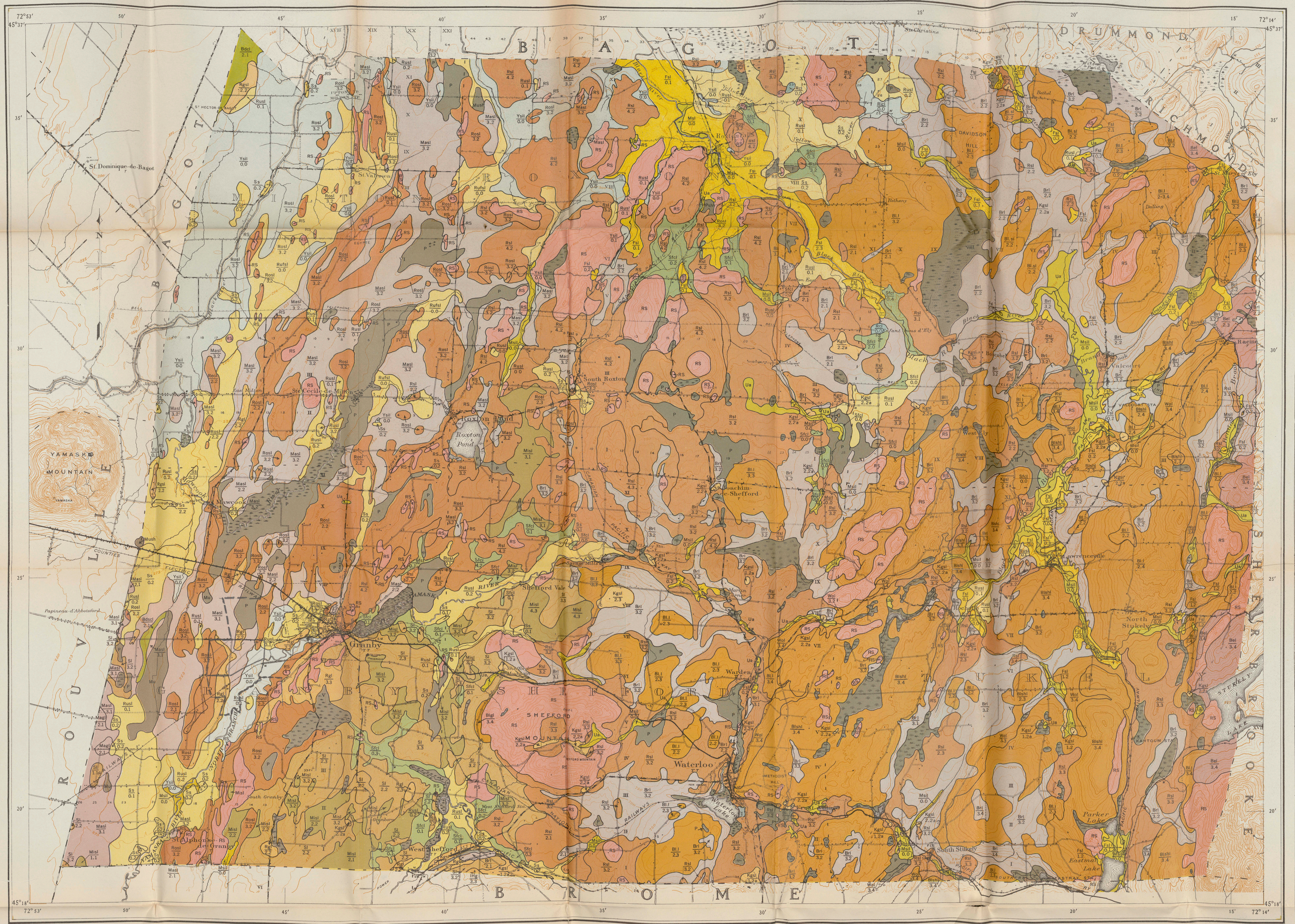
Church with spire	Eglise, avec clocher	(centre of circle is centre of spire) (le centre du cercle est le centre du clocher)
" " tower	" " tour	
" without either	" sans clocher ou tour	
School	École	S
House	Maison	
Barn	Grange	
Saw mill	Scierie	S.M.
Grist mill	Minoterie	G.M.
Cheese factory	Fromagerie	C.F.
Other mill or factory	Autre moulin ou usine	
Cemetery	Cimetière	C
Quarry	Carrière	
Sand or gravel pit	Sablière ou Gravière	
Altitudes (in feet)	Altitudes (en pieds)	179
Bench marks	Repère d'altitude	B.M. 375
Triangulation station	Repère de triangulation	375
Contours: elevation / depression	Courbes de niveau: d'elevation / de depression	400 / 375

Rapids / Rapides; Bridge / Pont ((C) cement (S) stone (I or W) iron or wood / (I ou W) en fer ou en bois (C) en beton (S) en pierre); Swing bridge / Pont tournant; Dam / Barrage; Ford / Gué; Cliff / Falaise; Lighthouse / Phare; Ferry / Traverse; Canal; Locks / Ecluses; Marsh / Marais; Submarine contours (in fathoms) / Courbes bathymétriques (en brasses); W.L. 50

Scale 1 mile to 1 inch or 1 : 63,360
Echelle 1 mille au pouce 1:63,360
Miles / Milles — 1 ¾ ½ ¼ 0 1 2 3 4 5
Yards / Verges — 1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000

Contour interval 25 Feet.
All Elevations in Feet above Mean Sea Level.
Equidistance des courbes de niveau: 25 pieds
Les hauteurs sont données en pieds au-dessus du niveau moyen de la mer.

CARTE DES SOLS - SOIL MAP
COMTE DE SHEFFORD COUNTY
QUEBEC



SOIL LEGEND

SOILS OF THE APPALACHIAN UPLAND DEVELOPED FROM TILL					
SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Ascot sandy loam	sandy loam to loam till derived from slates	good	rolling to hilly	P	Asl
Ascot sandy loam - shallow phase	"	"	"	P	Asl sh
Magog loam	"	"	level to undulating	P	Ml. l
Berkshire loam	sandy loam to loam till derived from schistose materials	good	strongly rolling to hilly	P	Bel
Berkshire loam - shallow phase	"	"	"	P	Belsh
Blandford loam	"	"	rolling to hilly	BP	Bl. l
Blandford loam - shallow phase	"	"	strongly rolling to hilly	BP	Blshl
Blandford gravelly loam	"	"	sloping	BP	Blgl
Blandford sandy loam	"	imperfect	"	BP	Blsl
Woodbridge loam	"	"	"	BP	Wol
Woodbridge loam - shallow phase	"	"	"	BP	Wolsh
Peru loam	"	poor	"	H	Pel
Racine sandy loam	reworked sandy loam till derived largely from slate and sandstone	good	undulating to hilly	P	Rsl
Racine sandy loam - shallow phase	"	"	"	P	Rslsh
Brompton sandy loam	"	poor	undulating to gently undulating	H	Brl
Brompton gravelly loam	"	"	"	H	Brgl
Roxton slaty sandy loam	sandy loam till derived mainly from slate and sandstone	good	terraces	P	Rosl
Mawcook sandy loam	"	poor	level to undulating	H	Masl
Mawcook gravelly sandy loam	"	"	"	H	Magl
Shefford shaly loam	shaly loam to loam till derived from soft shale and slate	good	undulating to gently rolling	BP	Sl
Shefford shaly loam - shallow phase	"	"	"	BP	Slsh
Milton sandy loam	"	poor	level to gently undulating	H	Misl

SOILS ON THE ST. LAWRENCE PLAIN DEVELOPED FROM TILL					
SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
St. Sebastien shaly loam	loam to clay loam till derived largely from shale and slate	good	undulating	BP	Seshl
St. Sebastien shaly clay loam	"	"	"	BP	Seshcl
Henryville loam	loam to clay loam till derived from underlying calcareous rocks	"	"	BP	Hl
Bedford sandy clay loam	"	poor	gently undulating to undulating	I	Bdscl
Bedford clay loam	"	"	"	I	Bdcl
Ste. Brigide clay loam	reworked sandy loam to clay loam till derived from slates and limestones	imperfect	level to undulating	I	Bcl
Ste. Brigide sandy loam	"	"	"	I	Bsl
Farmington loam	shallow till over limestone bedrock	good	broken	BP	Fal

SOILS OF THE APPALACHIAN AREA DEVELOPED FROM WATER DEPOSITED MATERIALS					
SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Colton sandy loam	outwash sands and gravels	good to excessive	undulating to rolling	P	Csl
St. Francis sandy loam	outwash coarse sands	"	"	BP	Fsl
Knowlton gravelly sandy loam	poorly sorted gravelly material in kames and eskers	"	kamey	BP	Kgsl
Rougemont gravelly sandy loam	stratified gravelly material in beaches	"	sloping	BP	Rgsl
Rougemont gravelly loam	"	"	"	BP	Rgl
Sheldon sandy loam	alluvial sands over clay	good	"	P	Shsl
Suffield loam	clay loam to silt loam material	"	"	BP	Sfl
Suffield clay loam	"	"	"	BP	Sfcl
Milby sandy loam	recently deposited alluvium	"	level	A	Msl
Milby silt loam	"	imperfect	"	A	Msil
Alluvial soils - undifferentiated	"	poor	"	A	U a

SOILS ON THE ST. LAWRENCE PLAIN DEVELOPED FROM WATER DEPOSITED MATERIALS					
SOIL NAME	PARENT MATERIAL	DRAINAGE	TOPOGRAPHY	GROUP	
Ste. Sophie sand	deep sands over clay	good to excessive	undulating to rolling	P	Ss
Rubicon sandy loam	"	variable	gently undulating	GP	Rusl
Rubicon fine sandy loam	"	"	"	GP	Rufsl
St. Damase sandy loam	shallow sandy deposits over clay	imperfect	"	I	Dsl
Yamaska silt loam	alluvio-lacustrine clay loam to silt loam deposits	"	level to gently undulating	I	Ysil
Yamaska loam	"	"	"	I	Yl
Yamaska fine sandy loam				I	Ysl
Richelieu clay loam	alluvio-lacustrine silty clay loam to clay deposits	"	"	I	Ricl
Richelieu sandy clay loam	"	"	"	I	Riscl
Richelieu fine sandy loam	"	"	"	I	Risl
Iberville clay loam	"	poor	level to depressional	H	Icl
Ste. Rosalie clay loam	lacustrine-marine clays	imperfect	level to gently undulating	I	Rcl
St. Rosalie heavy clay loam	"	"	"	I	Rhcl
Ste. Rosalie loam	"	"	"	I	Rl
Ste. Rosalie clay loam calcareous phase	"	"	"	I	Rcl–c

MISCELLANEOUS SOILS					
Iron Hill gravel	shallow gravel derived from syenite	good	rolling to broken	L	IHg
Rough stony land	variety of materials	variable	broken	Land type	RS
Muck	well decomposed organic deposits	poor	level to depressional	B	Mu
Shallow Muck	"	"	"	B	Mush
Peat	poorly decomposed organic deposits	"	"	B	P
Swampy land	thin organic accumulations over mineral soil material	"	depressional	H	

COMPLEXES

Milton-Shefford complex — Mi–s
Henryville-Bedford complex — H – Bd
St. Sebastien-Ste. Rosalie complex — Se – R.

GREAT SOILS GROUPS

A = Azonal Soils
B = Bog Soils
H = Half Bog Soils
P = Podsol Soils
GP = Groundwater Podsol Soils
BP = Brown Podsolic Soils
I = Immature Soils
L = Lithosols

CONVENTIONS

SOIL SYMBOL: Name —Texture / Stoniness —Topography

STONINESS

0 —Stone free
1 —Occasional stones
2 —Stones numerous but do not interfere with cultivation
3 —Stones numerous, many boulders
4 —Too stony for cultivation, suitable for rough pasture
5 —Rough and stony land, outcrops of bedrock
—Rock outcrop .... ✓ ✓ ✓

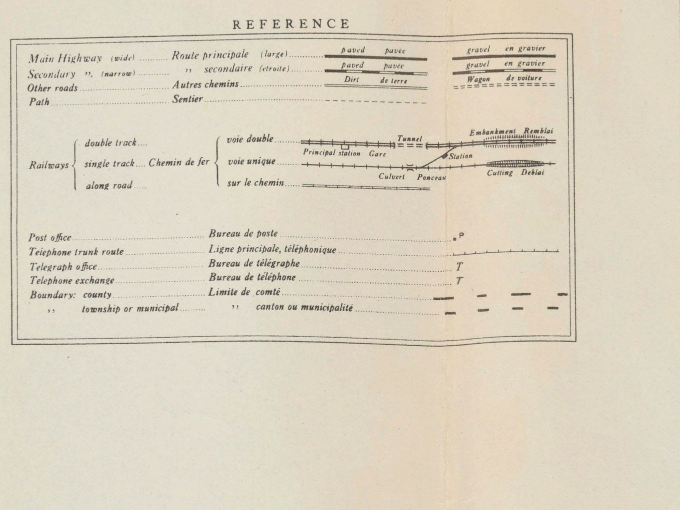
TOPOGRAPHY

0 —Level to gently undulating
1 —Gently undulating to undulating
2 —Undulating to rolling
2a—Kamey
3 —Rolling to hilly
4 —Hilly
5 —Mountainous

Soil information compiled by the Experimental Farms Service, Dominion Department of Agriculture, in co-operation with Macdonald College, Quebec.

Renseignements sur le sol, compilés par le Service des Fermes Expérimentales, Ministère fédéral de l'Agriculture, en collaboration avec le Collège Macdonald, Québec.

REFERENCE



LÉGENDE DES SOLS

SOLS DES APPALACHES, DÉVELOPPÉS DE TILL					
NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sol franc sableux Ascot	till franc à franc - sableux dérivé d'ardoises.	bon	vallonnée à montueuse	P	Asl
Sol franc sableux Ascot-phase mince	"	"	"	P	Asl sh
Sol franc Magog	"	"	unie à ondulée	P	Ml. l
Sol franc Berkshire	till franc à franc - sableux dérivé de matériaux schisteux.	"	fortement vallonnée à montueuse	P	Bel
Sol franc Berkshire-phase mince	"	"	"	P	Belsh
Sol franc Blandford	"	"	vallonnée à montueuse	BP	Bl. l
Sol franc Blandford-phase mince	"	"	fortement vallonnée à montueuse	BP	Blshl
Sol franc graveleux Blandford	"	"	en pente	BP	Blgl
Sol franc sableux Blandford	"	imparfait	"	BP	Blsl
Sol franc Woodbridge	"	"	"	BP	Wol
Sol franc Woodbridge-phase mince	"	"	"	BP	Wolsh
Sol franc Peru	"	mauvais	"	H	Pel
Sol franc sableux Racine	till remanié, franc sableux, dérivé surtout d'ardoises et de grès.	bon	ondulée à montueuse	P	Rsl
Sol franc sableux Racine-phase mince	"	"	"	P	Rslsh
Sol franc sableux Brompton	"	mauvais	ondulée à légèrement ondulée	H	Brl
Sol franc graveleux Brompton	"	"	"	H	Brgl
Sol franc sablo-graveleux Roxton	till franc sableux dérivé surtout d'ardoises et de grès,	bon	terrasses	P	Rosl
Sol franc sableux Mawcook	"	mauvais	unie à ondulée	H	Masl
Sol franc sablo-graveleux Mawcook	"	"	"	H	Magl
Sol franc graveleux Shefford	till franc à franc graveleux dérivé d'ardoises et de schistes argileux.	bon	ondulée à légèrement vallonnée	BP	Sl
Sol franc graveleux Shefford-phase mince	"	"	"	BP	Slsh
Sol franc sableux Milton	"	mauvais	unie à légèrement ondulée	H	Misl

SOLS DE LA PLAINE DU ST. LAURENT, DÉVELOPPÉS DE TILL					
NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sol franc graveleux St. Sébastien	till franc à franc argileux dérivé surtout d'ardoise et de schiste argileux.	bon	ondulée	BP	Seshl
Sol franc argilo-graveleux St. Sébastien	"	"	"	BP	Seshcl
Sol franc Henryville	till franc à franc argileux dérivé des roches calcaires sous-jacentes.	"	"	BP	Hl
Sol franc sablo-argileux Bedford	"	mauvais	légèrement ondulée à ondulée	I	Bdscl
Sol franc argileux Bedford	"	"	"	I	Bdcl
Sol franc argileux Ste. Brigide	till remanié, franc sableux à franc argileux dérivé de calcaires et d'ardoises	imparfait	unie à ondulée	I	Bcl
Sol franc sableux Ste. Brigide	"	"	"	I	Bsl
Sol franc Farmington	till mince sur roc.	bon	accidentée	BP	Fal

SOLS DES APPALACHES, DÉVELOPPÉS DE MATÉRIAUX SÉDIMENTAIRES					
Sol franc sableux Colton	sables et graviers de délavages	bon à excessif	ondulée à vallonnée	P	Csl
Sol franc sableux St. Francois	sables grossiers de délavages.	"	"	BP	Fsl
Sol franc sablo-graveleux Knowlton	graviers mal assortis, en forme de kames et d'eskers	"	en forme de kame	BP	Kgsl
Sol franc sablo-graveleux Rougemont	gravier de plage, stratifié.	bon à excessif	en pente	BP	Rgsl
Sol franc graveleux Rougemont	"	"	"	BP	Rgl
Sol franc sableux Sheldon	Sable alluvionnaire sur argile.	bon	"	P	Shsl
Sol franc Suffield	dépot franc-argileux à franc-limoneux	"	"	BP	Sfl
Sol franc argileux Suffield	"	"	"	BP	Sfcl
Sol franc sableux Milby	alluvion récent	unie	"	A	Msl
Sol franc limoneux Milby	"	imparfait	"	A	Msil
Sols alluvionnaires non différenciés		mauvais	"	A	U a

SOLS DE LA PLAINE DU ST. LAURENT, DÉVELOPPÉS DE MATÉRIAUX SÉDIMENTAIRES					
NOM DU SOL	ROCHE MÈRE	DRAINAGE	TOPOGRAPHIE	GROUPE	
Sable Ste. Sophie	sables profonds sur argile.	bon à excessif	ondulée à vallonnée	P	Ss
Sol franc sableux Rubicon	"	variable	légèrement ondulée	GP	Rusl
Sol franc sableux fin Rubicon	"	"	"	GP	Rufsl
Sol franc sableux St. Damase	mince dépot sableux sur argile	imparfait	"	I	Dsl
Sol franc limoneux Yamaska	dépot alluvio-lacustre, franc argileux à franc limoneux.	"	unie à légèrement ondulée	I	Ysil
Sol franc Yamaska	"	"	"	I	Yl
Sol franc sableux fin Yamaska	"			I	Ysl
Sol franc argileux Richelieu	dépot alluvio-lacustre argileux à franc limono-argileux	"	"	I	Ricl
Sol franc sablo-argileux Richelieu	"	"	"	I	Riscl
Sol franc sableux fin Richelieu	"	"	"	I	Risl
Sol franc argileux Iberville	"	mauvais	unie ou en dépression	H	Icl
Sol franc argileux Ste. Rosalie	argiles lacustres ou marines.	imparfait	unie à légèrement ondulée	I	Rcl
Sol franc argileux lourd Ste. Rosalie	"	"	"	I	Rhcl
Sol franc Ste. Rosalie	"	"	"	I	Rl
Sol franc argileux- phase calcaire	"	"	"	I	Rcl–c

SOLS DIVERS					
Gravier Iron Hill	gravier mince dérivé de syénite	bon	vallonnée à accidentée	L	IHg
Terrain rocailleux accidenté	matériaux variés	variable	accidentée	Type de terrain	R S
Terre noire	dépots organiques bien décomposés	mauvais	unie ou en dépression	B	Mu
Terre noire mince				B	Mush
Tourbe	dépots organiques mal décomposés.	"	"	B	P
Marécage	mince dépot organique sur sol minéral.	"	en dépression	H	

Compiled, drawn and published by the Experimental Farms Service, Ottawa, 1946, from base maps furnished by the Department of National Defence.

Compilé, dessiné et publié par le Service des Fermes Expérimentales à Ottawa, 1946, d'après une carte de base fournie par le ministère de la Défense Nationale.

COMPLEXES

Complexe Milton-Shefford....... Mi – s
Complexe Henryville-Bedford.... .... H–Bd.
Complexe St. Sébastien-Ste, Rosalie..... Se – R.

GROUPES DE SOLS

A = Azonal
B = Bog
H = Half Bog
P = Podsol
GP = Groundwater Podsol
BP = Brun Podsolique
I = Incomplètement mûri
L = Lithosol

CONVENTIONS

Symbole: Nom du sol — Texture / Quantité de pierres — Topographie

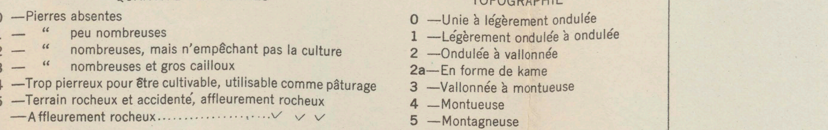
QUANTITÉ DE PIERRES

0 —Pierres absentes
1 — " peu nombreuses
2 — " nombreuses, mais n'empêchant pas la culture
3 — " nombreuses et gros cailloux
4 —Trop pierreux pour être cultivable, utilisable comme pâturage
5 —Terrain rocheux et accidenté, affleurement rocheux
—Affleurement rocheux.................... ✓ ✓ ✓

TOPOGRAPHIE

0 —Unie à légèrement ondulée
1 —Légèrement ondulée à ondulée
2 —Ondulée à vallonnée
2a—En forme de kame
3 —Vallonnée à montueuse
4 —Montueuse
5 —Montagneuse

Scale 1 mile to 1 inch or 1 : 63,360 — Echelle 1 mille au pouce ou 1 : 63,360



Contour interval 25 Feet
All Elevations in Feet above Mean Sea Level.

Equidistance des courbes de niveau: 25 pieds.
Les hauteurs sont données en pieds au-dessus du niveau moyen de la mer.

REFERENCE