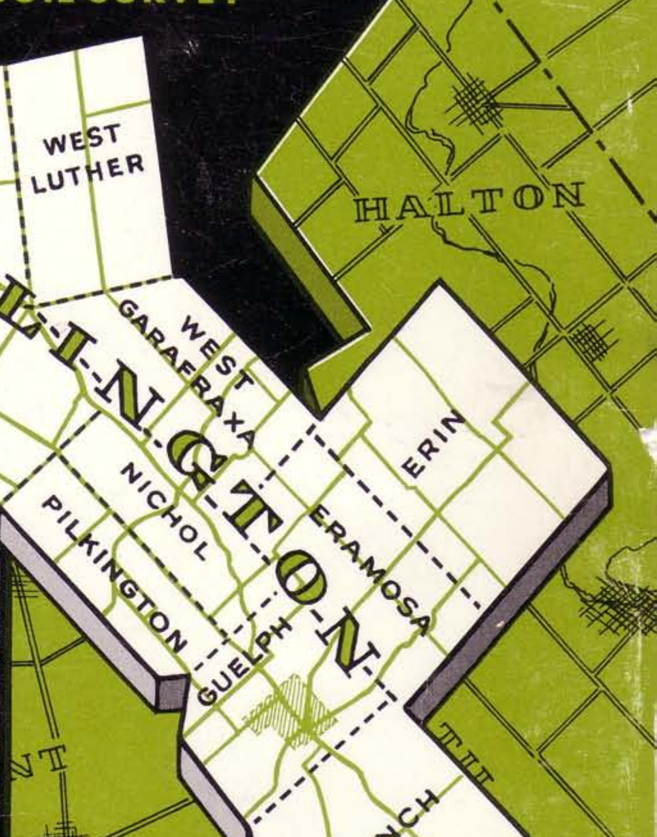
SOIL SURVEY OF WELLINGTON COUNTY ONTARIO

REPORT Nº 35 OF THE ONTARIO SOIL SURVEY



Prepared jointly by the Research Branch, Canada Department of Agriculture and the Ontario Agricultural College.

DA DEPARTMENT OF AGRICULTURE, OTTAWA

ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO

West Central Counties
Wellington
1963

SOIL SURVEY
of
WELLINGTON COUNTY
Ontario

by

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GUELPH, ONTARIO
1963

REPORT NO. 35 OF THE ONTARIO SOIL SURVEY

RESEARCH BRANCH, CANADA
DEPARTMENT OF AGRICULTURE AND THE ONTARIO
AGRICULTURAL COLLEGE

SOIL SURVEY MAPS AND REPORTS

PUBLISHED BY COUNTIES

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PREFACE

The soil survey of Wellington County was initiated in 1946 by the late Professor F. F. Morwick and N. R. Richards, now Dean, Ontario Agricultural College. The authors acknowledge the assistance of J. E. Gillespie and the student assistants who assisted with the field mapping, helpful advice of Dr. P. C. Stobbe, Director, Soils Research Institute, Central Experimental Farm. Grateful acknowledgement is due to various members of the Department of Soil Science for assistance in drafting and in the analysis of the soils.

The soil map was prepared for lithographing by the Cartographic Section of the Soil Research Institute, Central Experimental Farm, Ottawa.

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Map—Soil Map of Wellington County in Pocket Back of Report

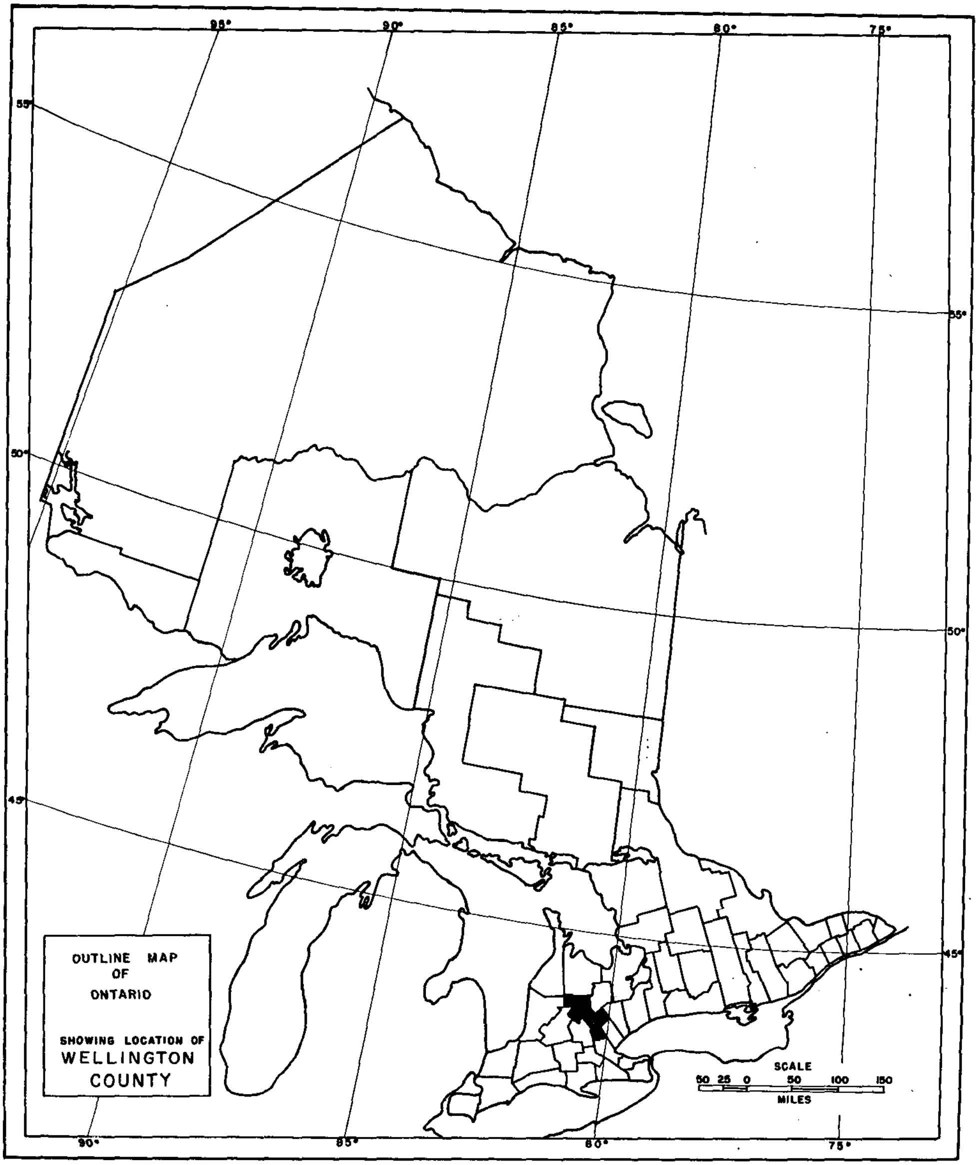


Figure 1. Outline Map of Ontario Showing Location of Wellington County

THE SOIL SURVEY OF WELLINGTON COUNTY
Ontario

INTRODUCTION

The survey of the soils of Wellington County was completed in 1946 and the soils have been correlated with the soils in other counties more recently. The object of this study was to determine the location and extent of the different soils and to obtain information about their use for the production of agricultural crops. A map showing the distribution of the various types of soils accompanies this report.

The report describes the geology, climate, vegetation, relief and drainage and indicates how these factors have influenced soil development. A description of each kind of soil, together with a discussion of its use for agricultural purposes is included. In the section on soil management some fundamental principles of management are discussed. The soils are also rated according to their present and potential agricultural use. In the absence of crop yield information, the rating has been made chiefly on the basis of the physical and chemical characteristics of the soil.

Over 90 per cent of the total land area in the county is occupied farm land. Dairying and mixed farming are most common, but livestock raising and the growing of cash crops are prevalent in some areas. Poultry and swine provide a large part of the farm income. Potatoes are an important crop in the Hillsburgh district as are turnips in the vicinity of Guelph and Elora. The largest acreage of flax in the Province is grown in Wellington County. The relationship between these uses and the soils in the county is presented in the report.

Although the soil map shows the general pattern of soils in the county, it does not show exact detail because of the limitations of the scale. Many of the soil areas on the map include small amounts of other soils. For example, areas of Parkhill and London soils, too small to be shown on the map, occur in the depressions of areas mapped as Guelph. Such inclusions occupy less than 20 per cent of any area shown on the map as one soil type,

GENERAL DESCRIPTION OF THE AREA

Location

Wellington County is located in Western Ontario between 80° and 81° west longitude and between 43°30′ and 44° north latitude (Fig. 1). It is bounded on the east by the Counties of Halton, Peel and Dufferin, on the north by Grey County, on the west by Huron, Perth and Waterloo, and on the south by Wentworth County. The total land area is 652,160 acres (1019 square miles).

Principal Towns

Guelph (population 40,000) is the county seat. The dignity and charm of old world architecture combined with modern suburbs and an expanding, active industry, make this one of the most attractive cities in the Province. It is also the location of the Ontario Agricultural College, Ontario Veterinary College and Macdonald Institute, well known centres of higher education.

Thirteen miles northwest of Guelph is Fergus (3,928)*. Arthur (1,256) located in the north-central section of the county, is the headquarters of the Agricultural Representative. Palmerston (1,518), a divisional point for the Canadian National Railways, is located in Minto Township a few miles southeast of Harriston (1,632). Harriston and Mount Forest (2,576) are important business centres in the northern end of the county. The towns and villages provide ready local markets for the many products of the farms.

The location of the principal towns within the county is shown in Figure 2.

*Population figures from the Municipal Directory, 1962, Department of Municipal Affairs.

Population

In 1956, according to the Census of Canada, the total population of Wellington County was 75,791. Approximately 36 per cent of the people were rural dwellers but only 24 per cent lived on farms.

The trend in population growth is shown in Table 1. From 1881 to 1921 the population decreased but has increased steadily since 1921. The urban population has increased to a greater extent than rural population, e.g. from 1951 to 1956 the population in Wellington County increased by 8,861 persons, 6,504 of whom were in the City of Guelph. In 1941 almost 43 per cent of the people in Wellington County lived in the country but by 1951 this figure was only 38 per cent and by 1956 was further decreased to 36 per cent. Such trends in population away from the rural areas are evident in many parts of the Province.

TABLE 1.

TREND IN TOTAL POPULATION

Year	*Population*	*Year*	*Population*
1871	56,128	1921	54,160
1881	64,641	1931	58,164
1891	59,350	1941	59,453
1901	55,646	1951	66,930
1911	54,492	1956	75,791

Transportation

Wellington County is well supplied with transportation facilities. Roads and railways traverse the county, connecting it with the large marketing centres in the Province. Highway No. 7 and Highway No. 401 provide easy access from the southern townships to Toronto or Kitchener. Highway No. 6, connecting

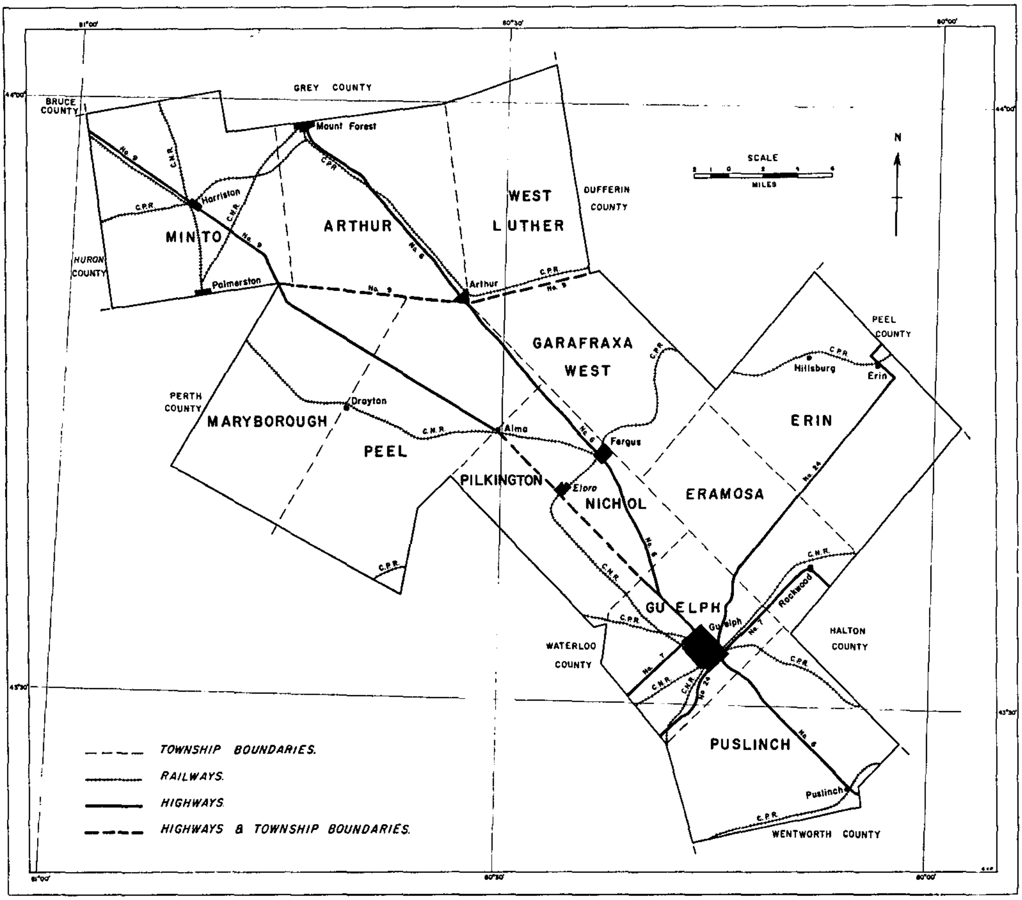


Figure 2. Townships, Principal Towns, Highways and Railways in Wellington County

Mount Forest, Arthur, Fergus and Guelph, runs through the centre of the county to Hamilton. The northern part of the county is served by Highway No. 9, which connects Arthur and Harriston. Additional transportation facilities are provided by Highways No. 24, 86 and 87, and a network of good county and township roads.

Palmerston is a divisional point for the Canadian National Railways from which lines radiate through many of the townships. The main line of the C.N.R. from Toronto to London and Windsor passes through Guelph and the main line of the C.P.R. between Galt and Toronto passes through the southern end of Puslinch Township. The Canadian Pacific Railway also has branch lines through Erin, Puslinch, Garafraxa, Guelph, Arthur and West Luther Townships.

Geology of the Rocks

In the southern portion of Ontario, as a result of repeated glaciations, the rock is covered by a mantle of loose materials called drift which varies from a few inches to several hundred feet in thickness. The soils have developed directly from the deposits of drift; thus the extent to which the underlying bedrock has contributed to the composition of the soils is often difficult to assess.

The region comprising Wellington County is underlain by sedimentary strata of Silurian and Devonian ages (Fig. 3). The lowest strata of Silurian rocks consist of sandstone, limestone and shale and are called the Medina formation. These rocks are overlain by grey and buff dolomites of the Lockport and Guelph formations which are, in turn, overlain by grey calcareous shales and brown, platy dolomite of the Salina formation. The uppermost Silurian strata are brown dolomite and grey to bluish argillaceous dolomite of the Bertie-Akron formation. All of these formations, except the Medina, occur in Wellington County.

Overlying these Silurian beds on the western side of the county are the Devonian rocks of the Norfolk formation. These are grey, bluish and brown limestone, calcareous sandstone and chert.

Surface Deposits

The surface deposits in Wellington County are chiefly of glacial origin and formed the parent material from which the soils have developed. The variations that occur in texture, relief and drainage of soils are a result of differences in the nature of these deposits. Figure 4 shows the distribution of the principal kinds of surface deposits in the county.

The surface deposits are classified as till, outwash, kame, esker, deltaic and lacustrine on the basis of the mode of deposition and the texture of the deposit. Glacial tills are non-sorted materials and consist of a mixture of broken rock fragments and soil particles that range in size from sand to clay. Till materials cover a large part of Wellington County.

Clay loam tills occur mainly in Maryborough and Peel Townships and part of Arthur, West Luther and West Garafraxa. The silt and clay contents of the till in this area vary within rather narrow limits and contains few stones. In places, especially in Arthur and West Luther, the clay loam till is covered by a thin deposit of silt.

Loam textured till materials predominate in the northern and southern ends of the county. The till plains in these areas are drumlinized and contain many low broad oval hills with smooth slopes characteristic of drumlins. In the

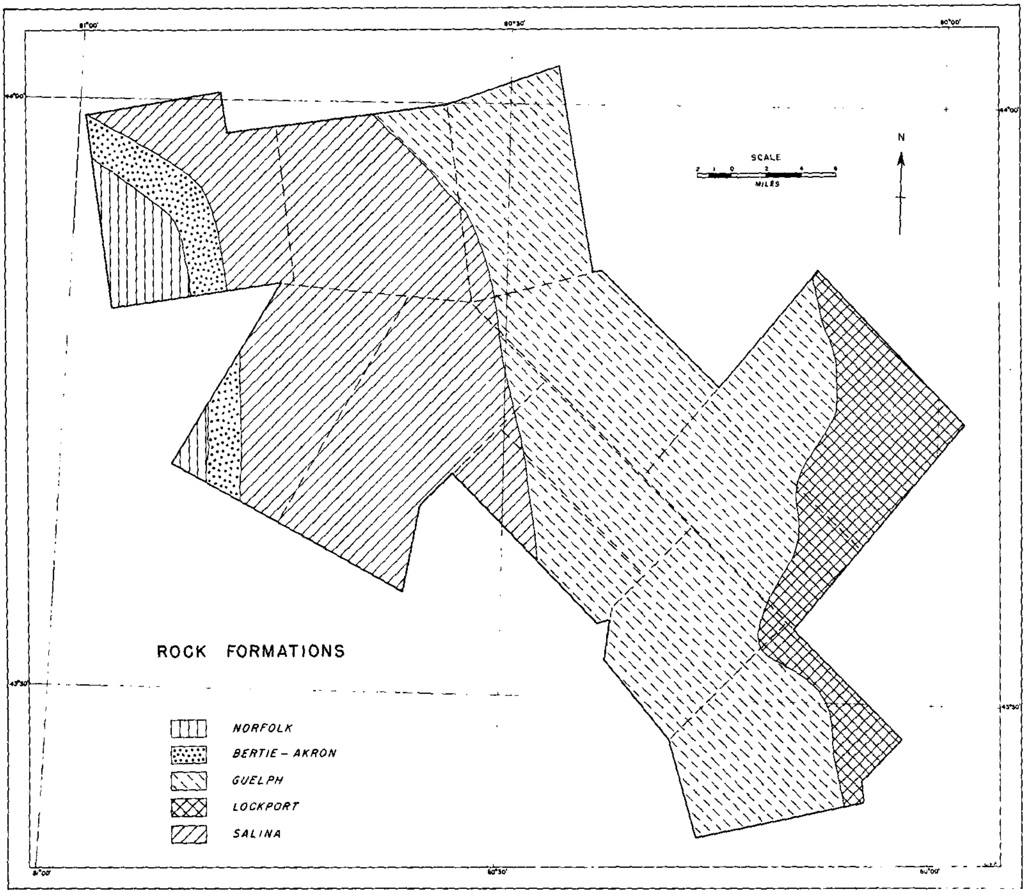


Figure 3. Outline Map showing Rock Formations in Wellington County

southern part of the county the till is calcareous being derived chiefly from dolomitic limestone. Its pale brown colour may be due to the presence of small amounts of reddish brown shale. In the north, the till is highly calcareous being derived from softer, brown dolomitic limestone of the Norfolk formation. This till is yellowish brown in colour and contains fewer large boulders than that of the Guelph region in the south.

The southern end of Erin Township and a large part of Puslinch Township are covered by recessional moraines. These moraines consist of very stony loam till and have a hilly topography. Boulders are common, although quantity varies from place to place.

Various valleys or spillways were formed by glacial streams between the drumlins and between the hills of the recessional moraine. Along the sides of these valleys, there are broad deposits of outwash gravels and sands. Although isolated deposits of outwash gravel are widely distributed within the county, the principal areas of such materials are in Guelph, Puslinch, Erin and Minto Townships. Gravel deposits rather than sand are most common and occur in relatively smooth plains.

A characteristic esker

Other deposits that are somewhat similar to outwash in the nature of the materials are kame and esker deposits. In Wellington County the kames are sandy hills often found in association with the stony tills of the recessional moraines. The main kame deposits are in Erin and Minto Townships and can be recognized by their rough topography. The soil materials are dominantly fine sands. Esker deposits consist of gravel occurring in the form of long, narrow, winding ridges. They are most common in the loam till regions where they

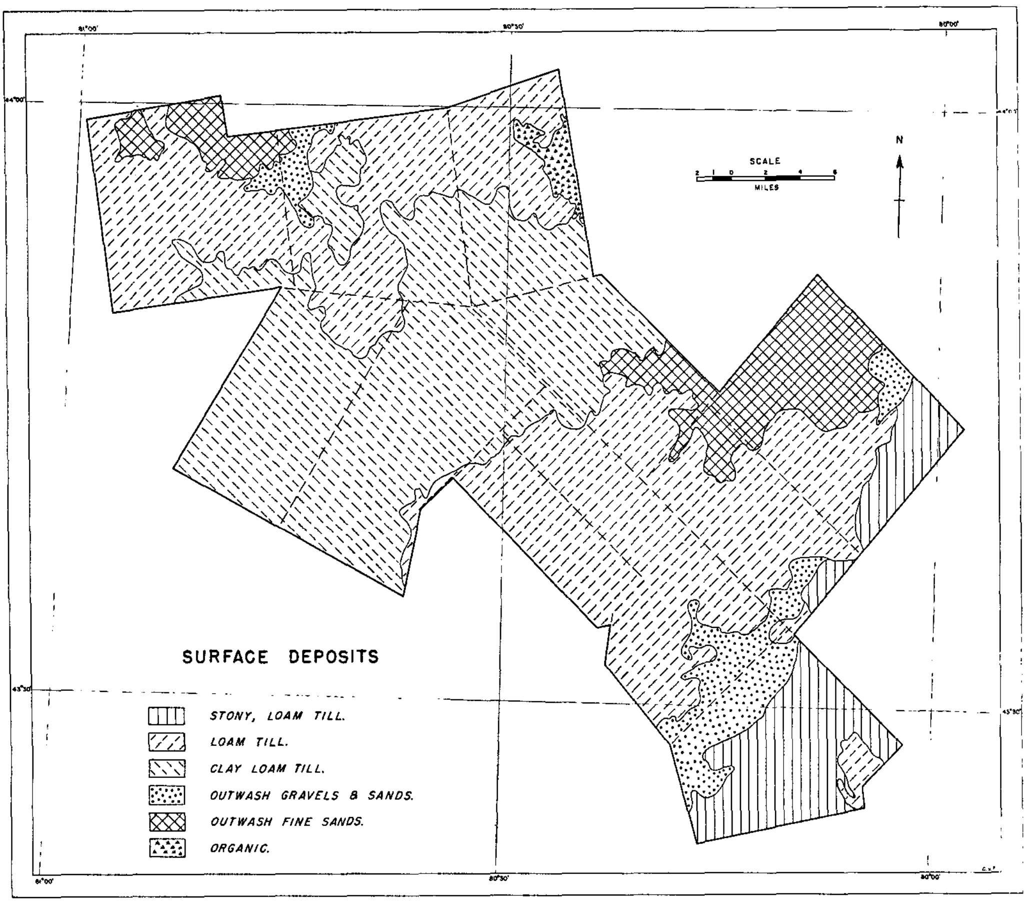


Figure 4. Outline Map showing Surface Deposits in Wellington County

cross the plain in a general direction parallel to the long axis of the drumlins but are broken in places by the meltwater spillways.

Lacustrine deposits are fine textured materials laid down in still or very slowly moving waters. Only small lacustrine areas occur in the county probably as a result of local ponding during glacial times.

Swamps are common in low-lying areas where the water has been impounded. In such places, organic materials have accumulated. Organic deposits are scattered throughout the county, the largest of which is the Luther Marsh.

Vegetation

Vegetation is an important factor in soil formation. Changes in vegetation can in time change the properties of a soil. At one time Wellington County was forested but the trees were removed during settlement and now the forest vegetation is sparse and confined to woodlots. It is difficult to measure the exact effect on the soils of the county of the change from forest to a vegetation which is chiefly grass. However, there is little doubt that decaying grass roots are producing a thicker surface layer than that formed under trees.

Not only does the vegetation influence the development of a soil, but the soil itself influences the vegetation. The kinds of trees found in any location depend, to some degree, on soil conditions. For example, in the region comprising Wellington County beech and sugar maple are the dominant species growing on the well drained loams; elm, white cedar, and willow are most numerous where the soil is wet; and pine were probably in heavy stands on the well drained sands.

Climate

Meteorological stations in Wellington County are located at Guelph and Mount Forest. Climatic data for these stations is presented in Tables 2 and 3 along with data from Huntsville and Welland to permit comparison of the climate of Wellington County with other climatic regions to the north and to the south.

TABLE 2

TEMPERATURE AT GUELPH, MOUNT FOREST AND OTHER SELECTED POINTS

	Temperature in Degrees F.			
	Guelph	*Mount Forest*	*Huntsville*	*Welland*
Month	(44)*	(26)	(30)	(45)
December	24	22	19	28
January	20	18	14	24
February	18	16	12	22
Winter	21	19	15	25
March	29	27	24	32
April	42	39	39	44
May	54	52	52	56
Spring	42	39	38	44
June	63	62	61	65
July	68	67	66	71
August	66	65	64	69
Summer	66	65	64	68
September	59	58	57	62
October	48	46	45	52
November	36	34	32	39
Fall	48	46	45	48
Annual	44	42	41	47
May 1 to Oct. 1	62	61	60	65

*Years Observed.

TABLE 3

PRECIPITATION AT GUELPH, MOUNT FOREST AND OTHER SELECTED POINTS

	Precipitation in Inches			
	Guelph	*Mount Forest*	*Huntsville*	*Welland*
Month	(44)*	(23)	(30)	(45)
December	2.14	3.49	3.28	2.89
January	2.39	3.74	3.09	3.07
February	1.74	2.83	2.45	2.90
Winter	6.27	10.06	8.82	8.86
March	1.79	2.71	2.78	2.68
April	2.38	2.66	2.09	2.84
May	2.72	3.09	2.35	2.76
Spring	6.89	8.46	7.74	8.28
June	2.84	3.35	3.69	2.71
July	3.07	2.90	2.96	3.22
August	2.86	2.78	2.70	2.38
Summer	8.77	9.03	9.35	8.31
September	2.50	3.20	3.84	2.85
October	2.39	3.00	3.44	2.93
November	2.44	3.03	3.24	2.65
Fall	7.33	9.23	10.52	8.43
Annual	29.26	36.78	36.41	33.88
May 1 to Oct. 1	13.99	15.32	16.04	13.92

*Years Observed.

According to table 2, winters are cold with mean temperatures of 19° to 21° F. and summers are warm with mean temperatures of 65° to 66° F. The mean temperatures for Guelph and that part of the county south of it are warmer than those of the more northern regions because of the southern exposure of the Guelph region. The frost-free period ranges from about 147 days at Guelph to about 126 days at the northern boundary of the county. The growing season is 189 to 196 days.

The average annual precipitation at Guelph is 29.26 inches, whereas at Mount Forest it is 36.78 inches. Snowfall ranges from 51 inches at Guelph to 97 inches at Mount Forest. Unfortunately, the area of high precipitation occurs in the same region as large acreages of level, imperfectly and poorly drained soils. As a result, seeding is often delayed because of prolonged wet soil conditions. It is also significant that the warmer region has the least precipitation.

Relief and Drainage

This region of Ontario has the typical land form features associated with Continental glaciation. Elongated hills, known as drumlins, occupy much of the southern and northern parts of the county, while the central part consists of gently undulating ground moraine. The most continuously rugged relief is on the terminal moraines in Puslinch Township and the southern end of Eramosa and Erin Townships. Other areas of rugged relief occur in the vicinity of Hillsburgh and on the west of Mount Forest morainic sandhills.

In general, the land slopes from east to west and from north to south. The highest land about 1600 feet above sea level occurs near the eastern boundary of the county north of Erin. In the southern part of Puslinch Township, the altitude is about 1000 feet above sea level whereas it is about 1250 feet above sea level along the western side of the county.

Some of the drainage features within the county are shown in Figure 5; the most prominent being the Grand River. The Speed and Eramosa Rivers

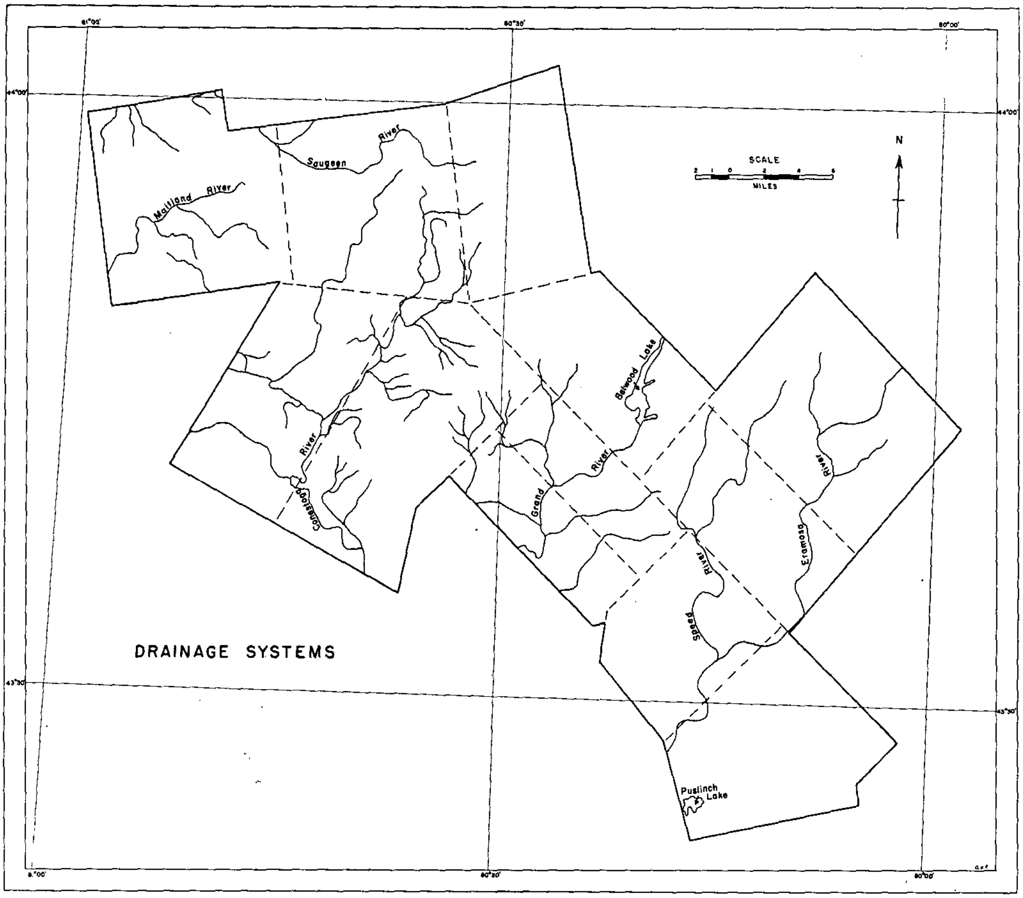


Figure 5. Outline Map showing Drainage System of Wellington County

meet at Guelph and join the Grand at Preston. The Grand River itself flows through Elora and Fergus and has been dammed near Fergus to make Belwood Lake. The Conestoga River draining Maryborough and Peel Townships has been dammed near Glen Allan to make Conestoga Lake. These lakes are used as recreational areas and are a means of water supply while their dams are effective in flood control. The northern part of the county is drained by the Maitland River system and the South Saugeen River.

Although the rivers and creeks are effective drainage outlets, there are many areas of level mineral soils and depressional bogs that lack satisfactory natural drainage outlets and they remain saturated with water for the major portion of the year.

THE CLASSIFICATION AND DESCRIPTION OF THE SOILS

The surface geological deposits previously described are the parent materials from which the soils of the county have developed. Soils differ because of differences in parent materials; however soils developed in similar parent materials may also differ because of differences in drainage and in natural vegetation.

Under the cool, humid climate and the native forest vegetation, the soils of Wellington County have become more acid than the parent materials due to the removal of bases, particularly calcium, from the surface layers of the soil by percolating water. This is referred to as a process of leaching and the effect of weathering and leaching during several thousand years has caused the development of layers or horizons within the soil. These horizons differ from one another in thickness, colour, texture or structure.

A vertical cut through the soil exposes a characteristic sequence of layers (soil profile). The different layers of the soil are often referred to as surface soil, subsurface soil, subsoil and parent material. However, because many soils have more than three horizons, it is convenient to use the specific pedological terms —A horizon, B horizon and C horizon which are further subdivided into A_1, A_2, B_1, B_2, C, etc. or *Ah, Ae, Bt1, Bt2, C etc.

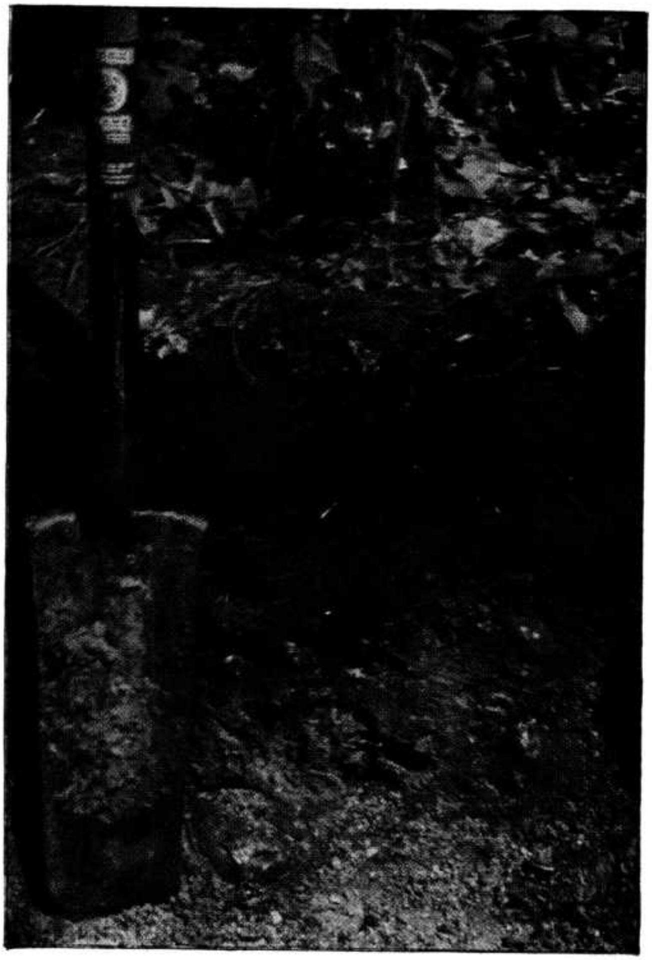
The A horizon is the surface horizon and in many soils can be subdivided into A_1 and A_2. The A_1 horizon contains the largest amounts of organic matter and is underlain by A_2, the horizon that shows most clearly the effects produced by the process of leaching. The B horizon is finer in texture and more compact as a result of the accumulation of clay and other fine materials carried down from the A horizon. Uuderlying the B horizon is the C horizon, composed of material unaltered or only slightly altered by the soil forming processes i.e. parent material.

Poorly drained soils, i.e. soils in which ground water is present in the soil for large parts of the year, have a gley horizon immediately below the A_1 horizon. The gley horizon is bluish grey or brownish grey with reddish mottling and may contain iron concretions.

Soils are principally classified by the kind, number and arrangement of horizons in the soil profile.

Thirty-nine soil series were recognized and mapped in the County. Soil series differ from one another in one or more of the following features of the soil profile—number, colour, thickness, texture, structure and chemical composition of the horizons, drainage, depth to bedrock, stoniness, and slope.

*Horizon nomenclature according to the National Soil Survey Committee 1963.



Soils of the Brown Forest Great Group have thin profiles and a brown subsoil

Many soil series, however, have some features in common, and on that basis are grouped into Great Groups. In Wellington County soils of Brown Forest, Grey-Brown Podzolic, Dark Grey Gleysolic, and Organic Great Groups occur. A generalized description of a soil representing each of these groups follows.

The Brown Forest soils occur chiefly on highly calcareous materials. These soils have a dark brown surface horizon, (A_1) about 4 inches thick, high in organic matter, and a neutral or mildly alkaline reaction. This A_1 horizon is underlain by a brown B horizon which may contain a slight accumulation of clay. In general, the B horizon shows no colour subdivisions and the profile brown is uniformly down to the unweathered parent material that occurs at a depth of about 18 inches. The base saturation of all horizons is generally 100 per cent.

The Grey-Brown Podzolic soils cover most of the county. The profile has a dark greyish brown A_1 horizon, 3 inches thick, relatively high in organic matter, and is underlain by a yellowish brown A_2 horizon that becomes lighter in

Grey-Brown Podzolic soil profile

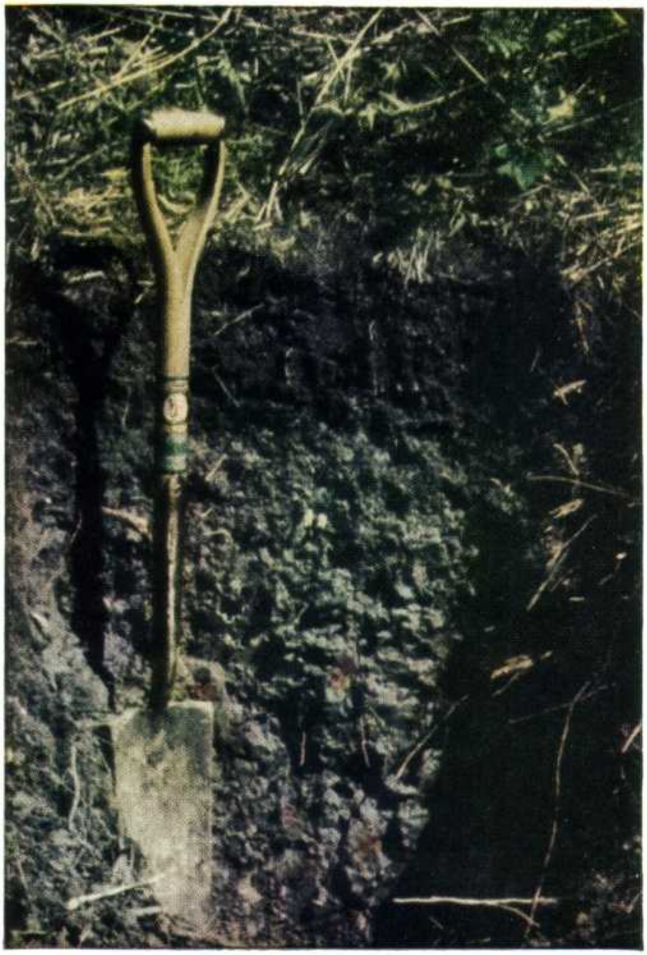
colour with depth. The B horizon is brown and finer in texture than other horizons in the profile. It contains accumulations of clay and sesquioxides. The calcareous parent material occurs at depths of 20 to 30 inches.

The poorly drained soils of the County have the characteristics of the Dark Grey Gleysolic and Organic Great Groups. The Dark Grey Gleysolic soils have a mineral surface soil high in organic matter and a dull mottled subsoil. A very dark grey to black A_1 horizon about 8 inches thick is underlain by a mottled, dark grey to greyish brown "gley" horizon. The gley horizon is underlain by the parent material.

Organic soils contain at least 20 per cent of organic matter and are more than 12 inches thick. The organic layer is underlain by a strongly gleyed mineral soil or rock. The composition of the organic materials varies according to the type of vegetation from which they formed and on their degree of decomposition

Series, Types, Phases and Complexes

The units by which soils are mapped and described are designated as series, types and phases. The principal mapping unit is the series which in turn may



A Dark Grey Gleysolic Profile

consist of two or more types or phases. All the soils included in a series are relatively uniform both in their development and in their land use. Soil series are subdivided into soil types on the basis of the texture of the surface soil. The full name of the soil type is a combination of the series name and the surface texture, for example, Guelph loam. The soil phase is not a part of the natural classification of soils and can be a subdivision of the soil type, series or any other classification unit.

Soil complexes which have been used in this survey as mapping units are combinations of two or more soil types. These mapping units are used where two or more soil types occur in such an intricate pattern that they cannot be separated on the map. In naming each complex, the names of the dominant soil types are used. The characteristics of each type are the same as in the areas where they occur alone.

Soil Catena

Soils that have developed on similar parent material but differ in the characteristics of the solum as a result of differences in drainage are commonly grouped into a unit that is called a soil catena. The catena name is taken from the soil series that has good natural drainage. Such a grouping of series in the county is shown in Table 4.

TABLE 4

CATENARY RELATIONSHIP OF WELLINGTON COUNTY SOILS

Catena Name	Series Members — Drainage: *Good*	*Imperfect*	*Poor*
Brant	Brant	Tuscola	Colwood
Burford	Burford	Brisbane	Gilford
Caledon	Caledon		
Donnybrook	Donnybrook		
Dumfries	Dumfries	Killean	Lily
Farmington	Farmington		
Fox	Fox	Brady	Granby
Guelph	Guelph	London	Parkhill
Harriston	Harriston	Listowel	Parkhill
Hillsburgh	Hillsburgh		
Huron	Huron	Perth	Brookston
Teeswater	Teeswater		Gilford

SOIL KEY

A. Soils Developed on Glacial Till.

	Acreage
I. **Coarse, calcareous, loam parent material**	
(a) Well-drained	
1. Dumfries loam (G.B.P.)	42,700
(b) Imperfectly drained	
1. Killean loam (G.B.P.)	3,500
(c) Poorly drained	
1. Lily loam (D.G.G.)	600
II. **Pale brown, calcareous, loam parent material**	
(a) Well-drained	
1. Guelph loam (G.B.P.)	64,000
2. Guelph sandy loam (G.B.P.)	400
(b) Imperfectly drained	
1. London loam (G.B.P.)	26,300
(c) Poorly drained	
1. Parkhill loam (D.G.G.)	10,400
2. Parkhill silt loam (D.G.G.)	3,300
III. **Yellowish brown, calcareous, loam parent material**	
(a) Well-drained	
1. Harriston loam (G.B.P.)	45,400
2. Harriston silt loam (G.B.P.)	15,100
(b) Imperfectly drained	
1. Listowel loam (G.B.P.)	9,000
2. Listowel silt loam (G.B.P.)	39,600
IV. **Calcareous, clay loam parent material**	
(a) Well-drained	
1. Huron loam (G.B.P.)	74,800
2. Huron silt loam (G.B.P.)	6,800
(b) Imperfectly drained	
1. Perth loam (G.B.P.)	93,000
2. Perth silt loam (G.B.P.)	12,000
(c) Poorly drained	
1. Brookston loam (D.G.G.)	9,800
2. Brookston silt loam (D.G.G.)	4,300

B. Soils Developed on Outwash.

I. **Calcareous, medium sand parent material**	
(a) Well-drained	
1. Fox sandy loam (G.B.P.)	6,800
(b) Imperfectly drained	
1. Brady sandy loam (G.B.P.)	2,200
(c) Poorly drained	
1. Granby sandy loam (D.G.G.)	3,200
II. **Loam material overlying coarse gravel**	
(a) Well-drained	
1. Burford loam (G.B.P.)	28,200
(b) Imperfectly drained	
1. Brisbane loam (G.B.P.)	3,500
(c) Poorly drained	
1. Gilford loam (D.G.G.)	4,800
III. **Fine Sandy loam material overlying coarse gravel**	
(a) Well drained	
1. Caledon fine sandy loam (G.B.P.)	13,000
IV.—**Silt loam material overlying coarse gravel**	
(a) Well drained	
1. Teeswater silt loam (G.B.P.)	4,500
V. **Fine to medium sand materials in stony moraine**	
(a) Well drained	
1. Hillsburgh sandy loam (G.B.P.)	2,400
2. Hillsburgh fine sandy loam (G.B.P.)	35,000
VI. **Coarse gravel and cobblestone**	
(a) Well drained	
1. Donnybrook sandy loam (G.B.P.)	8,800

C. Soils Developed on Lacustrine Deposits.

I.—**Calcareous, fine sandy loam and silt loam parent materials**	
(a) Well drained	
1. Brant fine sandy loam (G.B.P.)	1,900
(b) Imperfectly drained	
1. Tuscola silt loam (G.B.P.)	200
(c) Poorly drained	
1. Colwood fine sandy loam (D.G.G.)	1,200
2. Colwood silt loam (D.G.G.)	900
II. **Calcareous clay loam parent materials**	
(a) Poorly drained	
1. Toledo clay loam (D.G.G.)	2,400

D. Shallow Soils.

I. **Calcareous loam till overlying limestone**	
(a) Well drained	
1. Farmington (B.F.)	1,500

E. Soils Developed on Recent Alluvial Deposits.

I. **Loam, sandy loam and silt loam materials**	
(a) Variable Drainage	
1. Bottom Land (R)	6,300
2. Stream Courses (R)	1,200

F. Soils Developed on Organic Deposits.

(a) Very poorly drained	
1. Muck	32,200
2. Peat	6,400

G. Soil Complexes.

1. Dumfries-Hillsburgh	9,000
2. Donnybrook-Teeswater	1,000
3. Brant-Harriston	3,600

Great Groups

B.F.—Brown Forest

D.G.G.—Dark Grey Gleysolic

G.B.P.—Grey-Brown Podzolic

R.—Regosol

DUMFRIES SERIES

The main area of Dumfries soils is in Erin and Puslinch Townships. These soils have developed from stony soil material derived mainly from limestone. The material is therefore calcareous and free carbonates can be found at depths of 18 to 24 inches except in places of severe erosion where they occur at the soil surface.

The topography is hilly; slopes are steep, irregular and short; depressions or "potholes" are common. Since water runs rapidly off the steep slopes or readily percolates through the stony materials the Dumfries soils are well drained. However, within the areas shown on the soil map there are often areas of poorly drained soils too small to be delineated. These potholes contain water during a large part of the year, cannot be easily drained and therefore are not arable.

Hills and rough surface areas in the Dumfries series

Surface erosion has occurred on most of the cultivated slopes. Indeed, the soil loss has been so great on many of the knolls that the whole profile hass been removed and only the light grey parent materials remain. Erosion is slight where the land has been kept under grass or tree cover. Stones and boulders are numerous both on the surface and throughout the soil mass. As a result, stone removal becomes an annual chore and the presence of frequent stone piles interferes with cultivation.

The Dumfries soil is classed as Grey-Brown Podzolic, having a dark grey Ah layer about 4 inches thick, a yellowish brown Ae horizon which becomes lighter in colour with depth and a dark brown B horizon which contains more clay than any other horizon in the profile. Although this is the general appearance of the soil profile there are certain variations which should be noted. One or more of the horizons may not be present depending on the amount of soil which may have been removed by erosion. In addition there is considerable variation in the thickness of the horizons and the number of stones.

Most of the Dumfries soil areas have been cleared and are used for livestock raising and dairying. Because of steep slopes and stoniness somewhat less than 40 per cent of the land is under cultivated crops. Pastures and woodlots make up the remaining 60 per cent. Spring grains, winter wheat, mixed hay, pasture and silage corn are the main crops grown. Pastures occupy almost 35 per cent of the Dumfries soils and are often weedy and thin.

Pasture improvement on the smoother slopes and reforestation of the steep areas are the keys to better land use in the Dumfries area. Hardwoods, especially sugar maple and beech, do grow well. More attention could be paid to the wildlife potential in areas occupied by the Dumfries soils.

KILLEAN SERIES

The Killean soils which are in association with the Dumfries soils are imperfectly drained and occur on hummocky upland areas where surface run-off is low and permeability is slow. The material from which these soils have been derived, is the same as that of the Dumfries series.

The profile of the Killean soil is similar to that of the Dumfries, except that the horizons are not as well developed and the soil colours are somewhat duller. The effects produced by imperfect drainage can be seen in the horizons below the surface. Where soils remain saturated for large portions of the year, mottles or blotches of yellow and orange colours appear. The Killean soil profiles are relatively uniform, the thickness, colour, texture and structure of the horizons being almost the same wherever these soils occur. There is some variability in the number of stones occurring on the surface.

Most of the Killean soils are cleared and used for pasture. Surface stones often interfere with cultivation but where they have been removed cereal grains are grown. Seeding operations are delayed in the spring by an excess of water. The presence of a high water table at certain periods of the year also has an adverse effect on the growth of certain legumes, especially alfalfa.

LILY SERIES

Like the Killean soils the Lily soils are developed from the same materials as the Dumfries soils. The Lily soils occur in depressional areas between the hills. In such locations water tends to accumulate and the soils remain wet for most of the year.

The soils in these locations have characteristics that are greatly different from those of the soils occurring on the slopes where drainage is much better. The Lily soils differ from the adjacent upland soils especially in the darker colour of the surface soil due to organic matter accumulation, and to some extent, the accumulation of eroded surface soil carried down the slopes by running water.

The dark coloured surface soil is commonly eight to twelve inches thick, has a friable granular structure, and a neutral to slightly alkaline reaction. Below the surface layer is a grey layer which is strongly mottled. The colour becomes lighter and the structure coarser with depth.

Because of their stoniness and wetness the Lily soils are seldom cultivated. They are used for rough pasture or for woodlots. In many places existing woodlots contain trees and bushes of low quality. Replanting with the proper species and good management could make the woodlot an asset to the farm.

GUELPH SERIES

The Guelph soils occupy the gently rolling hills and the steeply rolling drumlins in the vicinity of the city of Guelph. Most of the 64,400 acres of these soils occur in a belt between Fergus and Guelph running from Waterloo County in the west almost to Peel County in the east.

The soil parent material consists of glacial till derived from the grey and brown limestones of the underlying rock strata. The soils are predominantly loams although some small areas of sandy loam occur east of Oustic. The higher sand content in these soils may be due to the influence of the outwash sands which completely surround them.

These are among the best agricultural soils in the Province. In general there are very few field stones or boulders; the only handicap to cultivation is the frequency and steepness of slopes. The soils are well drained both internally and externally but retain adequate amounts of moisture for the needs of agricultural crops. Erosion hazard is great on the steep slopes.

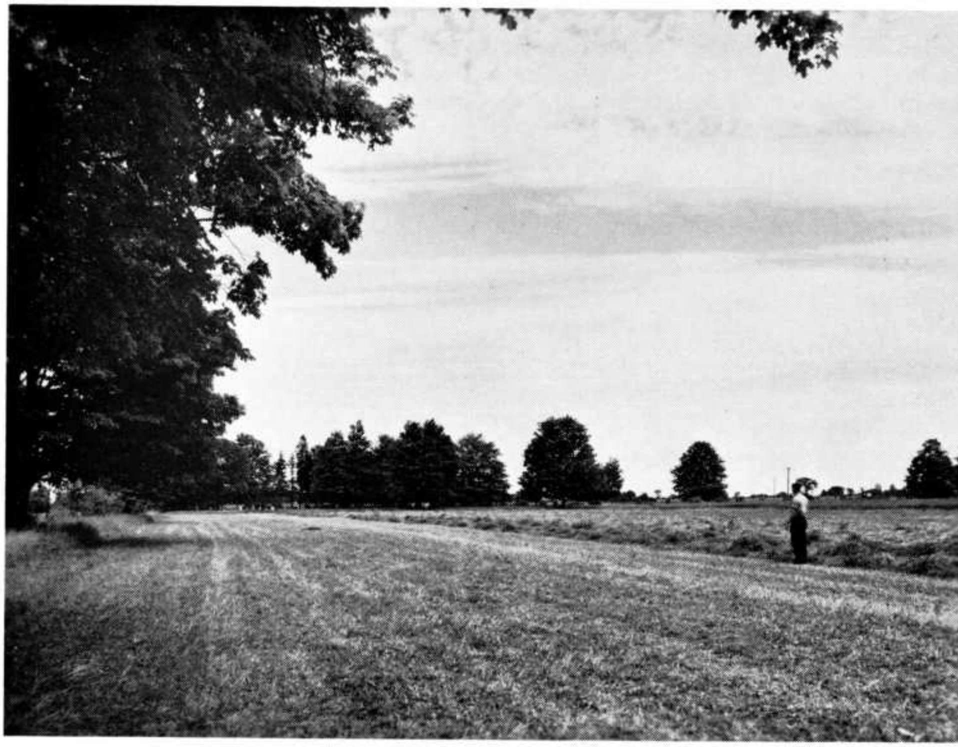
The surface soil is dark greyish brown and moderately high in organic matter content. Below the surface layer is a brown layer which becomes lighter in colour with depth and rests on a dark brown to dark yellowish brown layer containing more clay than the layers above or below it. The depth of soil to the unaltered parent material is approximately twenty-four inches except where water erosion has removed the upper portion of the soil. The Guelph soils are classified as Grey-Brown Podzolic.

This portion of Ontario was first settled between 1820 and 1830 and although the Guelph soils have been cultivated for 140 years erosion has not been extreme because of predominance of hay and pasture crops. Dairying and livestock raising have been the major farm enterprises throughout the years. The main crops grown are pasture, hay, mixed grains, oats, winter wheat and silage corn. Turnips for table use are grown commercially. Yields of most crops are well above the provincial average but could be economically increased by applying commercial fertilizers at somewhat higher rates than are currently used.

LONDON SERIES

The London soils occurring in association with the Guelph Series are important agricultural soils in Wellington County. They are imperfectly drained soils on gently undulating upland areas where surface runoff is slow and internal drainage is moderate. The material from which these soils have been derived is the same as that of the Guelph series and they therefore have the same potential for agricultural production if they are artificially drained.

The dark colored surface horizon is commonly one or two inches thicker than the same horizon in Guelph soils, and one or two per cent higher in organic matter content. The average organic matter content for cultivated surface soils is over 5 per cent. The layers below the surface are duller in colour



A crop of hay on London loam

than those of the Guelph soils and are not as easy to differentiate. Mottles or blotches of orange and yellow colours appear in the subsoil and in the parent material indicating that the water table is high at certain periods of the year. The accumulation of clay in the subsoil (B) horizon is not as great as it is in that of the Guelph soils.

The London soils are general purpose soils capable of producing arable crops or good pastures in support of mixed farming, livestock raising or dairying. The high water table delays seeding operations in the spring, may adversely affect the growth of alfalfa, or reduce the yield of winter wheat by winter-killing. However, when artificially drained the London soils have a higher potential than the Guelph, mainly because of their smoother topography; a factor contributing to easier management.

PARKHILL SERIES

These poorly drained soils cover 13,700 acres in the county and occur in depressions in association with the Guelph, London, Harriston and Listowel soil series. Although these soils are wet for the major part of the year there is a time, generally late in the summer, when they are free from excess water.

In contrast to the associated upland soils, the Parkhill soils have a much darker and thicker surface soil. The black organic matter from the decaying leaves, stems and roots of plants tends to accumulate in wet places and it is mixed with the mineral soil by worms and by cultivation to produce a thick black surface soil. Some of the dark surface has also resulted from the accumulation of surface soil carried down the adjacent slopes by water.

The brown subsoil colour of the better drained soil is not present in the Parkhill soils. Instead, the surface is underlain by two grey layers that differ from each other in intensity of colour and in structure. Usually the upper layer is a darker grey than the layer below it. However, in some places, the upper layer is lighter grey. The subsoil layers may be distinctly yellowish where these soils occur in association with the Harriston and Listowel soils. The yellowish brown of the parent materials is reflected the colour of the whole profile. The subsoil layers are profusely mottled.

A *Parkhill loam profile*

The surface soil is generally neutral; the subsoil becomes more alkaline with depth. Free carbonates are commonly present at 24 inches or less.

The Parkhill soils are often too wet for regular cultivation and therefore are used for pasture and hay crops. These soils may be included with the regular rotation land if they are artificially drained. Artificial drainage may be difficult to install because of the problem of finding a suitable outlet.

HARRISTON SERIES

Although Harriston soils occur in most of the townships in the county, the largest blocks are found in Minto Township and in the vicinity of Fergus and Elora. A total of 60,500 acres have been mapped in Wellington.

These soils have a moderately to gently rolling topography and are well drained. The soil parent material is a glacial till that has been derived from the soft yellowish brown limestones that form the underlying rock strata. Except for the occasional stone on the surface, the upper part of the soil profile is stone-free. The limestones weather and disintegrate rapidly and those that remain occur mainly in the lower subsoil and parent material. When rubbed between the fingers, the weathered surface of these stones crumbles to a soft floury material consisting mainly of particles of silt size. Although most of the soils are loam the silt content is rarely below 45 per cent, in contrast to the Guelph soils in which the silt content is commonly below 45 per cent.

The Harriston soils have the same number and sequence of layers as the Guelph soils and therefore are included in the same group—Grey-Brown Podzolic. However, they differ from the Guelph in colour, composition of the parent materials, and to a lesser extent texture and stoniness. The most striking feature is the pale yellowish brown colour and the presence of the soft limestones in the parent materials. The yellowish cast is a feature of the whole profile.

These are among the best agricultural soils in Southern Ontario and the only handicap to cultivation is the frequency and steepness of the slopes. Where little or no erosion has taken place the depth of soil to unaltered parent material is approximately twenty-four inches. The surface soil is slightly alkaline in reaction and is easily worked.

On the Harriston soils livestock raising and dairying are the common farm enterprises. Hay, pasture, mixed grains and oats are the main crops grown. Winter wheat, barley, silage corn and turnips are important crops on some farms. Without fertilizer the average yield of oats is about 60 bushels per acre while that of hay is about 2 tons per acre. These yields can be increased profitably by using fertilizer.

LISTOWEL SERIES

Imperfectly drained soils that have developed from the same parent material as the Harriston series are referred to as the Listowel series. This series occupies 48,600 acres in the county. The Listowel soils occur on gently undulating upland areas where surface run-off is slow and internal drainage is moderate.

These soils remain saturated for a portion of the year and mottles or blotches of yellow and orange are present in the subsoil. The overall colours of the subsoil layers are somewhat duller than those of the same layers in the well drained soils. The texture of these soils is predominantly silt loam.

The Listowel soils have a dark coloured surface horizon which has an average organic matter content of over 5 per cent. This surface soil is underlain by a light yellowish brown mottled layer which rests on a mottled brown horizon. Although the latter layer contains more clay than the layer above the clay accumulation is not as great as it is in well drained soils. Calcareous parent material occurs at an average depth of twenty inches.

The surface soil is neutral to moderately alkaline and contains a medium amount of essential plant nutrients. These soils support mixed farming and livestock enterprises. Cereal grains, hay and pasture are the main crops grown; winter wheat is grown but yields may be reduced by severe winter ice conditions. Silage corn is also grown, yields averaging 14 tons per acre.

HURON SERIES

Huron soils are found in small, often widely separated, blocks in Pilkington, Nichol, Garafraxa, Luther, and Arthur Townships, and in larger continuous areas in Maryborough and Peel Townships. They occupy 81,600 acres in the county.

The soil parent material is greyish brown glacial till of fairly uniform texture and composition. This till is calcareous and has a clay loam or silty clay loam texture. The topography is generally gently rolling with steep slopes occurring along the sides of the larger creeks and rivers. Slopes are short and irregular. The Huron soils are moderately well drained.

The surface soil is usually loam in texture, containing 20 to 27 per cent clay. Hence the soil is quite sticky when it is wet. In some areas especially around Arthur, Huron soils have a thin silt loam surface deposit. The surface horizon is underlain by a yellowish brown layer of clay loam that becomes very pale brown to light grey when the soil is dry. This horizon is not as thick as it is in the coarser textured soils nor is it as easily subdivided into two layers on the basis of colour. The browner upper part of this horizon is either thin or entirely

A Huron loam profile

lacking. A dark brown horizon containing more clay than the layers above is the next in the sequence. This horizon has a blocky structure which persists under various moisture contents. These blocky aggregates and their natural fracture lines probably make the soil more permeable than would be expected for clay or clay loam textures.

The Huron soils belong to the Grey-Brown Podzolic Great Group of soils. The soil profile is well developed and has an average thickness of twenty inches.

Most of these soils have been cleared for farming. Hay, pasture and cereal grains are the principal crops and for these the Huron soils rank among the best in the county. They are easy to cultivate except when the upper loamy horizons have eroded away leaving the clayey subsoil. In general the farm economy is based on beef cattle and hogs, with dairying being important in some areas. Corn for ensilage is grown on many farms; winter wheat is often the main cash crop. Crop yields are high except where the sticky brown clay or greyish parent material has been exposed. Here, crop growth is uneven and yields are lower.

PERTH SERIES

The Perth soils occupy 105,000 acres in Wellington County in association with the Huron soils. They have the same greyish brown parent materials as the Huron soils but differ from them in having imperfect drainage. They occupy the lower slopes of hills and large portions of gently undulating ground moraine. As a general rule the Perth soils have sufficient slope to permit some of the sur-

A Perth loam profile

face water to drain away, but much of the rainfall enters the soil. Because the underlying materials are fine textured, the movement of soil water through the soil is slow and the mottled appearance of the subsoil horizons is an indication that the moisture content is high for many months of the year.

The Perth soils have a Grey-Brown Podzolic development but are somewhat thinner in their profile depths than those of the better drained soils. The depth of the profile ranges from 13 to 18 inches. The surface soil is thicker and darker than that of the Huron soil but has the same textural range, that is from loam to silt loam. The subsoil horizons are similar to those of the Huron except for the presence of mottled colours and a much thinner subsoil horizon. In some locations the thin grey subsoil layer has been mixed with the surface layer by cultivation and is no longer evident.

These soils are ideal for the production of cultivated hay and cereal crops. However, for certain crops, especially alfalfa, they need artificial drainage. Tile drains are installed in some areas of Perth soils and each year more are being laid. Drainage outlets are readily available in the municipal ditches. The high moisture content of these soils at certain times of the year probably has advantages as well as disadvantages. Half the cultivated acreage is used for seeded hay and improved pasture. For these crops moisture reserves are important during the dry period of the year from July through August. During the years when the spring season rainfall is heavy, these soils become wet and sticky and seeding and the cultivation of the land for spring sown crops is delayed.

BROOKSTON SERIES

The Brookston soils have developed from clay loam till similar to that of the Huron and Perth soils but under poor drainage. They occur as small level to depressional areas wherever these clay materials are found and occupy 14,100 acres in the county.

In common with other poorly drained soils these soils have a dark surface soil, 8 to 12 inches thick, high in organic matter content, of friable granular structure and neutral reaction.

Underlying the surface layer is a grey mottled horizon which may be subdivided into two layers on the basis of slight differences in colour and structure. This rests on the calcareous parent material which, in Wellington County, usually occurs at depths of 18 to 24 inches.

The surface soil varies from loam to silt loam, in contrast to the Brookston soils mapped in some other counties, particularly Essex and Lambton, where surface soil is dominantly clay and clay loam. The reaction is neutral on the surface and becomes more alkaline with depth.

Because Brookston soil areas in Wellington County are mainly small, scattered and wet many of them are not cleared. If cleared, the Brookston soils are used chiefly for pasture. In southwestern counties where Brookston soils occur in larger blocks drainage has been improved; they are used for grain corn, soybeans, burley tobacco and canning crops.

In Wellington County drainage improvement is probably difficult to implement since the areas in which the Brookston soils are located act as catch basins for water run-off from adjacent slopes and few outlets are available.

FOX SERIES

The Fox soils occur in small widely scattered areas throughout the county and occupy a total of 6,800 acres. The largest areas are located north of Puslinch Lake and a few miles east of Fergus.

The soil parent material is calcareous sand, deposited as glacial outwash, and in most cases is found beside present-day streams. Although the deposits are dominantly medium sand, fine sands and coarse sands and even gravel sometimes occur as strata with the medium sands. In general the Fox soils have a gently undulating topography with smooth slopes. However, there is an area near Puslinch Lake where short, irregular slopes of moderate steepness are common. Steep slopes may also occur near the banks of some of the streams where these soils are found. Internal drainage is very rapid because of the open nature of these sandy materials.

The Fox soils in Wellington County have well expressed Grey-Brown Podzolic characteristics. The surface is a thin, very dark greyish brown horizon of slightly acid reaction which rests on yellowish brown subsurface horizons. The subsurface horizons vary from 5 to 30 inches in thickness; hence, the depth to calcareous sand parent material varies tremendously and within short distances. This variability in thickness is related to the development of the dark brown B horizon for although its thickness is relatively uniform it is very irregular or wavy. Because the B horizon contains the highest clay content of the horizons in the profile it also has the highest moisture holding capacity. It is possible that the amount of moisture available to the growing plant is dependent on the proximity of this textural horizon to the surface. The closer the horizon is to the surface, the more moisture is available for plant use.

The Fox soils are widely known in the south western part of the Province as the principal tobacco and fruit growing soils. In Wellington County cool climate and the small size of the various areas have prevented these soils from being used for these crops. They are used mainly for growing hay and pasture crops, although winter wheat, oats, mixed grains and silage corn can be grown. Low water holding capacity and a low natural fertility restrict crop production. Productivity can be increased considerably by applying commercial fertilizer.

BRADY SERIES

The Brady soils are imperfectly drained, soils developed from calcareous sand deposits of similar composition as those from which the Fox soils developed. They occupy smooth areas that have little visible slope. These areas are small in size and occur in various parts of the county, often in association with the better drained sandy soils. They occupy 2,200 acres in the county.

The horizons of the soil profile have a more uniform thickness than those of the Fox soils, and have mottled colours. The horizon that occurs just under the dark surface is usually thin and light greyish brown. The B horizon is yellowish brown and has only slightly greater clay content than that of the other horizons of the profile. Carbonates are present at an average depth of 18 inches.

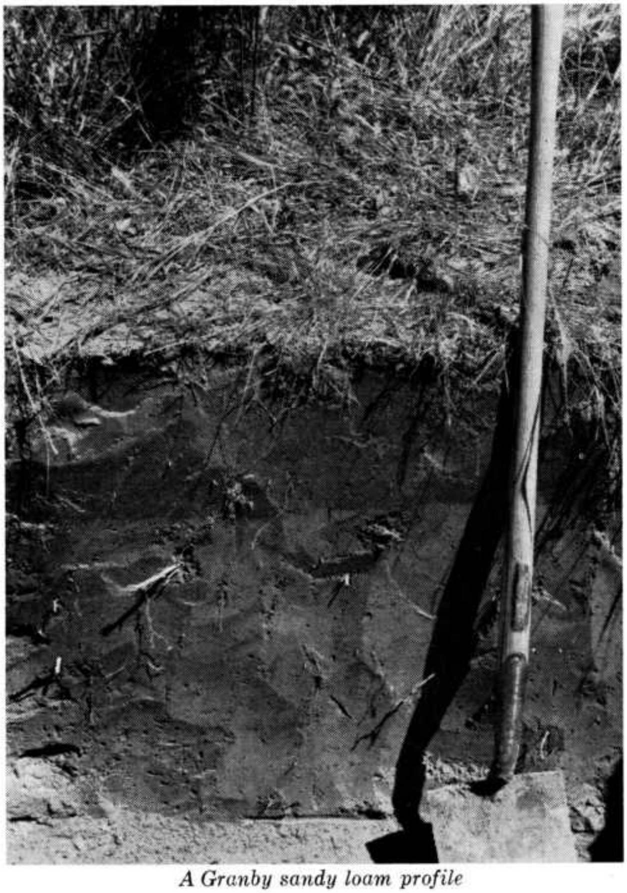
The surface soil is very dark greyish brown or black and is about 6 inches thick. The soil reaction is neutral in the surface soil and only slightly acid in the subsurface horizon. Occasionally the lower subsoil horizons are cemented to form a pan which is generally discontinuous.

The Brady soil areas have been cleared and are being cultivated. At the present time some of these soils are used for growing the various crops that are adapted to the region and in other locations pasture in the principal crop. It is evident however that these are not very productive soils regardless of the kind of crop being grown.

GRANBY SERIES

The Granby soils are the poorly drained associates of the Fox soils but they do not always occur near them. Granby soils occupy depressional areas and occur in landscapes of soils developed on glacial till as well as those developed on kame or outwash materials. The Granby soils have developed from calcareous outwash sand. Since they occur in depressions, the soils are saturated with water for the greater part of the year. These soils occupy a total of 3,200 acres in the county.

The soil profile that is produced under these conditions is typically Dark Grey Gleysolic. In the uncultivated state an 8 inch surface horizon high in organic matter is always present. Under cultivation this dark surface becomes mixed with the underlying horizon resulting in an even thicker surface. The subsoil horizons are strongly mottled, grey in colour, and can be differentiated into two horizons on the intensity of the grey colour and of the mottling. The upper layer is often a darker grey than the lower but sometimes the reverse occurs. Some of these soils have uniform grey subsoil with few mottles. This condition seems to occur in soils that have remained saturated for long periods of time. The calcareous sand is generally present at about 18 inches.



A Granby sandy loam profile

The Granby soils are rarely cultivated but are covered by small bushes and trees. The trees have little economic value except where there are large numbers of white cedar. The cedar provide an income when marketed as posts and poles. When cleared the Granby soils are used for pasture or grazing land.

BURFORD SERIES

Well drained soils consisting of loam surface horizons on gravel deposits are named Burford. The gravel was deposited by glacial meltwaters in the form of spillways that are most common in the southern part of the County the largest of which occurs on the terraces that border the Speed River. The deposits are stratified with a considerable range in the size of the material from one stratum to another. The materials vary in size from fine sand to cobbles and where these deposits occur adjacent to the stony till of the Dumfries soils, strata consisting of large stones are found.

Stratified gravel underlying the Burford loam profile

These soils occupy a total of 28,200 acres in the county. The topography is gently undulating except along the edge of the terraces where slopes are often steep. Gravel, stones, and cobbles are usually present on the soil surface and throughout the soil profile but they usually do not interfere with cultivation. Where the loam surface is thin stones are more numerous and may interfere with cultivation especially in those areas associated with the Dumfries soils.

The Burford soils are classified as Grey-Brown Podzolic and have a very dark greyish brown surface soil about four inches thick. Immediately below the surface is a yellowish brown Ae horizon which is thin and slightly acid. As in many Grey-Brown Podzolic soils, this horizon is browner in the upper portion than in the lower. However, in cultivated fields the brown layer is often absent and the horizon is a uniform colour. The B horizon is always located immediately above the calcareous gravel. It is dark brown and contains a considerable concentration of translocated clay. The depth of the profile to the underlying gravel varies from 12 to 30 inches within very short distances.

The Burford soils are producing crops such as spring grains, winter wheat, hay, pasture and silage corn. They are suitable for orchards and certain canning crops but are not being used for these crops to any great extent. For the most part the agriculture on these soils is of the generalized type. Dairying is not developed intensively except in the vicinity of Guelph where there is a continuous demand for dairy products. The underlying gravel is in demand for the construction of highways and county roads and the manufacture of certain building materials. Most of the deposits are deep and well sorted. Large gravel pits are located on the outskirts of Guelph.

Because of the open nature of the Burford soils, moisture deficiencies exist during every growing season. The Burford soils also have a low to medium content of the essential plant nutrients.

BRISBANE SERIES

The Brisbane soils are imperfectly drained and developed on materials that are similar to those that produced the Burford soils. These soils occur in association with the Burford soils and occupy small areas scattered throughout the county. About 3,500 acres of these soils are present.

The Brisbane soils have level topography and their external drainage is slow. Internal drainage is also slow because of the presence of a high water table or an impermeable layer. The surface soil is very dark grey to black and commonly contains more than 5 per cent organic matter. In most areas the gravel and cobblestone subsoil does not turn up in the plow layer, and hence does not appear on the soil surface.

The Brisbane soils, classified as Grey-Brown Podzolic, have profile characteristics similar to the Burford series. The horizons are mottled and the development of the B horizon is not as pronounced as in the Burford nor is the B horizon as wavy as it is in the Burford. The depth to the calcareous gravel is fairly uniform, being an average of 18 inches.

The Brisbane soils are not intensively cultivated but are used mostly for pasture or grazing lands. Certain areas are used for growing spring grain and occasionally some corn is grown for fodder. However, many farmers avoid using these soils in their rotation because of the excess moisture which often delays seeding.

GILFORD SERIES

Associated with areas of Burford and Brisbane soils and other soils of outwash origin are soils with poor drainage. These are the Gilford soils that occupy 4,800 acres in the county, and are found in depressional areas. Like the Brisbane soils these occur in small areas widely scattered throughout the County.

These soils have developed their characteristics under water saturated conditions. During the later part of the summer season the water table drops to a lower level but rises again in the fall. However, even at its lowest level the water table is often within six to eight feet of the surface. This wet condition gives rise to the thick black surface soil of high organic matter content that is typical of most of the poorly drained soils in Southern Ontario.

The soil profile has a surface soil about 8 inches thick underlain by strongly mottled, grey subsoil horizons. The subsoil horizons often contain lenses of silt and clay which appear to be depositional rather than the result of specific profile development. The lower of the two subsoil layers may be more mottled than the layer above it. Calcareous gravel most commonly occurs at 24 inches.

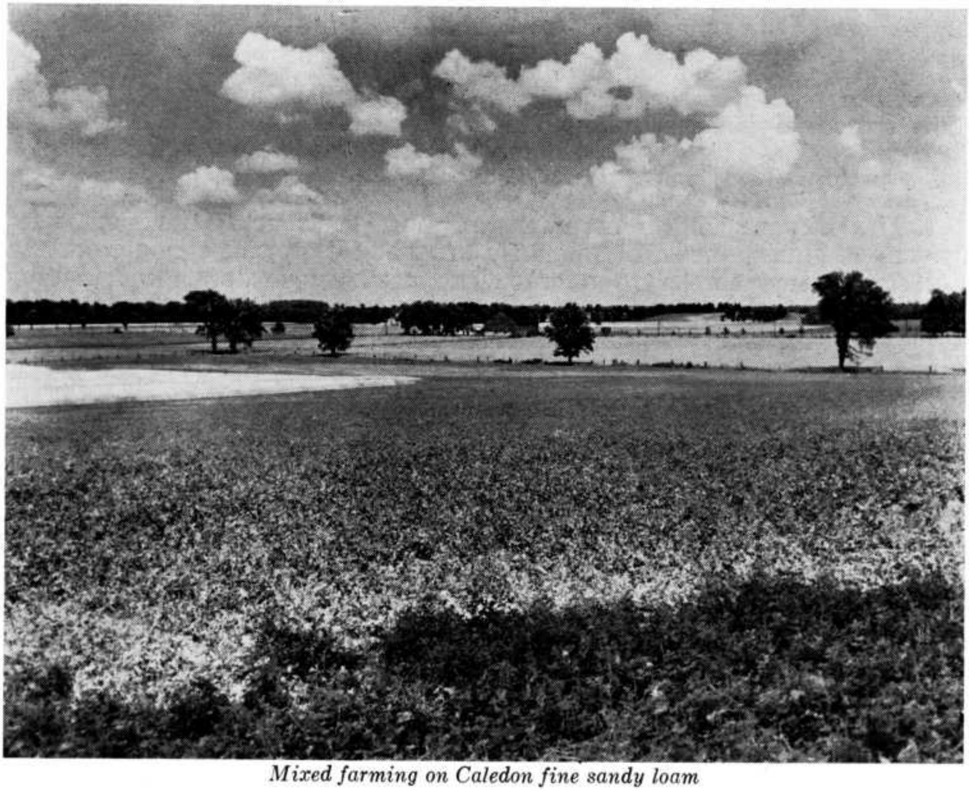
Gilford soils are essentially non-arable soils but in some cases can be used as pasture land. The majority of these soils are uncleared and serve as bushlots that provide excellent cover for wildlife.

CALEDON SERIES

The Caledon soils are well drained and have developed on gravelly materials that are similar to those that produced the Burford soils. However, the materials overlying the gravel are stonefree fine sands whereas those overlying the gravel of the Burford soils are cobbly loams.

Caledon soils occur principally in Eramosa and Erin Townships on gently undulating landscapes where external drainage is moderate and internal drainage is rapid. Slopes are long and smooth—quite different from some of the areas of Caledon soils in Peel County where short steep, irregular slopes are common. The largest area of Caledon soil is found near Rockwood along number 7 highway. This, along with a number of smaller areas, occupies a total of 13,000 acres in Wellington County.

Grey-Brown Podzolic characteristics are well expressed in the Caledon soils. The surface soil is very dark greyish brown about 3 inches thick in uncultivated areas. On cultivation a part of the subsurface is mixed with the surface to form a thicker surface layer which may be a little paler colour. The Ae horizons are about 24 inches thick, their yellowish brown colour becoming lighter with depth. The B horizon is dark brown and is located immediately above the calcareous



Mixed farming on Caledon fine sandy loam

gravel. The thickness of the profile is remarkably uniform varying from 36 to 40 inches. Gravel and cobblestones occur only in the subsoil. Except for the occasional field stone on the surface, the remainder of the soil profile is stonefree.

There is little distinction that can be made between the Caledon and Burford soils in regard to land use. All the crops that are commonly grown in the region can be produced successfully on the Caledon soils.

TEESWATER SERIES

The Teeswater soils were named after the village of Teeswater in Bruce County, the region in which these soils were first mapped. In Wellington County they occur in Minto Township and the northwest part of Arthur Township occupying about 4,500 acres.

These soils are like the Caledon soils but differ from them in having a silt loam texture. They are developed on the gravelly terraces beside some of the rivers and streams; they have a gently undulating topography and are well drained. The composition of the underlying gravel differs from that of the Burford and Caledon soils in that it contains a number of gravel and cobblestones of the same composition as those described in the glacial till of the Harriston series. These soft, yellowish stones seem to influence the colour of the profile which is somewhat more yellow than the profiles of other soils developed on gravel. The soil materials above the gravel have a high silt content giving rise to a silt loam texture.

The Teeswater soils are classified as Grey-Brown Podzolic. They have the dark coloured surface horizon and yellowish brown subsurface horizons. The B horizon in which clay is concentrated is at the juncture of the silt and gravel and is easily recognized by its dark yellowish brown colour. The overburden materials have a comparatively uniform thickness of about 36 inches.

The surface soil is friable, stonefree and therefore, easily worked. It contains a good reserve of plant nutrients. These soils drain rapidly, warm up early in the spring and have a sufficiently high moisture holding capacity to supply plants during the dry periods of the year.

These soils are among the best agricultural soils in Southern Ontario and are capable of producing all crops suitable to the area in which they are located. Winter wheat, spring grains, silage corn, hay and pasture are grown on the mixed farms in the region. These are good potato soils.

HILLSBURGH SERIES

The Hillsburgh soils occur mainly between Hillsburgh and Belwood but extend also into Dufferin County. They are well drained soils and occupy 37,400 acres in the County. Rough topography and sandy soil materials are the prominent characteristics.

The steepest slopes are those north of Hillsburgh, but knobby hills are general. Although slopes are commonly short and irregular there are some places where they are long and smooth. These soils have developed from fine sands which are intermixed with and overlie the coarse, stony till of the Dumfries soils. In most instances the till occurs at such a depth that it has little or no effect on soil development. These soils are very susceptible to wind erosion; small stones often appear at the surface in areas where soil loss has been severe. Both external and internal drainages are rapid.

The soil profile has the characteristics of the Grey-Brown Podzolic Great Group. The surface soil consists of a thin dark brown fine sandy loam. The development of the B horizon is irregular and the great variability in the thickness of the subsurface horizons gives this profile an appearance much like that of the Fox soils.

Many soil areas shown on the soil map contain small inclusions of other soils. These small areas are not delineated because of their size. This situation is particularly true of soils developed on kame moraines like the Hillsburgh. Each

Gully erosion on Hillsburgh soils

area of Hillsburgh soil shown on the map includes some Donnybrook, Brant or Granby soils. In every case, however, these soils make up less than 15 per cent of the area shown as Hillsburgh.

The Hillsburgh soils are noted as potato soils and except on the steeper slopes which are droughty and erosive, they are well suited to this cash crop. Beef cattle and hogs constitute the main animal farm produce in this area. The result is that hay and pasture occupy a large part of the farm acreage. Cereal grains and fodder corn are also grown.

The steep slopes and the knobby hills are not usually cultivated. Some of these areas are covered by grass and others have been reforested. However, since erosion has continued in some of the grassed areas there is need for further reforestation.

DONNYBROOK SERIES

The Donnybrook soils are gravelly soils occurring in hills and ridges that are more specifically designated as kames and eskers. Some good examples of eskers, on which the Donnybrook soils have developed, can be found in various parts of the county. One of the best examples of an esker can be traced from Guelph to West Montrose. Others cross the plains south and east of Mount Forest. Although these soils do not occur in large continuous blocks, but are small and scattered throughout the county, they occupy a total of 8,800 acres.

The topography is hilly and slopes are steep. The soil materials consist of stratified sands and gravels mixed with stones. As may be expected with coarse materials having steep slopes, both external and internal drainages are rapid and cultivated crops frequently suffer from the lack of moisture.

The soil profile is thin, rarely exceeding 12 or 18 inches. These soils are classified as Grey-Brown Podzolic. A dark greyish brown surface horizon about 3 inches thick and a yellowish brown Ae horizon overly the dark brown B horizon. When seen in cross section the lower boundary of the B horizon occurs as tongues extending into the underlying calcareous gravel. All horizons of the profile are very stony.

These are non-arable soils and where the deposits are not being taken for road materials they are covered by trees or grass. When they occur near the stream terraces of the Burford and Caledon series, eskeroid deposits are not so highly regarded as a source of gravel.

BRANT SERIES

The Brant soils are well drained soil developed from waterlaid fine sands and silt. They occur chiefly in the region west of Elora and occupy about 1,900 acres. In Wellington County these soils have been mapped in association with the Harriston soils. The stonefree material consists of 5 or 6 feet of fine sandy loam and silt loam over the stony loam till that constitutes the parent material of the Harriston soils.

The soil materials are often varved and consist of alternate layers of silt loam and fine sand. They are calcareous, alluvial deposits. The topography is gently rolling and both external and internal drainages are moderate.

Soil development has produced a profile that has the characteristics of the Grey-Brown Podzolic Great Group. The surface soil is very dark greyish brown about 5 inches thick in uncultivated locations. The Ae horizons are yellowish brown and show some variation in thickness because of the wavy nature of the B horizon. A dark brown colour, well expressed blocky structure, and concentration of clay make the subsoil (B horizon) easy to identify. This horizon is ordinarily 10 inches thick. The overall thickness of the profile varies from 24 to 30 inches.

The Brant soils are susceptible to erosion but soil losses have not been high up to the present time. However, a complete soil cover is desirable all seasons of the year, particularly during the fall and spring. These soils are capable of producing all crops suitable to the area. Winter wheat, oats, barley and silage corn are grown but since livestock raising and dairying are the principal enterprises much of the land is used for growing cultivated hay and pasture.

TUSCOLA SERIES

The Tuscola soils occupy only 200 acres in the county and therefore do not materially affect the agriculture of the area. They are imperfectly drained and occupy the gently undulating landscapes between the slopes of better drained soils. The topographic position of these soils suggests that they represent temporary lacustrine basins since they do not occur in association with other lacustrine deposits but rather with morainic deposits. The composition of the soil material and its origin is assumed to be the same as that which produced the Brant soils. The difference between the two series is primarily that of drainage and topography.

The soil development is Grey-Brown Podzolic and the profile is like that of the Brant series except for the presence of mottling and somewhat duller colours in the A_e and B horizons. The surface and Ae horizons have a silt loam texture but are underlain by a layer with a silty clay loam texture. The calcareous parent material occurs at 20 to 24 inches.

The Tuscola soils are used mainly for the production of hay and for pasture. Some grains and silage corn are grown when spring seeding is not delayed by excess moisture.

COLWOOD SERIES

The Colwood series includes the poorly drained soils that have developed from the same soil materials that in better drained positions have given rise to Brant and Tuscola. Although they occupy 2,100 acres in the county they are relatively unimportant to agriculture because they occur in small, widely scattered areas. Small areas of Colwood are found in almost every township.

These soils are found in the depressions between the hills and drumlins of the morainic areas. The poorly drained depressions act as catch basins for excess run-off water and also as reservoirs for eroded surface soil carried down from the adjacent slopes. As in the case of the Tuscola soils, they consist of materials of alluvial origin of fine sandy loam and silt loam texture.

A Colwood silt loam profile

The soils are classified as Dark Grey Gleysolic. The surface soil is black silt loam or fine sandy loam about 6 inches thick. The subsurface horizon is greyish brown and mottled indicating that the water table is high during most of the year. The underlying horizon is also greyish brown but may have a coarser structure. The depth to the underlying calcareous materials is about 24 inches.

The agricultural utilization of these soils is limited and any use made of them will depend on the ease with which they can be drained. At present they are used chiefly for pasture.

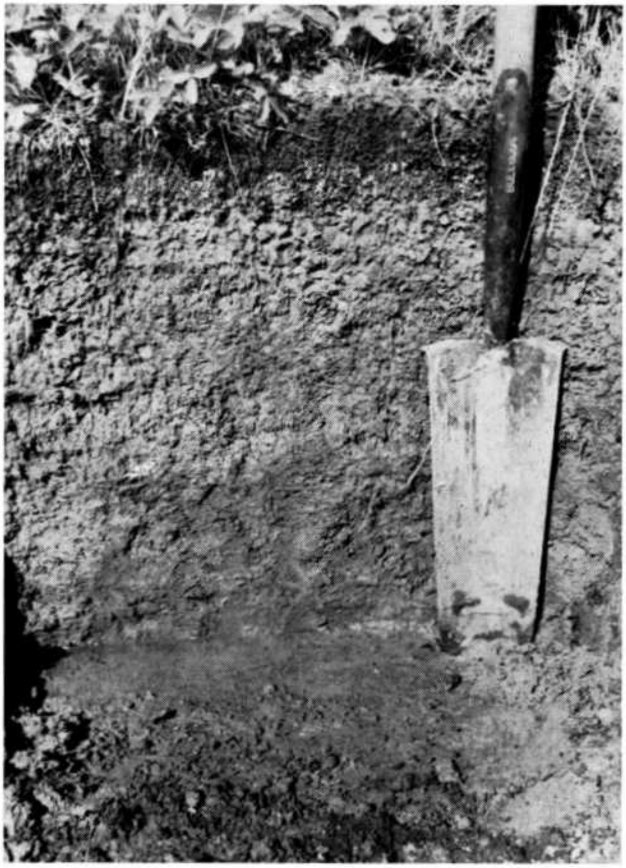
TOLEDO SERIES

The Toledo soils occupy less than half of one per cent of the land area of the county (2,400 acres) and therefore, from the standpoint of the production of crops, are of little agricultural value. These soils are poorly drained and are located in level and depressional areas.

The soil material has a silty clay loam to clay loam texture and is of lacustrine origin. In some places it consists of alternate bands of brownish clay loam and greyish silt loam.

These soils are classified as Dark Grey Gleysolic. The surface soil is black and has a high content of organic matter. The subsoil horizon is divisible into two horizons on the basis of colour. The upper portion is usually darker than the lower portion and contains less mottling. The soil is neutral to slightly alkaline throughout the profile but becomes more alkaline at a depth of about 30 inches where free carbonates are present.

Many of the small areas where these soils occur are covered with trees, mainly elm. Cleared areas are used chiefly for pasture. The agricultural use that is made of these soils depends on the amount of tile drainage that has been installed to remove the excess water. Little or no tile have been installed in these soils in Wellington.



A Toledo clay loam profile

FARMINGTON SERIES

The Farmington soils occupy 1,500 acres, considerably less than one per cent of the county land area, and are found along the Eramosa River, chiefly near the village of Rockwood. These are shallow soils developed from loam till that has a depth of less than one foot over the underlying limestone bedrock.

The topography is usually level but may be broken by ridges or rock outcrops. The soils are well drained but because of the shallowness of the soil, have a low moisture-holding capacity.

The soil profile varies. In thin deposits there is seldom more than a thin surface layer over the bedrock but in somewhat deeper deposits the dominant horizon is a brown to dark brown subsoil layer just below the surface. The parent material is a calcareous, stony loam. This kind of soil development is classified as Brown Forest.

Although these soils are not suitable for agricultural use they do make good recreational areas. In addition the underlying bedrock is easily quarried into thin flat blocks that can be used for patios, sidewalks and other construction purposes.

BOTTOM LAND

The term Bottom Land is applied to all soils that occur on variable textured alluvial deposits in river and creek beds that are subject to periodic flooding. The soil material found in these locations consists of alluvial sands, silts and clays laid down at various times of the year, but very largely during the spring thaw. The texture of the material that is deposited is influenced by the source of supply and by the velocity of the stream during deposition. The more rapid the water movement the coarser are the materials deposited. Most of the areas of bottom land consist of alternating layers of coarse and fine materials. These soils have no profile development and their reaction is neutral in all locations.

These soils vary in their agricultural adaptation from fair pasture land to fair arable soils. Their use depends on the length of time that they remain flooded. Most of these soil areas are being used as pasture land and are excellent for this purpose.

STREAM COURSES

Stream courses represent the narrow eroded channels through which the small streams in the county are flowing. They are shown on the soil map to indicate the pattern of surface drainage.

MUCK

Soils that have been classed as Muck consist of organic deposits that have accumulated in shallow lakes, ponds or wet undrained depressions. These soils differ from the soil series previously described in that they are derived from decayed plant remains.

These plant remains are well decomposed and the deposits consist of black, soft and fluffy organic material together with a few coarse particles of woody fragments from trees. The black material is derived from sedges and grasses, and from the leaf litter that is deposited annually by the deciduous trees.

Muck soil is common in undrained depressions in which organic materials accumulate. It is found in all of the counties and districts in Ontario and it occupies almost five per cent of Wellington County. Muck is most likely to develop in areas that are water-saturated for the entire year. Such locations are common in this glaciated region in both upland areas and along the meandering stream channels or old glaciated spillways. The depth of the Muck varies from a few inches to several feet. In general the depths of the deposits in Wellington County exceed five feet.

Organic soils do not have profile development like that which is found in mineral soils but they do have various layers. These layers can be differentiated on the basis of their composition, and on the degree of decomposition of the organic materials. These soils are neutral in reaction throughout the profile.

In other counties, areas such as the Holland Marsh, Thedford Marsh, Erieau Marsh and the Albert Bog have been developed for the production of vegetable crops. In Wellington County no such development has taken place. The principal deterrents to their development are high cost, small size of many of the areas, and the competition for markets from established areas in more or less the same region. At present most of the Muck areas in the county are covered with trees and underbrush. Before these areas are cleared, drained, and fertilized for agricultural production, careful consideration should be given to the effect such development would have on the water table levels and on wildlife.

PEAT

The Peat soils consist of organic deposits that have accumulated in shallow lakes, ponds or wet undrained depressions. Peat is not as well decomposed as Muck. It is brown and very fibrous. The roots, mosses and wood fragments that make up the deposit retain their structure. One large area of Peat covering 6,400 acres occurs in the county and forms a part of the Luther swamp, a place that is well known to duckhunters.

Peat soils are generally acid and do not commonly occur in Southern Ontario but are found more often in more northerly regions. With modern methods the peats of Southern Ontario would make good market garden lands. The factors that restrict their development for agriculture are cold climates, high cost of development and a surplus of produce.

In Wellington County the Peat soils serve a most useful purpose as wildlife habitats and water reservoirs.

DUMFRIES - HILLSBURGH COMPLEX

The Dumfries-Hillsburgh complex of soils comprises much of the morainic area east of Clifford in the northern part of Minto Township. The Dumfries series and the Hillsburgh series which are here combined in one mapping unit, have been described previously in this report and were differentiated on the basis of texture, stoniness and composition of the parent material. The Dumfries soils are stony loams developed from coarse stony till whereas the Hillsburgh soils are stonefree fine sandy loams developed from alluvial fine sands.

Although these soil series can be recognized as separate entities, they alternate from stony loam to stonefree fine sandy loam over short distances and each individual covers such a small area that the soil boundaries cannot be plotted on a map of scale 1 inch equals 1 mile. Areas with similar soils were previously mapped as the Pike Lake series in the Grey County Soil Survey Report.

The Dumfries soils occupy about 55 per cent of the land included in the complex, and the Hillsburgh about 35 per cent. The remaining 10 per cent is made up of small amounts of Brant, Brisbane and Gilford soils.

These soils are used mainly for livestock raising and hay and pasture are the main crops grown. Cereal grains and some silage corn are grown on the more gently rolling lands where stones do not interfere with cultivation.

DONNYBROOK - TEESWATER COMPLEX

The Donnybrook-Teeswater complex of soils occupies 1,000 acres of land about 2 miles west of Palmerston. This area is a level plain of silt loam on outwash gravel broken at frequent intervals by small stony and gravelly kames of sandy texture.

This complex is composed of about 55 per cent Donnybrook soils and 45 per cent Teeswater. The land use that is applied to this complex of soils is the same as that for the individual series. The Donnybrook soil is wooded or is used for pasture and the level areas of Teeswater produce cereal grains, silage corn and hay.

BRANT-HARRISTON COMPLEX

The Brant-Harriston complex comprises 3,600 acres in the area that lies west and slightly north of the village of Elora. The soil series that make up the complex are differentiated mainly on texture and kind of parent materials. The Brant soils have fine sandy loam profiles and the Harriston, silt loam profiles. The Brant soils are developed from alluvial fine sands and silts and the Harriston from silt loam or loam till.

The Brant soils occupy about 60 per cent of the complex and the Harriston soils about 38 per cent. The remaining two per cent consists of Tuscola and Listowel soils.

The land use on this complex of soils is the same as that for the individual series. The complex is used primarily for dairying and livestock raising, the principal crops being spring grains, winter wheat and hay. Some silage corn is grown for winter feed for the stock.

AGRICULTURAL METHODS AND MANAGEMENT

The climate and the soils of Wellington County are suitable for the growing of a wide variety of crops. General farm crops such as oats, barley, mixed grain, silage corn, hay, and pasture, and cash crops such as winter wheat, turnips, and potatoes are widely grown. The acreages of the field crops grown in 1956, as reported in the Census of Canada, are shown in Table 5.

TABLE 5

ACREAGES OF FIELD CROPS BY TOWNSHIP (1956 CENSUS)

	Crop							
Township	*Hay*	*Mixed Grains*	*Oats*	*Wheat*	*Silage Corn*	*Flax Seed*	*Barley*	*Potatoes*
Arthur	13,018	10,855	6,357	157	255	502	276	256
Eramosa	7,686	5,954	2,501	1,381	968	—	135	84
Erin	12,350	8,214	4,298	1,436	1,156	21	321	516
Garafraxa W.	9,280	7,194	3,319	348	734	894	246	126
Guelph	6,611	3,474	2,548	1,567	946	—	162	142
Luther, W.	10,259	9,501	2,095	65	337	781	262	21
Maryborough	12,554	10,839	4,577	700	677	483	359	18
Minto	13,157	12,784	5,108	605	546	275	379	76
Nichol	5,234	4,318	1,548	592	774	155	139	37
Peel	16,712	15,826	5,348	1,586	1,808	1,087	801	40
Pilkington	5,771	4,939	2,311	898	1,106	21	188	48
Puslinch	8,037	2,141	4,195	2,722	852	—	186	226
Total	120,669	96,039	44,205	12,057	10,159	4,219	3,454	1,590

As shown in Table 5, most of the farm land is used for growing hay, mixed grains and oats. Large acreages of these crops are necessary to provide feed for the large numbers of livestock in the county. Silage corn is also an important livestock feed and a considerable acreage is devoted to this crop. More flax is grown for seed in Wellington County than in any other county or district in the Province. This is probably partly due to the presence of large acreages of imperfectly drained soils of medium to high natural fertility. When wet weather delays the seeding of spring grains flax can often be grown as an alternative crop. The effect of climate on the growing of winter wheat is demonstrated in Table 5. The largest acreages of this crop are grown in the southern townships of Wellington County where the winters are not so severe as those of the more northerly townships.

Dairying, livestock raising and mixed farming are the main farm enterprises. Dairying prevails in the areas close to large centres of population. Beef and hog raising are important in Erin Township and in the region near Fergus and Elora, and mixed farming is most common in the northern townships. The main emphasis is placed on livestock raising as confirmed by the census figures showing—119,000 cattle, 13,500 sheep, 94,000 pigs and 1,200,000 chickens.

All the farm manure is spread on the land. The quantity of manure used varies greatly, depending on the number of livestock kept. On farms where large quantities of manure are used annually, the soils are rich in humus, have a high fertility level and good physical condition.

SOIL MANAGEMENT

The term soil management refers to the various practices that are used or recommended in the use of soils for the growing of agricultural crops. These practices vary with different soils and with different crops and the farmer learns through experience the kind of practices that give the best results. The reason why many different methods are necessary is that soils may be too infertile, too hilly or too wet for good farming. Whatever the limitations of the soil of a particular farm may be, the central objective of soil management is to develop and maintain a proper relationship between the plant and the soil on which it grows.

Success in the growing of crops depends, therefore, on the farmer knowing two sets of factors: the requirements of the different plants he can grow and the characteristics of the soil on his farm. Almost any kind of soil can be modified by management to grow any climatically adapted plant if one is willing to pay the cost. Successful farmers attempt to fit their cropping program to the capability of the soils.

As mentioned in previous pages, most soils consist of a sequence of definite layers or horizons, one above the other. These horizons collectively are called the soil profile. Very young soils or those occurring in poorly drained positions may not have horizons. In examining soils, the main things to observe are depth, texture, structure, drainage and nutrients.

DEPTH

The soils of Wellington County, in general, have sufficient depth to provide space for the development of plant roots and the storage of water for normal crop production. Although growing plant roots may extend several feet into the soil, it is ordinarily considered that a depth of three feet is all that cultivated plants require. This factor becomes serious only in those areas where the soil is thin over bedrock, or where it varies from an inch or two to a depth of one foot. Such soils can provide only a small space for roots and the storage of water. During much of the growing season, therefore, these soils cannot support the plant with the moisture it needs for normal growth. These soils are also too shallow for normal cultivation.

It is estimated that 0.2 per cent of Wellington County consists of shallow soils. These are being used as pasture land and woodlots. The amount of land involved is so small that it has no effect on agricultural production in the county and, therefore, no useful purpose can be served by attempting to develop it for agriculture.

TEXTURE

This term refers to the relative proportions of sand, silt and clay that make up the soil material. The texture in most soils changes from horizon to horizon and extremes are often present when one kind of deposit overlies another. In many of the soil series described, the B horizon contains more clay than the soil above or below it.

The classes of soil texture start with sand, which has only a little silt and clay. Then with increasing amounts of clay, the principal classes are loamy sand, sandy loam, loam, silt loam, clay loam and clay. The classes can be distinguished by squeezing a moist sample between the fingers. The sands are harsh and gritty and the particles scarcely hold together. At the other extreme, clay can be rolled into a smooth, sticky ball.

In general, soils of intermediate texture such as sandy loams, loams and silt loams are easiest to handle. Sands and loamy sands are open and water drains readily through them, so they hold rather small quantities of water and are said to be droughty soils. However, their water holding capacity can be increased to some extent by adding liberal amounts of barnyard manure or other forms of organic material. Clays, on the other hand, tend to become hard and stick together in clods unless they are handled carefully.

STRUCTURE

The individual soil particles—sand, silt or clay—group themselves to form various kinds of aggregates which are called structure. The ideal structures are those which are small and soft, such as granular or crumb. The next best are the small blocky, nut-like aggregates, between which water and roots can move.

This ability of soil particles to form desirable aggregates is accomplished mainly by organic matter, that is, the dead portions of plant materials which are added to soils either by the death of plants at the surface or the decay of plant roots. In cultivated soils where crops are continually being removed, there is little return made to the soil of this very important material.

In sandy soils, each grain of sand is often by itself. Clayey soils on the other hand, if deficient in organic matter, become cloddy if ploughed when wet. Hardpans can form in loams and even sands when some cementing material is present to hold the particles together. Wherever they occur within the depth of normal rooting of plants, such hard, cloddy soils must be reworked to make them granular or blocky. It is not enough to break up massive clods. Organic matter must be added, as is done by the addition of barnyard manure or the ploughing down of green manure, in order that fragments will not flow back together into masses when they are wet again.

DRAINAGE

Poorly drained soils are rarely, if ever, productive. It is possible for grass crops to survive and frequently flourish under extremely wet conditions but most cultivated plants cannot remain too long in soils that are saturated with water.

The drainage of the soil depends upon topography and permeability. Inadequate drainage most often occurs in areas of level or depressional topography but may also occur on undulating areas where slowly permeable materials exist. Often there is little evidence in the surface soil alone of poor drainage beneath. Therefore, it is important that such conditions be identified by an examination of the soil profile. The conditions of soil drainage are indicated fairly reliably by soil colours. Bright, solid colours of brown or yellow suggest fairly good drainage, but in low ground, grey and mottled horizons indicate poor drainage.

A summary of the drainage condition of the soils in Wellington County is given in the following table.

TABLE 6

Drainage of Wellington County Soils

Drainage Class	*Acreage*	*Per Cent of Total Area*
Good	364,900	57.5
Imperfect	189,300	29.8
Poor	40,900	6.5
Very Poor	38,600	6.2

According to Table 6 almost 43 per cent of the land is inadequately drained. The remedy that must be applied to improve the drainage must be determined for each individual field. Where open ditches and high crowns may be satisfactory for one field, tile drainage may be essential for another. In all cases, the cost of installation and maintenance of a drainage system in relation to the price of the crop produced should be considered.

NUTRIENTS

Nutrients or the food that plants derive from the soil cannot be seen. They can be guessed at from the vigor of growing plants. A measure of nutrients contained in the soil can be obtained accurately on samples in the laboratory.

Some general statements can be made with respect to the nutrient elements that will apply to all soils occurring in this area.

One of the most important conditions required for good plant growth is that there be a balance of plant nutrients in the soil. All plants take at least 12 essential elements from the soil. The most common elements found to be deficient are nitrogen, phosphorus and potassium. These are the elements contained in mixed fertilizers. Calcium and magnesium are included in liming materials and small amounts are usually present in mixed fertilizers. The other elements used in lesser amounts are sulphur, iron, boron, manganese, copper, zinc and molybdenum.

Each of the above elements is contained in manure, but since it would take a long time to build up the phosphorus content of a phosphorus deficient soil with manure alone, it is more practical to use chemical fertilizer in addition to organic matter. Deficiencies of nitrogen can be remedied by the growing of leguminous crops such as red clover and alfalfa, particularly if it is ploughed down while a good stand is still remaining. But only a part of the phosphorus and sulphur supplied to crops is derived from this organic matter. The remaining portion is derived from the inorganic fraction of the soil.

The inorganic or mineral fraction makes up the bulk of most soils. It is derived from rocks of various kinds and their degradation products. The nutrient supplying power of the larger particles—that is, the sand and silt—are quite different from those of the fine particles or clay fraction. Since the nutrient elements are held in the soil mainly by the finer particles, clay textured soils are commonly considered to have a higher nutrient supply than coarser textured soils.

In order to estimate the amounts of fertilizer that it is necessary to apply to achieve a balance of plant nutrients in the soil, several things need to be determined: the nutrients already in the soil, plus those normally added in manure; the general requirements of the plants to be grown; and the amounts of the nutrients contained in the various fertilizer materials available for use.

This information is being obtained for a great many specific soil types by the research being done on experimental stations and experimental farms and by soil testing laboratories. Differences in climate, soil, and plants mean that the research must be conducted in many locations. For localities in which no research results are available, recommendations are based on results obtained in related conditions.

Ratings of the Soils According to Their Suitability for Different Crops

Although the soils listed in this report have characteristics by which they differ from one another, many of these characteristics have only a slight effect on the ability of the soil to produce crops. There are, therefore, many soils which have approximately equal potentials for crop production and may be grouped together for that purpose.

It is recognized that a poor soil that is well managed will outyield a good soil poorly managed. In the ratings given, no assessment has been made of the effect that a particular kind of management may have on the crop potentials of the soils but it is assumed that the normal farm practices are carried out on all the soils listed. The soils have been listed as types and placed in one of six groups namely, good cropland, good to fair cropland, fair cropland, fair to poor cropland, poor cropland and unsuitable for crops.

This rating represents an estimate of the crop producing ability of the soil based on the characteristics of the soil itself and crops growing on the soil, together with information supplied by farmers and experimental workers. Although the reliability of these groupings have not been verified by crop yield figures for all crops, they have in other counties proven to be reasonably accurate for purposes of farm management and land use planning.

The meanings of the letters used in Table 7 are as follows: G—Good, G-F—Good to Fair, F—Fair, F-P—Fair to Poor, P—Poor.

TABLE 7

CROP RATINGS FOR WELLINGTON COUNTY SOILS

Soil Type	*Wheat*	*Oats*	*Mixed Grains*	*Alfalfa*	*Red Clover*	*Alsike Timothy*	*Silage Corn*	*Flax*	*Potatoes*	*Pasture*
Good Cropland										
Teeswater silt loam	G	G	G	G	G	G	G	G-F	F	G
Harriston silt loam	G	G	G	G	G	G	G-F	G-F	F	G
Harriston loam	G	G	G	G	G	G	G-F	G-F	F	G
Guelph loam	G	G	G	G	G	G	G-F	G-F	F	G
Huron silt loam	G	G	G	G	G	G	G-F	G-F	F	G
Huron loam	G	G	G	G	G	G	G-F	F	F	G
Brant fine sandy loam	G-F	G	G	G	G	G	G-F	F	G-F	G-F
Guelph sandy loam	F	G	G	G-F	G-F	G	G-F	F	G-F	G-F
Good to Fair Cropland										
Tuscola silt loam	F	G-F	G-F	F	G-F	G	G-F	G-F	F-P	G
Listowel silt loam	F	G-F	G-F	F	G-F	G	G-F	G-F	F-P	G
Listowel loam	F	G-F	G-F	F	G-F	G	G-F	F	F-P	G
London loam	F	G-F	G-F	F	G-F	G	G-F	F	F-P	G
Perth silt loam	F	G-F	G-F	F	G-F	G	F	G	P	G
Perth loam	F	G-F	G-F	F	G-F	G	F	G-F	P	G
Caledon fine sandy loam	F	G-F	G-F	F	F	G-F	G-F	F-P	G-F	G-F
Burford loam	F	G-F	G-F	F	F	F	G-F	F-P	F	G-F
Fair Cropland										
Brookston loam	P	F	F	P	F	F	F	F	P	G-F
Brookston silt loam	P	F	F	P	F	F	F	F	P	G-F
Toledo clay loam	P	F	F	P	F	F	F	F	P	G-F
Colwood silt loam	P	F	F-P	P	F-P	F	F	F	P	G-F
Colwood fine sandy loam	P	F	F-P	P	F-P	F	F	F	P	G-F
Fox sandy loam	F	F	F	F-P	F	F	F-P	P	G-F	F
Hillsburgh fine sandy loam	F	F	F	F-P	F	F	F-P	P	G-F	F
Dumfries loam	F-P	F	F	F	F	F	F-P	P	F-P	F
Hillsburgh sandy loam	F-P	F	F	F-P	F-P	F	F-P	P	F	F
Fair to Poor Cropland										
Parkhill loam	P	F-P	F-P	P	F-P	F	P	F-P	P	F
Parkhill silt loam	P	F-P	F-P	P	F-P	F	P	F-P	P	F
Donnybrook sandy loam	P	P	P	F	F	F	P	P	P	F
Brisbane loam	P	F-P	F-P	P	P	F	P	P	P	F
Brady sandy loam	P	F-P	F-P	P	P	F-P	P	P	P	F
Killean loam	P	F-P	F-P	P	P	F-P	P	P	P	F
Poor Cropland										
Gilford loam	P	P	P	P	P	P	P	P	P	F-P
Lily loam	P	P	P	P	P	P	P	P	P	F-P
Granby sandy loam	P	P	P	P	P	P	P	P	P	P

The soil types included in good cropland give higher average yields and are adaptable to a greater variety of crops than other soils occurring in the county. They have an ideal texture, they contain few stones, are well drained, and have sufficient depth for root development and storage of moisture. All these soils except Teeswater silt loam are subject to erosion of the surface by water, a problem that is serious when the soil is left bare during periods of high water runoff.

The soils in good to fair cropland have certain limitations in crop production that make them less suitable and less productive than the previous group. The Tuscola, Listowel, London and Perth soils require artificial drainage. The Caledon and Burford soils have only a moderate water holding capacity and the Burford may be stony. Satisfactory yields of all crops require the frequent use of commercial fertilizers and barnyard manure.

The soils included in fair cropland have many limitations in crop production as a result of having coarse texture, inadequate drainage, susceptibility to erosion, and/or stoniness. Because of the coarse texture of the Fox and Hillsburgh soils, the moisture supply is low and crops are affected in spite of good management practices. The Brookston, Toledo and Colwood soils require artificial drainage. In Wellington County these latter soils occupy comparatively small depressions which are difficult to drain because of the problem of finding a suitable outlet. However, when drainage is installed the soils can be rated higher. Stones interfere with cultivation on the Dumfries soil and require constant removal, as they occur in the soil mass as well as at the surface. In addition the Dumfries is very susceptible to erosion. The Hillsburgh soils are very susceptible to erosion and only the gentle slopes can be included in a regular rotation.

The soils included in fair to poor cropland have characteristics that limit their suitability to a few crops or to agricultural uses that do not require cultivation. The problems associated with these soils are inadequate drainage, low fertility, susceptibility to erosion and stoniness. Most of these problems have not been overcome since the cost of improving the soil would exceed the income derived from the crops now grown on these soils. Many of these types can be used as potential hay and pasture lands and it would probably be economical to apply commercial fertilizer on selected areas.

The soils included in poor cropland are suitable only for grazing or for forestry.

The soil complexes have not been shown in Table 7 because their rating is similar to that of the dominant soils which comprise the complex. The Brant-Harriston complex is good cropland, but the Dumfries-Hillsburgh complex is considered to be only fair cropland because of steep slopes, susceptibility to erosion, and droughtiness. The Donnybrook-Teeswater complex can be rated as fair cropland because of the large amount of low quality Donnybrook sandy loam in the complex.

In addition to the soils which have an agricultural value, there are soils in the county which have little or no agricultural value at the present time. Their use for agriculture is limited by excessive stoniness, very steep slopes, wetness or shallowness. However, if some of these soils could be improved and it may become economically advantageous to use them for agriculture. These soils are listed in Table 8.

TABLE 8

THE SUBMARGINAL SOILS OF WELLINGTON COUNTY

Muck
Peat
Bottom Land
Farmington Loam
Stream Courses

APPENDIX

Taxonomic Classification, Profile Descriptions and Analytical Data

BRADY SERIES

Parent Material: Calcareous medium sand

***Classification:** Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—Brady

Description:

A_1 (Ah) —0-5 inches sandy loam; very dark greyish brown (10YR 3/2); medium crumb structure; very friable consistency; stonefree; pH 7.0.

A_2 (Aeg) —5-8 inches loamy sand; pale brown (10YR6/3); mottled; single grain; loose; stonefree; pH 6.8.

B_2 (Btg) —8-12 inches sandy loam; yellowish brown (10YR5/8); mottled; weak medium subangular blocky; very friable; stonefree; pH 7.0.

B_3 (Bmg) —12-20 inches loamy sand; brownish yellow (10YR6/6); mottled; single grain; loose; stonefree; pH 7.3.

C (C) —Sand; light yellowish brown (10YR6/4); single grain; loose; stonefree; calcareous; pH 7.6.

*The classification of each series is made according to the definitions prepared by the National Soil Survey Committee, 1960.

BRANT SERIES

Parent Material: Calcareous alluvial fine sand and silt loam

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Honeywood

Description:

A_1 (Ah) —0-4 inches fine sandy loam; very dark greyish brown (10YR3/2); medium granular structure; friable consistency; stonefree; pH 6.6.

A_{21} (Ael) —4-14 inches fine sandy loam; yellowish brown (10YR5/6); weak medium crumb; very friable; stonefree; pH 6.6.

A_{22} (Ae2) —14-21 inches fine sandy loam; light yellowish brown (10YR6/4); weak fine crumb; very friable; stonefree; pH 6.3.

B_2 (Bt) —21-28 inches loam; dark brown (7.5YR4/4) medium subangular blocky; firm; stonefree; pH 7.0.

C (C) —Varved fine sand and silt loam; light brown (7.5YR6/4); soft; calcareous; stonefree; pH 7.6.

BRISBANE SERIES

Parent Material: Loam overlying coarse gravel

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—Brady.

Description:

A1 (Ah) —0-5 inches loam; very dark brown (10YR2/2); mottled; fine granular structure; friable consistency; few cobbles; pH 7.0.

A2 (Aeg) —5-7 inches loam; yellowish brown (10YR5/8) mottled; medium granular; friable; few cobbles; pH 7.0.

B2 (Btg) —7-19 inches gravelly loam; yellowish brown (10YR5/4); mottled; medium subangular blocky; friable; few cobbles; pH 7.2.

D (IIC) —Gravel; light yellowish brown (2.5Y6/4); single grain; loose; calcareous; pH 7.8.

BROOKSTON SERIES

Parent Material: Calcareous clay loam till

Classification: Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Brookston

Description:

A1 (Ah) —0-6 inches laom; black (10YR2/1); medium granular structure; friable consistency; few stones; pH 6.8.

G1 (Bmgl) —6-12 inches loam; greyish brown (2.5Y5/2); mottled; mottles light olive brown (2.5Y5/6); coarse subangular blocky; firm; stonefree; pH 7.0.

G2 (Bmg2) —12-27 inches clay loam; light brownish grey (2.5Y6/2); strongly mottled; mottles olive yellow (2.5Y6/8); coarse blocky; plastic; few stones; pH 7.2.

C (C) —Clay loam till; grey (10YR6/1); coarse blocky; plastic; few stones; calcareous; pH 7.6.

TABLE 9

ANALYSES OF SURFACE SAMPLES—BROOKSTON SERIES

Location *Township*	*Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
Garafraxa W.	II	25E	37.2	44.4	18.4	6.8	6.6
Minto	VII	27	37.2	50.8	12.0	7.0	7.0
Maryborough	XIV	3	35.0	49.2	15.8	7.0	8.1
Peel	XVII	15	31.6	50.0	18.4	6.8	5.4

BURFORD SERIES

Parent Material: Loam overlying coarse gravel

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Burford

Description:

A1 (Ah) —0-3 inches loam; very dark greyish brown (10YR3/2); fine granular structure; friable consistency; moderately cobbly; pH 6.8.

A21 (Ael) —3-6 inches loam; brown (10YR5/3); medium granular; friable; few cobbles; pH 6.6.

A22 (Ae2) —6-13 inches loam; light yellowish brown (10YR6/4); weak medium granular; friable; few cobbles; pH 6.8.

B2 (Bt) —13-18 inches clay loam; dark brown (7.5YR4/4); medium subangular blocky; friable; moderately cobbly; pH 7.2.

D (IIC) —Gravel; light yellowish brown (10YR6/4); single grain; loose; calcareous; pH 7.8.

TABLE 10

ANALYSES OF SURFACE SAMPLES—BURFORD SERIES

Township	*Location* *Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
Arthur	XI	8N	35.8	48.2	16.0	6.6	3.5
Erin	X	12NE	40.6	42.6	16.8	7.2	4.3
Puslinch	II	21	35.6	44.4	20.4	7.7	3.9
Puslinch	II	5	36.6	42.6	20.8	7.5	3.6

CALEDON SERIES

Parent Material: Fine sands overlying coarse gravel

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Burford

Description:

A1 (Ah) —0-3 inches fine sandy loam; very dark greyish brown (10YR3/2); fine crumb structure; very friable consistency; stonefree; pH 6.7.

A21 (Ael) —3-15 inches fine sandy loam; yellowish brown (10YR5/4); weak fine subangular blocky; very friable; stonefree; pH 6.4.

A22 (Ae2) —15-26 inches fine loamy sand; light yellowish brown (10YR6/4); single grain; loose; stonefree; pH 6.6.

B2 (Bt) —26-35 inches fine sandy loam; dark yellowish brown (10YR4/4); medium subangular blocky; friable; pH 7.0.

D (IIC) —Gravel; pale brown (10YR6/3); single grain; loose; calcareous; pH 7.8.

COLWOOD SERIES

Parent Material: Calcareous varved fine sand and silt loam

Classification: Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Colwood

Description:

A1 (Ah) —0-6 inches fine sandy loam; black (10YR2/1); medium crumb structure; friable consistency; stonefree; pH 7.0.

G1 (Bmgl) —6-13 inches fine sandy loam; greyish brown (10YR5/2); mottled; medium subangular blocky; friable; stonefree; pH 7.1.

G2 (Bmg2) —13-20 inches fine sandy loam; grey (10YR6/1); strongly mottled; coarse subangular blocky; friable; stonefree; pH 7.2.

C (C) —Varved fine sand and silt loam; pale brown (10YR6/3); calcareous; stonefree; pH 7.6.

DONNYBROOK SERIES

Parent Material: Calcareous, coarse gravel

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Dumfries

Description:

A_1 (Ah) —0-3 inches gravelly sandy loam; dark greyish brown (10YR4/2); fine crumb structure; loose consistency; moderately stony; pH 7.0.

A_{21} (Ae1) —3-6 inches gravelly sandy loam; yellowish brown (10YR 5/4); weak medium granular; loose; very stony; pH 6.8.

A_{22} (Ae2) —6-10 inches gravelly loam sand; light yellowish brown (10YR6/4); single grain; loose; pH 7.0.

B_2 (Bt) —10-15 inches gravelly sandy loam; brown (10YR5/3); fine subangular blocky; loose; very stony; pH 7.4.

C (C) —Coarse gravel; pale brown (10YR6/3); single grain; loose; calcareous; very stony; pH 7.8.

DUMFRIES SERIES

Parent Material: Stony sandy loam till

Classification: Order-Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Dumfries

Description:

A_1 (Ah) —0-4 inches loam; dark greyish brown (10YR4/2); fine crumb structure; friable consistency; very stony; pH 6.9.

A_{21} (Ae1) —4-9 inches loam; yellowish brown (10YR5/4); fine crumb; friable; moderately stony; pH 6.6.

A_{22} (Ae2) —9-13 inches loam; pale brown (10YR6/3); fine crumb; friable; very stony; pH 6.6.

B_2 (Bt) —13-22 inches clay loam; dark brown (10YR3/4); medium subangular blocky; firm; very stony; pH 7.2.

C (C) —Sandy loam till; pale brown (10YR6/3); weak medium subangular blocky; excessively stony; calcareous; pH 7.8.

TABLE 11

ANALYSES OF SURFACE SAMPLES—DUMFRIES SERIES

Township	*Location* *Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
Erin	5	6NE	30.8	49.6	19.4	7.2	2.9
Puslinch	7	15	43.0	40.6	16.5	7.7	3.0
Puslinch	7	31	47.2	36.0	16.8	7.6	2.5
Puslinch	Gore	21	45.2	38.0	16.8	7.4	3.3

FARMINGTON SERIES

Parent Material: Less than 12 inches loam till over limestone bedrock

Classification: Order—Brunisolic
Great Group—Brown Forest
Sub Group—Orthic Brown Forest
Family—Farmington

Description:

A_1 (Ah)	—0-5 inches loam; very dark greyish brown (10YR3/2); fine granular structure; friable consistency; moderately stony; pH 7.2.
B_2 (Bm)	—5-8 inches loam; dark brown (10YR4/3); weak medium subangular blocky; friable; moderately stony; pH 7.4.
C (C)	—8-9 inches gravelly loam till; pale brown (10YR6/3); calcareous; pH 7.8.
D (IIC)	—Limestone bedrock.

FOX SERIES

Parent Material: Calcareous medium sand

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Fox

Description:

A_1 (Ah)	—0-3 inches sandy loam; very dark greyish brown (2.5Y3/2); weak medium crumb structure; very friable consistency; stonefree; pH 6.4.
A_{21} (Ae1)	—3-18 inches loamy sand; yellowish red (5YR5/6); single grain; loose; stonefree; pH 6.2.
A_{22} (Ae2)	—18-24 inches loamy sand; light reddish brown (5YR6/4); single grain; loose; stonefree; pH 6.0.
B_2 (Bt)	—24-29 inches sandy loam; dark brown (10YR4/3); weak medium subangular blocky; very friable; stonefree; pH 6.8
C (C)	—Sand; pale brown (10YR6/3); single grain; loose; stonefree; calcareous; pH 7.6.

GILFORD SERIES

Parent Material: Loam overlying coarse gravel

Classification: Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Granby

Description:

A_1 (Ah)	—0-8 inches loam; black (10YR2/1); medium granular structure; friable consistency; slightly stony; pH 7.3.
G_1 (Bmg1)	—8-14 inches loam; greyish brown (10YR5/2); mottled; coarse subangular blocky; friable; slightly cobbly; pH 7.3.
G_2 (Bmg2)	—14-26 inches loam; light brownish grey (10YR6/2); strongly mottled; mottles brownish yellow (10YR6/6); massive; friable; cobbly; pH 7.3.
D (IIC)	—Gravel; pale brown (10YR6/3); single grain; loose; calcareous; pH 7.5.

TABLE 12
ANALYSES OF GILFORD LOAM

Horizon	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %	*Loss on Ignition* %
A_1	47.6	36.8	15.6	7.3	7.9	14.4
G_1	34.0	43.4	22.6	7.3	4.6	8.8
G_2	33.2	43.6	23.2	7.3	2.2	8.3
C	67.6	27.8	4.6	7.5	0.4	20.8

GRANBY SERIES

Parent Material: Calcareous medium sand

Classification: Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Granby

Description:

A_1 (Ah) —0-7 inches sandy loam; black (10YR2/1); medium crumb structure; very friable consistency; stonefree; pH 7.2.

G_1 (Bmg1) —7-12 inches sandy loam; dark grey (10YR4/1); mottled; weak medium crumb; loose; stonefree; pH 7.2.

G_2 (Bmg2) —12-21 inches loamy sand; grey (10YR6/1); mottled; single grain; loose; stonefree; pH 7.4.

C (C) —Sand; light brownish grey (10YR6/2); single grain; loose; stonefree; calcareous; pH 7.6.

GUELPH SERIES

Parent Material: Calcareous loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Guelph

Description:

A_1 (Ah) —0-5 inches loam; very dark brown (10YR2/2); fine granular structure; friable consistency; slightly stony; pH 6.8.

A_{21} (Ae1) —5-12 inches loam; brown (10YR5/3); medium granular; friable; slightly stony; pH 6.6.

A_{22} (Ae2) —12-16 inches loam; pale brown (10YR6/3); fine granular; friable; slightly stony; pH 6.7.

B_2 (Bt) —16-23 inches loam; dark brown (10YR4/3); medium subangular blocky; friable; moderately stony; pH 7.0.

C (C) —Loam till; greyish brown (10YR5/2); coarse subangular blocky; hard; moderately stony; pH 7.5.

TABLE 13

ANALYSES OF GUELPH LOAM

Horizon	Particle Size Distribution Sand %	Silt %	Clay %	pH	Organic Matter %	Cation Exchange Capacity m.e./100 gms.	Exchangeable Cations m.e./100 gms. Ca	Mg	K	Na
A_1	40.8	49.2	10.0	6.8	4.1	27.6	21.8	6.2	.14	.15
A_{21}	40.6	45.4	14.2	6.6	1.7	12.6	8.6	2.8	.07	.08
A_{22}	41.3	45.1	13.6	6.7	1.0	8.8	6.5	2.2	.05	.06
B_2	42.1	33.0	24.9	7.0	0.3	12.6	9.8	4.0	.15	.08
C	44.2	37.0	18.8	7.5	0.0	3.6	19.3	1.4	.06	.08

Horizon	SiO_2 %	R_2O_3 %	Fe_2O_3 %	Al_2O_3 %	CaO %	MgO %	K_2O %	Na_2O %	Bulk Density
A_1	74.2	16.7	4.5	12.2	2.5	1.1	2.2	3.0	0.87
A_{21}	74.3	17.6	4.5	13.1	1.6	1.0	2.2	2.8	1.25
A_{22}	73.8	17.7	4.5	13.2	1.9	1.0	2.2	2.8	1.39
B_2	69.9	20.2	6.0	14.2	2.4	1.7	2.4	2.5	1.38
C	50.1	12.8	3.7	9.1	23.6	8.9	1.8	2.8	1.80

TABLE 14

ANALYSES OF SURFACE SAMPLES—GUELPH SERIES

Township	*Location* *Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
Guelph	IX	5W	45.2	43.6	11.2	7.4	3.4
Nichol	VI	3	42.0	45.0	12.8	7.3	4.2
Pilkington	I	5W	39.1	46.0	14.9	7.3	4.3
Erin	II	16	38.2	44.4	17.4	7.3	3.4
Eramosa	IV	14	41.4	39.6	19.0	7.5	3.1
Eramosa	III	9	42.4	41.6	16.4	7.4	3.6
Eramosa	II	7	35.2	45.8	19.0	7.3	4.3

HARRISTON SERIES

Parent Material: Calcareous loam and silt loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Guelph

Description:

A_1 (Ah) —0-5 inches loam; very dark greyish brown (10YR3/2); medium granular structure; friable consistency; slightly stony; pH 6.8.

A_{21} (Ae1) —5-11 inches loam; brown (7.5YR5/4); medium granular; friable; stonefree; pH 6.5.

A_{22} (Ae2) —11-19 inches loam; light yellowish brown (2.5Y6/4); weak fine platy; soft; stonefree; pH 6.7.

B_2 (Bt) —19-25 inches loam; olive brown (2.5Y4/4); medium subangular blocky; friable; stonefree; pH 7.0.

C (C) —Loam till; light yellowish brown (2.5Y6/4); medium subangular blocky; hard; slightly stony; calcareous; pH 7.6.

TABLE 15

ANALYSES OF SURFACE SAMPLES—HARRISTON SERIES

Township	*Location* *Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
Minto	VIII	11	42.0	45.6	12.4	7.3	4.3
"	VIII	11	40.0	45.6	14.4	7.3	3.8
"	VII	42	38.6	48.8	12.6	6.8	3.8
"	XII	11	36.8	44.0	19.2	7.3	3.8
"	VII	1	46.0	43.8	10.2	7.4	4.4
"	II	36	36.8	52.6	10.6	7.1	4.2
Maryborough	XVI	9	27.0	61.8	11.2	6.8	4.6
W. Luther	X	9E	33.8	56.3	9.9	6.9	4.3
Arthur	IV	10	35.2	52.2	13.6	7.3	4.5
"	VII	9	34.4	53.8	11.8	6.7	4.1
"	IV	3	34.6	53.4	12.0	6.8	3.7

HILLSBURGH SERIES

Parent Material: Calcareous fine sand in end moraine

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Fox

Description:

A_1 (Ah) —0-3 inches fine sandy loam; dark brown (10YR3/3); fine crumb structure; very friable consistency; stonefree; pH 6.6.

A_{21} (Ae1) —3-9 inches fine loamy sand; dark yellowish brown (10YR 4/4); weak medium crumb; loose; stonefree; pH 6.3.

A_{22} (Ae2) —9-15 inches fine sand; light yellowish brown (10YR6/4); single grain; loose; stonefree; pH 6.3.

B_2 (Bt) —15-21 inches fine sandy loam; yellowish red (5YR4/8); weak medium subangular blocky; very friable; stonefree; pH 7.1.

C (C) —Fine sand; light yellowish brown (10YR6/4); single grain; loose; occasional stones; pH 7.5.

TABLE 16

ANALYSES OF SURFACE SAMPLES—HILLSBURGH SERIES

Township	*Location* *Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
Pilkington	III	10	58.0	28.0	14.0	6.6	2.4
Erin	IX	28N	62.6	26.2	11.2	6.3	3.3
Erin	VIII	27	74.6	15.2	10.2	7.0	1.9
Erin	V	28	54.2	33.0	12.8	7.5	2.4

HURON SERIES

Parent Material: Calcareous clay loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Orthic Grey-Brown Podzolic
Family—Huron.

Description:

A_1 (Ah) —0-5 inches loam; very dark greyish brown (10YR3/2); medium granular structure; friable consistency; stonefree; pH 6.9.

A_{21} (Ae1) —5-7 inches loam; pale brown (10YR6/3); medium granular; friable; slightly stony; pH 6.9.

A_{22} (Ae2) —7-12 inches loam; very pale brown (10YR7/3); coarse granular; friable; slightly stony; pH 6.7.

A_3 (A/B) —12-17 inches clay loam; light grey(10YR7/2); coating on dark greyish brown(10YR4/2); aggregates; medium subangular blocky; hard; slightly stony; pH 7.0.

B_2 (Bt) —17-23 inches clay; dark brown(10YR3/4); medium blocky; very hard; moderately stony; pH 7.3.

C (C) —Clay loam till; brown (10YR5/3); medium subangular blocky; very hard; moderately stony; calcareous; pH 7.8.

TABLE 17

ANALYSES OF SURFACE SAMPLES—HURON SERIES

Township	Location Conc.	Lot	Sand %	Silt %	Clay %	pH	Organic Matter %
W. Garafraxa	II	17W	35.6	44.0	20.4	6.8	3.4
W. Garafraxa	I	36	27.2	49.2	23.6	7.4	5.0
Maryborough	VIII	13	34.6	43.2	22.2	6.5	4.4
Maryborough	V	9	30.8	49.7	23.8	7.1	5.8
Peel	XIV	14	24.0	48.0	28.0	6.8	4.4
Peel	XI	20	24.4	48.8	26.8	6.6	5.4
Peel	III	2	27.4	45.2	27.4	6.8	3.7
Nichol	XIV	5	33.6	46.0	20.4	6.7	4.1
Peel	XIX	9	24.6	52.4	23.0	7.2	5.1
Peel	IX	13	22.4	56.8	20.8	7.2	4.4
Peel	XVII	6	32.8	53.6	13.6	6.6	3.8

KILLEAN SERIES

Parent Material: Calcareous stony, sandy loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—Killean

Description:

A_c (Aa) —0-6 inches loam; very dark greyish brown (10YR3/2); fine granular structure; friable consistency; very stony; pH 7.0

A_2 (Aeg) —6-9 inches loam; brownish yellow (10YR6/6); mottled; medium granular; friable; very stony; pH 6.8.

B_2 (Btg) —9-17 inches loam; yellowish brown (10YR5/6); mottled; medium subangular blocky; friable; exceedingly stony; pH 7.2.

C (C) —Sandy loam till; pale brown (10YR6/3); weak medium subangular blocky; excessively stony; calcareous; pH 7.8.

LILY SERIES

Parent Material: Calcareous stony sandy loam till

Classification: Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Lyons

Description:

A_1 (Ah) —0-7 inches loam; black (10YR2/1); fine granular structure; friable consistency; very stony; pH 7.2.

G (Bmg) —7-19 inches loam; greyish brown (10YR5/2); strongly mottled; weak medium subangular blocky; friable; exceedingly stony; pH 7.4.

C (C) —Sandy loam till; pale brown (10YR6/3); weak medium subangular blocky; excessively stony; calcareous; pH 7.8.

LISTOWEL SERIES

Parent Material: Calcareous loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—London

Description:

A_1 (Ah) —0-6 inches silt loam; very dark brown (10YR2/2); medium granular structure; friable consistency; stonefree; pH 7.0.

A_2 (Aeg) —6-12 inches silt loam; yellowish brown (10YR5/8); mottled; weak subangular blocky; soft; stonefree; pH 6.8.

B_2 (Btg) —12-24 inches silt loam; yellowish brown (10YR5/4); mottled; coarse subangular blocky; firm; stonefree; pH 7.3.

C (C) —Loam till; light yellowish brown (10YR6/4); medium subangular blocky; hard; few stones; calcareous; pH 7.8.

TABLE 18

ANALYSES OF SURFACE SAMPLES—LISTOWEL SERIES

Township	*Location* *Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
W. Luther	XII	4	27.8	58.8	13.4	7.4	5.8
W. Luther	X	3	30.0	54.5	15.5	7.0	5.8
Minto	VI	30	30.4	54.4	15.2	7.0	6.2
Arthur	XII	24	32.2	52.2	15.6	7.3	6.0
Arthur	IV	12	34.2	53.0	12.8	6.8	6.0
Arthur	X	4	37.5	49.9	12.6	7.4	5.2
Arthur	VII	8	31.6	50.6	17.8	7.2	5.7
Arthur	II	18	31.6	55.6	12.8	6.9	4.6
Arthur	XII	18	39.4	46.4	14.2	6.7	4.6

LONDON SERIES

Parent Material: Calcareous loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—London

Description:

A_1 (Ah) —0-6 inches loam; very dark greyish brown (10YR3/2); medium granular structure; friable consistency; slightly stony; pH 6.9.

A_2 (Aeg) —6-11 inches loam; yellowish brown (10YR5/6); mottled; weak fine subangular blocky; friable; slightly stony; pH 7.3.

B_2 (Btg) —11-16 inches loam; yellowish brown (10YR5/4); mottled; medium blocky; friable; slightly stony; pH 7.5.

C (C) —Loam till; greyish brown (10YR5/2); medium subangular blocky; compact; moderately stony; calcareous; pH 8.0.

TABLE 19

ANALYSIS OF LONDON LOAM

Horizon	Particle Size Distribution Sand %	Silt %	Clay %	pH	Organic Matter %	Cation Exchange Capacity m.e./100 gms.	Exchangeable Cations m.e./100 gms. Ca	Mg	K	Na
A1	42.1	45.7	12.2	6.9	6.5	18.2	13.5	3.0	.11	.08
A2	46.1	38.9	15.0	7.3	1.5	10.7	9.0	2.2	.09	.10
B2	47.8	34.2	18.0	7.5	1.4	11.8	9.2	2.8	.14	.07
C1	59.0	28.4	12.6	8.0	0.1	3.9	16.1	0.9	.07	.08
C2	47.8	37.8	14.4	8.2	0.1	2.7	18.8	1.3	.05	.09

Horizon	SiO_2 %	R_2O_3 %	Fe_2O_3 %	Al_2O_3 %	CaO %	MgO %	K_2O %	Na_2O %	Bulk Density
A1	74.4	17.4	4 6	12.8	1.9	1.0	2.2	2.9	1.12
A2	73.7	18.3	4.7	13.6	1.9	1.0	2.2	3.0	1.37
B2	72.7	19.3	5.3	14.0	2.0	1.1	2.4	2.9	1.56
C1	62.7	16.2	4.1	12.1	11.5	4.4	1.9	3.1	1.75
C2	49.5	13.4	3.4	10.0	23.8	8.2	1.9	3.1	1.92

PARKHILL SERIES

Parent Material: Calcareous loam till

Classification:
Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Lyons

Description:

A_1 (Ah) —0-7 inches silt loam; very dark brown (10YR2/2); medium granular structure; friable consistency; stonefree; pH 6.9.

G_1 (Bmg1) —7-14 inches loam; light olive brown (2.5Y5/6); strongly mottled; mottles olive yellow (2.5Y6/8); medium subangular blocky; friable; slightly stony; pH 7.3.

G_2 (Bmg2) —14-23 inches loam; light brownish grey (2.5Y6/2); strongly mottled; mottles yellowish brown (10YR5/8); coarse blocky; friable; slightly stony; pH 7.5.

C (C) —Loam till; light brownish grey (10YR6/2); strong brown (7.5YR5/8); mottles; weak medium blocky; hard; slightly stony; calcareous; pH7.8.

TABLE 20

ANALYSES OF PARKHILL SILT LOAM

Horizon	Particle Size Distribution Sand %	 Silt %	 Clay %	pH	Organic Matter %	Cation Exchange Capacity m.e./100 gms.	Exchangeable Cations m.e./100 gms. Ca	 Mg	 K	 Na
A_1	31.8	53.4	14.8	6.9	10.6	49.5	37.0	8.0	.27	.19
G_1	29.6	48.6	21.8	7.3	2.0	16.1	13.6	3.2	.18	.09
G_2	41.0	35.6	23.4	7.5	0.3	8.5	9.8	2.2	.18	.10
C	36.0	39.0	25.0	7.8	0.5	7.0	21.6	2.1	.12	.10

Horizon	SiO_2 %	R_2O_3 %	Fe_2O_3 %	Al_2O_3 %	CaO %	MgO %	K_2O %	Na_2O %	Bulk Density
A_1	70.8	19.2	5.2	14.0	3.0	1.3	2.3	3.0	0.68
G_1	72.0	19.2	5.0	14.2	1.9	1.1	2.3	3.0	1.28
G_2	68.6	18.6	5.2	13.4	3.9	2.5	2.4	3.1	1.42
C	59.3	16.2	4.6	11.6	14.5	3.7	2.2	3.0	1.85

PERTH SERIES

Parent Material: Calcareous clay loam till

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—Perth

Description:

A_1 (Ah) —0-5 inches loam; very dark brown (10YR2/2); coarse granular structure; friable consistency; pH 6.8.

A_2 (Aeg) —5-7 inches loam; yellowish brown (10YR5/4); mottled; fine subangular blocky; friable; pH 7.0.

B_{21} (Btg1) —7-10 inches clay loam; dark greyish brown (10YR4/2); mottled; medium subangular blocky; hard; slightly stony; pH 7.1.

B_{22} (Btg2) —10-20 inches clay loam; dark brown (10YR4/3); mottled; medium blocky; hard; slightly stony; pH 7.3.

C (C) —Clay loam till; greyish brown (10YR5/2); medium blocky; hard; slightly stony; calcareous; pH 8.0.

TABLE 21

ANALYSES OF SURFACE SAMPLES—PERTH SERIES

Location *Township*	*Conc.*	*Lot*	*Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
W. Garafraxa	IV	31E	27.8	47.8	24.4	7.3	6.0
Peel	IV	9	27.2	46.4	26.4	6.3	5.3
Maryborough	VII	13	29.5	49.1	21.4	7.1	5.0
Maryborough	XII	12	39.0	45.8	16.2	6.5	5.1
W. Luther	III	12	29.0	55.1	15.9	6.9	5.5
Arthur	II	17	31.4	54.2	14.4	7.2	6.4

TEESWATER SERIES

Parent Material: Silt loam deposits overlying coarse gravel

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Brunisolic Grey-Brown Podzolic
Family—Honeywood

Description:

A_1 (Ah) —0-3 inches silt loam; very dark greyish brown (10YR3/2); medium granular structure; friable; stonefree; pH 6.6.

A_{21} (Ae1) —3-15 inches silt loam; yellowish brown (10YR5/6); weak fine subangular blocky; very friable; stonefree; pH 6.6.

A_{22} (Ae2) —15-24 inches silt loam; light yellowish brown (10YR6/4); very weak fine platy; soft; stonefree; pH 6.0.

B_2 (Bt) —24-34 inches silty clay loam; dark yellowish brown (10YR4/4); medium subangular blocky; firm; slightly gravelly; pH 7.0.

D (IIC) —Gravel; light yellowish brown (10YR6/4); single grain; loose; calcareous; pH 7.8.

TOLEDO SERIES

Parent Material: Calcareous lacustrine silty clay loam

Classification: Order—Gleysolic
Great Group—Dark Grey Gleysolic
Sub Group—Orthic Dark Grey Gleysolic
Family—Colwood

Description:

A_1 (Ah) —0-6 inches silty clay loam; black (10YR2/1); medium granular structure; friable consistency; stonefree; pH 6.6.

G_1 (Bmgl) —6-11 inches silty clay loam; very dark greyish brown (2.5Y3/2);mottled; coarse subangular blocky; firm; stonefree; pH 7.0.

G_2 (Bmg2) —11-17 inches silty clay loam; greyish brown (2.5Y5/2); strongly mottled; mottles light olive brown (2.5Y5/6); coarse blocky; plastic; stonefree; pH 7.1.

C (C) —Silty clay loam; greyish brown (2.5Y6/2) with olive yellow (2.5Y6/8); mottles; massive; plastic; stonefree; calcareous; pH 7.6.

TABLE 22

ANALYSES OF TOLEDO SILTY CLAY LOAM

Horizon	*Particle Size Distribution* *Sand* %	*Silt* %	*Clay* %	*pH*	*Organic Matter* %
A_1	20.3	52.0	27.7	6.6	11.2
G_1	20.8	53.0	26.2	7.0	3.9
G_2	17.0	53.0	30.0	7.1	1.5
C	17.6	52.2	30.2	7.6	0.3

TUSCOLA SERIES

Parent Material: Calcareous alluvial fine sand and silt loam

Classification: Order—Podzolic
Great Group—Grey-Brown Podzolic
Sub Group—Gleyed Grey-Brown Podzolic
Family—Tuscola

Description:

A_1 (Ah) —0-5 inches silt loam; very dark brown (10YR2/2); medium granular structure; friable consistency; stonefree; pH 6.8.

A_2 (Aeg) —5-13 inches silt loam; light olive brown (2.5Y5/4); mottled; weak fine platy; soft; stonefree; pH 6.8.

B_2 (Btg) —13-19 inches silt loam; olive brown (2.5Y4/4); mottled; medium subangular blocky; friable; stonefree; pH 7.2.

C (C) —Varved fine sand and silt loam; light brown (7.5YR6/4); soft; calcareous; stonefree; pH 7.9.

GLOSSARY

Aggregate (soil)—A single mass or cluster of many soil particles, held together in a prism, granule, cube or other form.

Calcareous material—Material containing a large amount of calcium carbonate. It visibly effervesces when treated with hydrochloric acid.

Cation exchange capacity—A measure of the adsorptive capacity of soil for cations (hydrogen plus bases), or the amount of cations that can be absorbed by a stated amount of soil, usually expressed as milli-equivalents per 100 grams of dry soil. A soil with a fairly high cation exchange capacity is usually preferred for agriculture to one with a low exchange capacity because it will retain more plant nutrients and be less subject to leaching or exhaustion.

Consistency (soil)—The degree of mutual attraction of the particles in the whole soil mass, or their resistance to separation or deformation. Consistency is described by such general terms as loose or open; slightly, moderately or very compact; friable; plastic; sticky; soft; firm; hard and cemented.

Drift—Material of any sort deposited in one place after movement from another by natural forces. Glacial drift includes all glacial deposits, whether stratified or unstratified.

Drumlin—A narrow, often spoon-shaped, hill formed as part of a ground moraine. There is usually an abrupt slope at the end facing the source of ice and a gentle slope in the direction to which the ice moved.

Dune—A mount or ridge of loose sand piled by the wind.

Erosion—The wearing away of the land surface by water, wind or other forces, including human activities. It includes sheet, rill and gully erosion of soils.

Friable—Easily crushed between thumb and forefinger, and nonplastic.

Gley—A soil in which the material has been modified by a reduction process brought about by saturation with water for long periods in the presence of organic matter.

Horizon—A more or less horizontal layer in the soil profile having characters derived from the soil-building process.

Humus—The well-decomposed, more or less stable part of the soil organic matter.

Kame—The deposit of a stream that flowed between a glacier and a valley side. After the ice retreated the kame remained as a terrace-like deposit.

Lacustrine materials—Sediments deposits in lakes.

Leaching—The removal of constituents from the soil by percolating water.

Mottled—Irregularly marked with spots of different colors. Mottling of soils usually indicates poor aeration and lack of adequate drainage.

Muck—Dark-colored, decomposed organic material that has accumulated in damp areas. Muck has a higher mineral content than peat, and the bulk of the plant remains are decomposed beyond recognition.

Parent Material—Geological material from which a soil is derived.

Peat—Undecomposed to partly decomposed organic material with recognizable plant remains. Peat accumulates in bogs and seepage areas under very moist conditions.

Permeability—The quality or state of a soil or of any horizon in the soil profile that permits passage of water or air to all parts of the mass.

Percolation—Downward movement of water through the soil, especially the downward flow of water in saturated or nearly saturated soil.

p*H*—A logarithmic designation of the relative acidity or alkalinity of soil or other materials. A pH of 7.0 indicates the neutral condition. Higher values indicate alkalinity and lower ones acidity.

Plant Nutrients—The elements taken in by the plant, essential to its growth and used by it in the elaboration of its food and tissue. These include nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, copper, boron and perhaps other obtained from the soil; and carbon, hydrogen and oxygen obtained chiefly from air and water.

Plastic—Capable of being molded or modeled without rupture when moist.

Relief—The elevations of inequalities of the land surface when considered collectively. Minor surface configurations are called microrelief.

Soil profile—A vertical section of a soil that extends through the A and B horizons and the C horizon or the parent material.

Soil separates—The particle sizes on which textural classes of soil are based.

These are as follows:

	Diameter in millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Below—0.002

Sands are further separated according to the occurrence of different-sized sand fractions. Medium and coarse sands may contain over 25 per cent coarse sand but not over 50 per cent fine sands. Fine and very fine sands must contain over 50 per cent of the respective sand fractions.

Soil structure—The morphology of the aggregates of the soil particles. The following types are mentioned in this report.

Blocky—Blocklike, with sharp, angular corners.

Crumb—Porous and granular.

Granular—More or less rounded, with no smooth faces and edges, relatively non-porous.

Massive—In large cohesive masses, almost amorphous or structureless, with irregular cleavage faces.

Single-grained—Each grain by itself, as in sand.

Subangular blocky—With mixed rounded and flattened faces and many rounded vertices.

Solum—The upper, weathered part of the soil, in which the processes of soil formation take place. The A and B horizons.

Stratified materials—Geological materials composed of or arranged in strata or layers.

Submarginal soils—Soils that are unsuitable for a given purpose.

Texture—The percentages of sand, silt and clay in a soil determine its texture.

Till—An unsorted mixture of stones, gravels, sand, silt and clay transported by glaciers and deposited during the melting and recession of the ice.

Varves—Annual layers of sediment generally found in glacial lake deposits. Varves consist of two thin layers of differing composition, one laid down in summer, the other in winter when the lake is frozen over. The winter layer is thinner, darker-colored and of finer texture than the summer layer.

Water table—The upper limit of the soil or underlying material that is saturated with water.

Weathering—The physical and chemical disintegration and decomposition of rocks and minerals.