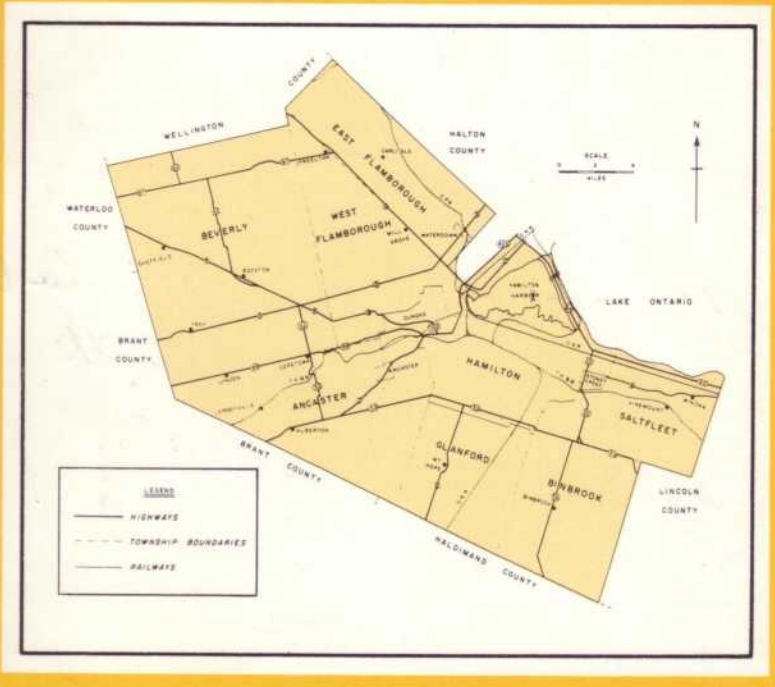
# SOILS OF

# WENTWORTH COUNTY

## Report No. 32 of the Ontario Soil Survey




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

ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO
CANADA DEPARTMENT OF AGRICULTURE, OTTAWA

Lake Ontario Counties
Wentworth
1965

# THE SOILS
## of
# WENTWORTH COUNTY

*by*

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1965



**REPORT No. 32 OF THE ONTARIO SOIL SURVEY**

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**and**
**ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO**

## ACKNOWLEDGMENTS

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The soil map was prepared for lithographing by the Cartographic section of the Soil Research Institute, Ottawa.

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## PUBLISHED BY COUNTIES

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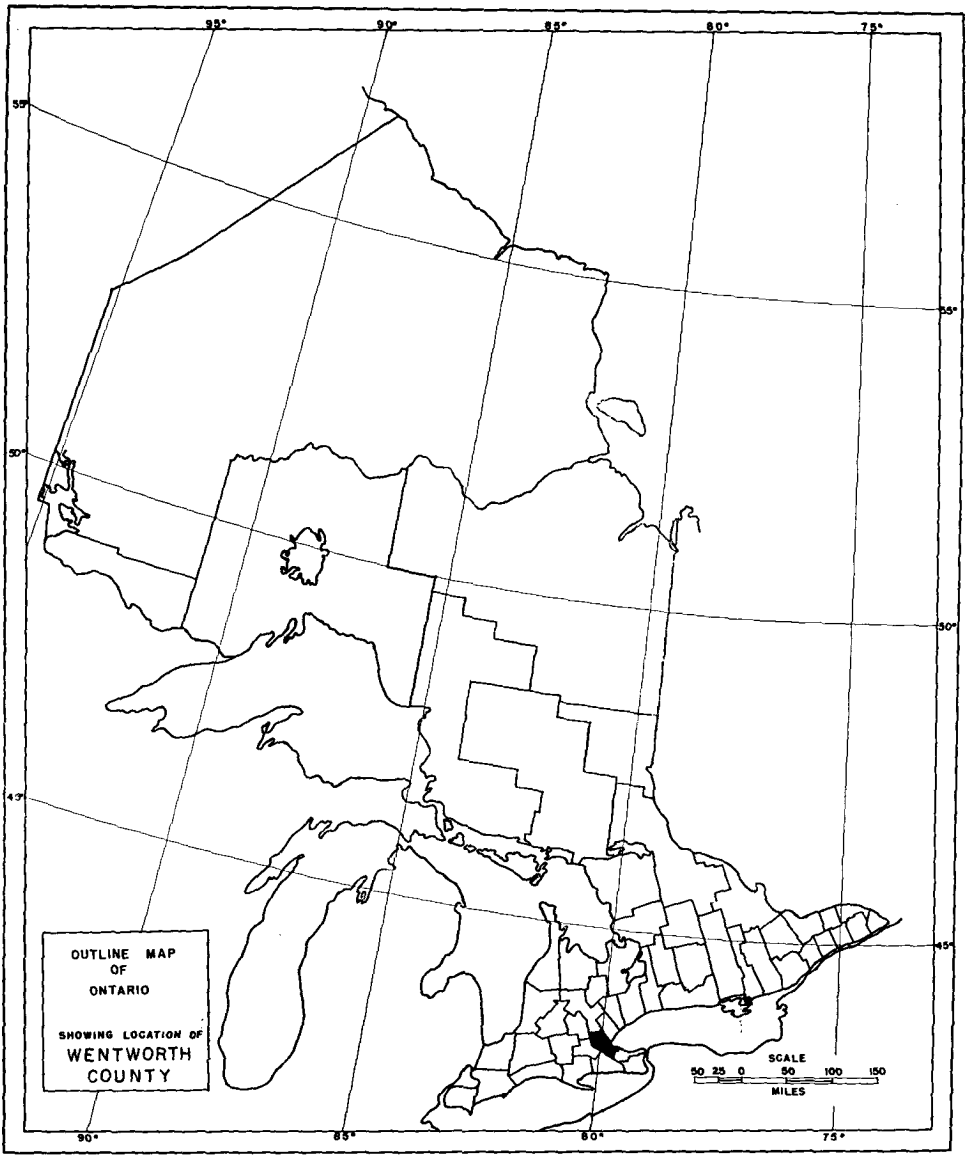



*Figure 1 — Outline Map of Ontario Showing Location of Wentworth County.*

# The Soils of Wentworth County

## INTRODUCTION

The first reconnaissance soil survey of Wentworth County was carried out in the early days of soil survey in Ontario. In recent years, the County has been completely resurveyed, and the acquisition of more detailed soils information in this County and in neighboring Counties has inevitably resulted in some changes in soil names and boundaries.

This report describes the geology, physiography, drainage, soil parent materials, and climate, and discusses their influences on soil development in the County. A brief review is given of the agricultural industry of the County and of the relation between agriculture and the soils.

A description is given of each soil series, with a short discussion of its present agricultural use. The land-use capability of each soil series unit is indicated.

The soil map accompanying this report shows the location and distribution of the various soil series in the County.

## GENERAL DESCRIPTION OF THE AREA

### Location and Size

Wentworth County is situated at the western end of Lake Ontario. It lies between 79°40′ and 80°15′ west longitude and 43°05′ and 43°20′ north latitude. It it bounded on the east by Lake Ontario and Halton and Lincoln Counties, on the south by Haldimand and Brant Counties, on the west by Brant and Waterloo Counties, and on the north by Wellington and Halton Counties.

The total area of the county is 458 square miles or 293,120 acres.

### Population

The population of the county in 1961 was 358,837. The majority of the people live around the highly industrialized city of Hamilton (273,991) and adjoining area, which also includes the towns of Dundas (12,912), Stoney Creek (6,043), and Ancaster.

### Agricultural Development

The first records of settlement in Wentworth County date from around 1790. Most of the early settlers were Loyalists who left the United States after the American Revolution. Some came directly from the States; others came from the eastern part of the Niagara Peninsula were settlement had started some 10 to 15 years previously. After 1800 the land was rapidly cleared, and by 1850 settlement was virtually complete in the County.

The first settlements took place in the most accessible locations along the lakeshore and streams below the escarpment. Much of the area now covered by Hamilton city was avoided by the first settlers because it was swampy and abounded with mosquitoes and rattlesnakes.

The present townships were surveyed and named in the early 1790's, but they remained as parts of the early Counties of Lincoln and Halton until 1816 when Wentworth County was incorporated. In 1854, the townships of East and West Flamborough were transferred from Halton to Wentworth County. In 1962, a section of East Flamborough township, below the escarpment, was returned to Halton County as part of the town of Burlington.

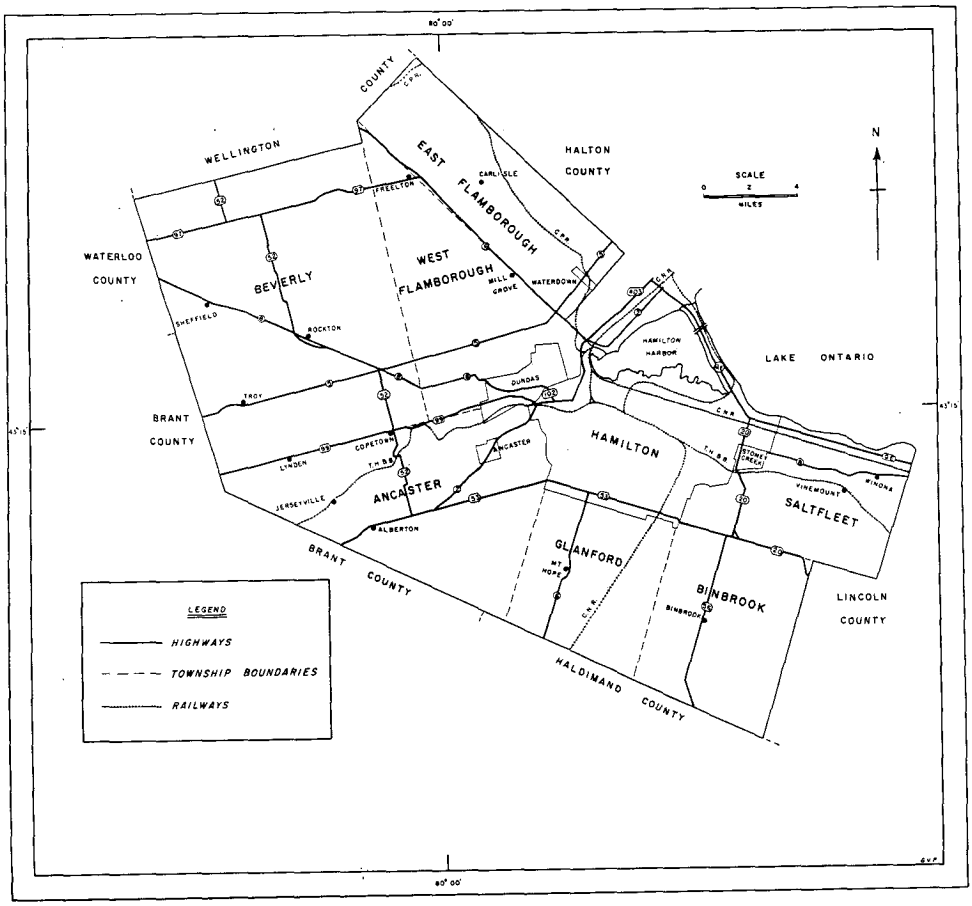



*Figure 2 — Townships, Principal Towns, Highways and Railways in Wentworth County.*

The first roads were little more than blazed trails, many of which followed old Indian footpaths. Such roads extended along Lake Ontario and from the head of the Lake to the River Thames. These early trails were soon replaced by corduroy roads which led to nearby towns such as Caledonia, Galt and Guelph and helped to hasten settlement in the County. By 1830, drained plank or gravel roads gradually replaced the corduroy roads, and by 1860 the principal roads in the County had been macadamized.

Agricultural development of the County began as soon as the settlers could clear trees and plant grains and tree fruits, whose seeds had often been brought from the old homesteads. There are indications that considerable grain was being grown by 1800, since a number of thriving flour mills were operating along the creeks flowing down from the escarpment by this date.

Wheat was one of the first crops of commercial importance in the County, mainly because of the prosperous wheat trade with the British market. In 1824, 10,000 bushels and in 1830, 150,000 bushels of wheat were estimated to have been shipped from Burlington Bay. By 1856 wheat was retailing at $1.25 per bushel, a price far higher than those established for other grains. Wheat production declined during the latter half of the 19th century, because of the development of new wheat lands in the West, and also because of the growing popularity of other field crops.

As the wheat acreage declined, barley became an established crop in Wentworth County. Its popularity was attributed to a good American market, and to good local markets aided by the flourishing breweries of Hamilton and Dundas and by the increasing livestock population.

Until 1850, sheep were the most prevalent type of livestock in the County, and there were good local markets for the wool and mutton. However, after 1850 as the forests were rapidly cut down and as agriculture was intensified, cattle and swine became increasingly important branches of livestock in Wentworth County. Dairying was also a more popular enterprise after 1850, although the market was mainly limited to local cheese factories. It was not until after 1900 that the creameries developed lucrative markets for fluid milk.

Wentworth County had become a well-established producer of fruit by 1859 when 30,000 barrels of peaches, plums, grapes, pears and apples, were shipped

**TABLE 1**

**CONDITION OF FARMLAND IN WENTWORTH COUNTY***

| Township | Acres | Improved Land Acres | %(1) | All Field Crops Acres | %(1) | Unimproved Land Acres | %(1) | Woodlot Acres | %(1) |
|---|---|---|---|---|---|---|---|---|---|
| Ancaster | 34,038 | 27,902 | 82 | 20,327 | 59 | 6,136 | 18 | 2,709 | 8 |
| Beverly | 58,353 | 40,816 | 70 | 27,713 | 47 | 17,537 | 30 | 7,000 | 12 |
| Binbrook | 24,234 | 21,289 | 87 | 15,724 | 65 | 2,945 | 13 | 1,378 | 6 |
| Flamborough E.** | 22,267 | 16,137 | 73 | 11,646 | 52 | 6,130 | 27 | 3,026 | 14 |
| Flamborough W. | 20,294 | 15,507 | 77 | 11,646 | 57 | 4,787 | 23 | 1,468 | 7 |
| Glanford | 18,870 | 17,376 | 92 | 12,720 | 67 | 1,494 | 8 | 647 | 3 |
| Saltfleet | 20,083 | 17,358 | 86 | 13,668 | 68 | 2,725 | 14 | 880 | 4 |
| Totals | 198,139 | 156,385 | | 113,444 | | 41,754 | | 17,108 | |

*Data compiled from Census of Canada 1961. (1) Percent of township acreage.

**Includes part of Burlington now in Halton County.

## TABLE 2

### DISTRIBUTION OF CROPS AND NUMBER OF LIVESTOCK IN WENTWORTH COUNTY*

| | | Major Field Crops | | | | | | | | | | | | Livestock | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Wheat | | Oats | | Corn Ensilage | | Corn Grain | | Hay | | Pasture | | | Milk | | |
| Township | Acres | Acres | %(1) | Acres | %(1) | Acres | %(1) | Acres | %(1) | Acres | %(1) | Acres | %(1) | Cattle | Cows | Pigs | Poultry |
| Ancaster | 34,038 | 2,212 | 6.5 | 6,542 | 19.2 | 894 | 2.6 | 833 | 2.4 | 6,504 | 19.1 | 4,906 | 14.4 | 6,532 | 3,165 | 4,649 | 170,922 |
| Beverly | 58,353 | 2,256 | 3.9 | 8,708 | 14.9 | 1,515 | 2.6 | 936 | 1.6 | 11,180 | 19.1 | 9,007 | 15.4 | 11,054 | 4,987 | 7,773 | 319,310 |
| Binbrook | 24,234 | 1,393 | 5.8 | 4,966 | 20.5 | 448 | 1.9 | 346 | 1.4 | 7,508 | 31.0 | 4,250 | 17.5 | 4,277 | 1,714 | 3,262 | 62,855 |
| Flamborough E.** | 22,267 | 894 | 4.0 | 2,436 | 10.9 | 248 | 1.1 | 496 | 2.2 | 2,841 | 12.7 | 2,149 | 9.6 | 2,556 | 774 | 4,381 | 174,114 |
| Flamborough W. | 20,294 | 983 | 4.9 | 3,219 | 15.8 | 349 | 1.7 | 702 | 3.5 | 3,640 | 17.9 | 2,287 | 11.2 | 3,071 | 1,407 | 4,854 | 144,504 |
| Glanford | 18,870 | 1,019 | 5.4 | 4,934 | 26.1 | 502 | 2.7 | 118 | 0.6 | 5,468 | 28.9 | 3,384 | 18.1 | 4,525 | 2,328 | 3,301 | 40,171 |
| Saltfleet | 20,083 | 858 | 4.3 | 2,128 | 10.6 | 252 | 1.3 | 85 | 0.4 | 4,096 | 20.4 | 2,235 | 11.1 | 2,328 | 1,074 | 1,859 | 86,117 |
| Totals | 198,139 | 9,885 | | 32,933 | | 4,208 | | 3,516 | | 41,237 | | 28,168 | | 34,343 | 15,449 | 30,079 | 997,993 |

*Data compiled from Census of Canada 1961. (1) Percent of township acreage.

**Includes part of Burlington now in Halton County.

*A view of the Niagara fruit belt as seen from the Niagara escarpment. Urban expansion is most noticeable in the background near the Lake Ontario shore.*

from the Niagara Peninsula. With the advent of the railway, the acreage of fruit trees increased, until by 1881, Saltfleet township had 8 percent of its total area under fruit, while the townships of East Flamborough and Ancaster had 5 percent and 4 percent, respectively, of their acreages planted to fruit trees.

In 1881 it was reported that hardly any artificial drainage had been established in the County and that West Flamborough was the only township where tile had been used. At the present time, there are still large acreages of slowly-drained, clay soils that have had little or no drainage improvement. These soils are mainly situated in the southeastern townships of Glanford, Binbrook, and Saltfleet.

Campaigns to increase soil productivity and fertility by crop rotation, drainage, and natural fertilizer additions were under way by the 1850's in Wentworth County, and helped to arouse the Wentworth County Council into giving $100 as its first grant to the two newly formed Wentworth agricultural societies. In 1881 it was reported that 28 percent of the farmers in Wentworth County used land plaster, salt, and superphosphate. The average proportions used were: plaster 150 pounds, salt 400 pounds, and superphosphate 500 pounds per acre. These soil amendments were used chiefly on hay, roots, barley and clover.

The acreage of farm land, and the numbers and distribution of the important types of livestock and field crops in Wentworth County have been compiled from the Census of 1961 and are shown in Tables 1 and 2. The townships of Beverly, East Flamborough, and West Flamborough have the largest acreages of unimproved land in the County. This is due to the fact that the Beverly Swamp and the shallow, rocky Flamborough Plain are contained in these townships.

The three southeastern townships of Saltfleet, Binbrook and Glanford have the highest proportions of improved land and land planted to field crops, but the two large western townships of Beverly and Ancaster have the largest acreage of improved land and cropland. These latter two townships are also important in

beef and dairy cattle production, with well over 50 percent of the total number of cattle in the County. The large acreage of corn for silage and grain in these townships is probably linked to the high cattle population and to the occurrence of large acreages of loam and sandy loam soils that are well suited for corn growing.

The townships of Glanford and Binbrook have higher proportions of their total acreages in small grains, hay, and pasture than the other townships. This is probably partly due to the large acreages of slowly-drained clay soils in these townships. Risks that are inherent in growing high-value crops on these soils could be greatly reduced by drainage improvement.

The townships of East and West Flamborough and Saltfleet township show a distinct trend towards smaller-sized farms (Table 3). This trend seems to be

**TABLE 3**

**SIZE OF FARMS IN WENTWORTH COUNTY***

| Township | All Farms | Less than 10 Acres | 10 to 70 Acres | More than 70 Acres |
|---|---|---|---|---|
| Ancaster | 404 | 62 | 123 | 219 |
| Beverly | 537 | 36 | 118 | 383 |
| Binbrook | 197 | 6 | 27 | 164 |
| Flamborough E.** | 322 | 84 | 107 | 131 |
| Flamborough W. | 277 | 43 | 104 | 130 |
| Glanford | 174 | 8 | 60 | 106 |
| Saltfleet | 456 | 130 | 229 | 97 |
| Totals | 2,367 | 369 | 768 | 1,230 |

*Data compiled from Census of Canada 1961.

**Includes part of Burlington now in Halton County.

**TABLE 4**

**ACREAGE OF FRUIT AND VEGETABLES IN WENTWORTH COUNTY***

| | Total Acres | | Percent (1) |
|---|---|---|---|
| Tree Fruit** | 5,012 | | 2.5 |
| Small Fruit | 3,138 | | 1.6 |
| Grapes | | 2,485 | 1.3 |
| Strawberries | | 397 | 0.2 |
| Raspberries | | 212 | 0.1 |
| Others | | 44 | 0.0 |
| Vegetables | 3,922 | | 2.0 |
| Tomatoes | | 934 | 0.5 |
| Sweet Corn | | 716 | 0.4 |
| Green Peas | | 574 | 0.3 |
| Cucumbers | | 456 | 0.2 |
| Others | | 1,242 | 0.6 |
| Potatoes | 2,878 | | 1.5 |
| Total | 14,950 | | 7.5 |

*Data compiled from Census of Canada 1961.

**In descending order of abundance (number of trees); pear, apple, plum, peach, sour cherry, sweet cherry.

(1) Percent of total farm land in County.

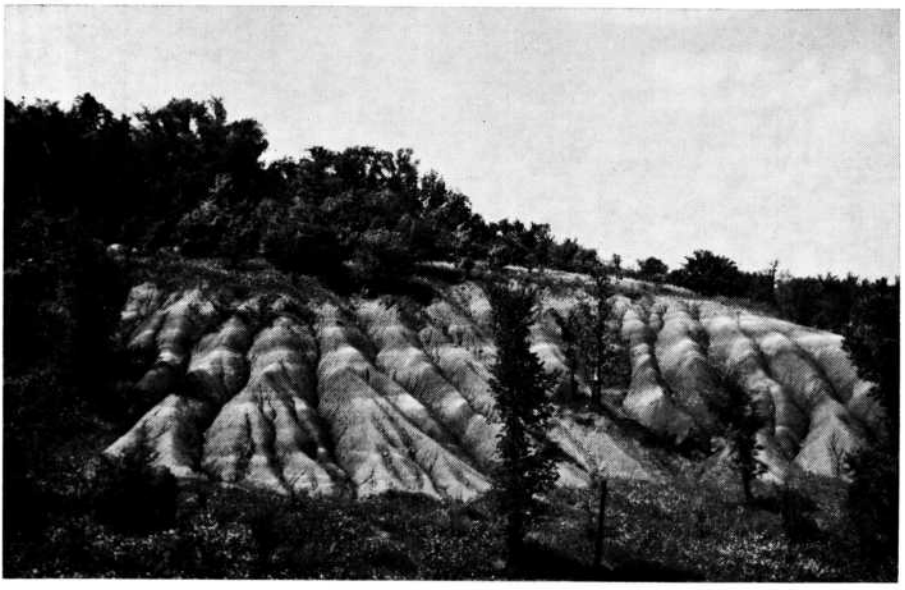
accompanied by greater fruit and vegetable acreages and perhaps, too, by increasing specialization in the swine and poultry industries.

The greatest concentration of tree fruits is in Saltfleet Township, below the escarpment, where the climate is most favorable for tender fruit such as peaches and sweet cherries. This area is rapidly being lost to agriculture through urban expansion.

Fruit and vegetable acreages are shown in Table 4. The acreages of small fruits and vegetables increase yearly and are expanding into areas where only field and forage crops have been grown. The well-drained sand and silt loam soils of East Flamborough and Ancaster townships presently account for most of the acreages of small fruits and vegetables in the County, but increasing acreages of these crops are being grown in the townships of West Flamborough and Binbrook.

**Bedrock Geology**

Detailed reports on the bedrock formations in Wentworth County and neighboring areas have been published by the Geological Survey of Canada. Dolomite, shale and sandstone make up the bedrock formations of Wentworth County. Their distribution and areal extent in the County are shown in Figure 3. The outstanding physiographic feature of the County is the Niagara escarpment which runs along part of the eastern border of the County, parallel to the Lake Ontario shoreline and the Dundas Valley.



*An exposure of unconsolidated Queenston shales along the face of the Niagara escarpment. Thin beds of gray shale alternate with thicker beds of red shale.*

The Queenston formation which is of Ordivician age, is the oldest formation in the County, and occupies the area from the base of the escarpment to the Lake Ontario shoreline. This formation also forms the surface bedrock of much of the Dundas Valley, although part of the Valley is reported to be carved in older Ordivician rocks which lie under the Queenston formation. The Queenston rocks consist of red mudstone with occasional greenish siltstone bands. It weathers rapidly into a cohesive, reddish soil on exposure to the atmosphere.

The Cataract and Clinton Groups, of Silurian age, rest upon the Queenston formation and are exposed only along the Niagara escarpment and in parts of the Dundas Valley. The Cataract Group consists mainly of red any gray sandstones and shales, while the Clinton Group is comprised of gray sandstone, dolomite, and limestone topped by black shale. These rocks may underlie the small patches of loose soil material near the base of the escarpment.

The Niagara escarpment is capped by resistant Silurian dolomites which make up the Lockport formation, and which grade into the Amabel formation north of Waterdown. Both formations consist of white, gray, and brown dolomites.

The Lockport formation provides the bedrock surface for those sections of Saltfleet and Barton townships which lie above the escarpment. Soils are shallow in some of the valleys of this region, and outcropping dolomite ledges along the valley sides are quite common.

The Amabel formation underlies most of East Flamborough township, and about one-half of West Flamborough township. It is characterized by extensive reef development north of Waterdown. Differential weathering of the resistant reef and less resistant interreef rocks appears to have had an influence on the loca-

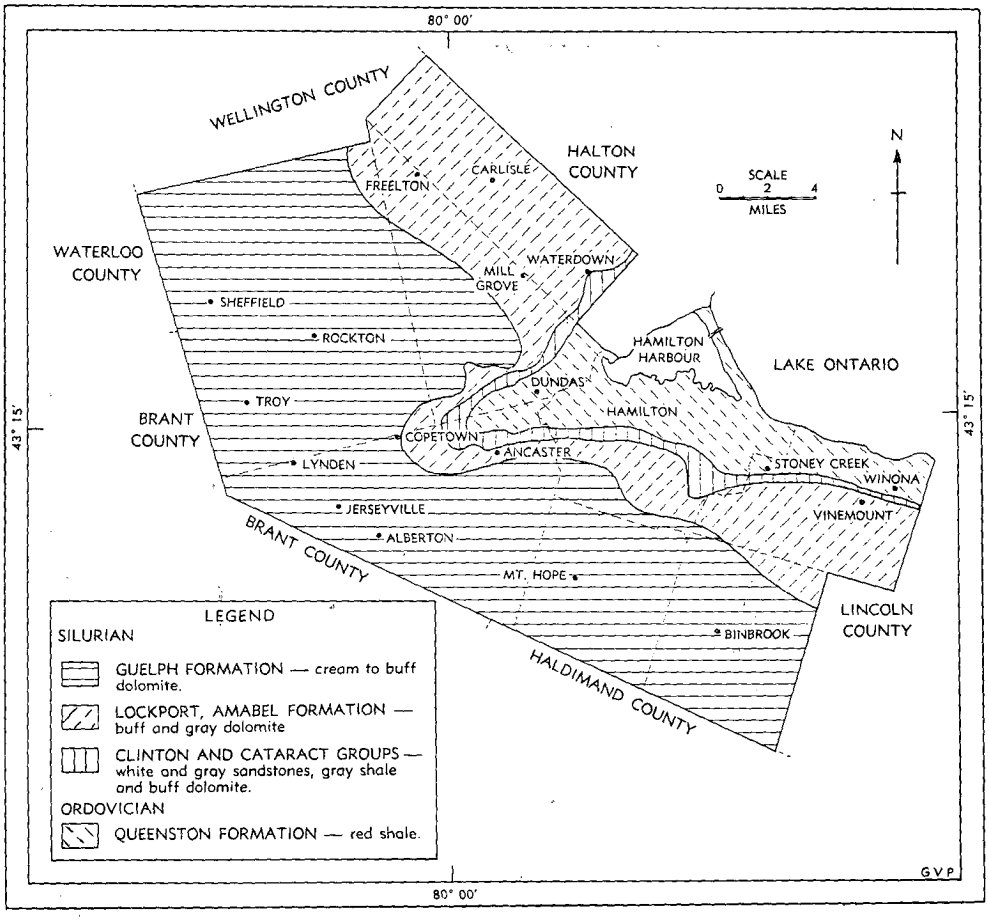



*Figure 3 — Outline Map Showing Bedrock Geology of Wentworth County.*

tion and formation of some of the drumlins and valleys in this area. Amabel rocks outcrop most extensively in the northern part of East Flamborough township.

The Guelph formation, also of Silurian age, overlies the Lockport-Amabel formations, and provides the bedrock surface for most of Beverly, Ancaster, Glanford, and Binbrook townships. This formation consists of light gray, buff-weathered dolomites whose surface topography in Wentworth County is more flat-lying than that of the Lockport-Amabel dolomites. Guelph dolomite underlies an extensive plain in Beverly and West Flamborough townships, where soils, when present, are usually shallow. Most of the Beverly Swamp is underlain at shallow depths by Guelph dolomite. Near the western edge of Beverly township some low reef ridges and domes of the Guelph formation are expressed as such in the surface topography.

**Relief and Drainage**

There are several distinct physiographic relief features in Wentworth County. The major change in relief is provided by the Niagara escarpment. It separates a lowland area bordering Lake Ontario from an upland region where elevations range from 500 to 1,100 feet above sea level.

The land below the escarpment has some characteristics not possessed by the upland part of the County. It is floored by soft, reddish shales and sandstones. Ravines have been cut in this material, and sometimes extend back in the form of notches into the escarpment. The Dundas valley is the largest and deepest of such notches. This valley was filled and then partially re-excavated during glacial and postglacial times.

The gently sloping area which extends from Lake Ontario to an elevation of about 350 feet, has been called the Iroquois Plain, because it was once covered by glacial Lake Iroquois. It consists of weathered red shale overlain by lenses of clay till and lacustrine sand. Drainage is slow where the sand is absent or very shallow. The ravines in this area have only a few, short tributaries, and their main contribution to the local drainage is to provide outlets for tile drains.

The bench between the Lake Iroquois shoreline and the escarpment is rolling and dissected by ravines. In the Dundas Valley, this bench has been cut by ravines to form a number of steep-sided serpentine ridges. Although the soils of this bench are predominantly clay tills, drainage is excellent and fruit trees thrive where slopes are not excessive.

Above the escarpment, the relief and drainage are to some extent controlled by the resistant dolomite bedrock which underlies the whole area. The flat clay plains, the bedrock plains and the broad, meandering stream valleys testify to the resistance of these flat-lying rocks.

An extensive clay plain, known as the Haldimand Clay Plain, covers most of the townships of Saltfleet, Binbrook, Glanford, Barton, and part of Ancaster township. The drainage of much of this region is poor to fair, but improves towards the west and along the dissected stream valleys, where the thickness of silt over clay increases.

A well-drained and well-dissected area of lake deposits extends from the Haldimand Plain north into Beverly township and east into the townships of East and West Flamborough. These deposits thin out over clay till in the Waterdown area, where a series of parallel, east-west trending ridges occur. They also become thin on the Flamborough Plain which lies north of the lake deposits.

The Flamborough Plain is a bedrock plain which extends north into Beverly township from the vicinity of Highway 5 and stretches east into East Flamborough township, just north of Mill Grove. Thin soils with varied textures and drainages occur over most of the southern part of the plain. There are only a few small streams running over the bedrock of this area.

The northern part of the Flamborough Plain contains a number of steep-sided drumlins. Their axes trend approximately east-west, and possess features such as wave-cut terraces and adjoining gravel spits which supposedly indicate erosion by glacial lakes. Most of the drumlins are intensively cultivated since they possess loamy, well-drained soils, but near the northern boundary of the County they become increasingly bouldery and some fields are still only half-cleared. Soil deposits between drumlins are often shallow and stony. There are large acreages of shallow muck swamps between the drumlins; the largest of these, the Beverly Swamp, spans the northern part of Beverly township.

The Galt and Moffat Moraines cut across the northwestern corner of the townships of Beverly and West Flamborough. Their relief is rough and hummocky; their soils are predominantly loam and gravelly loam in texture, and usually quite stony.

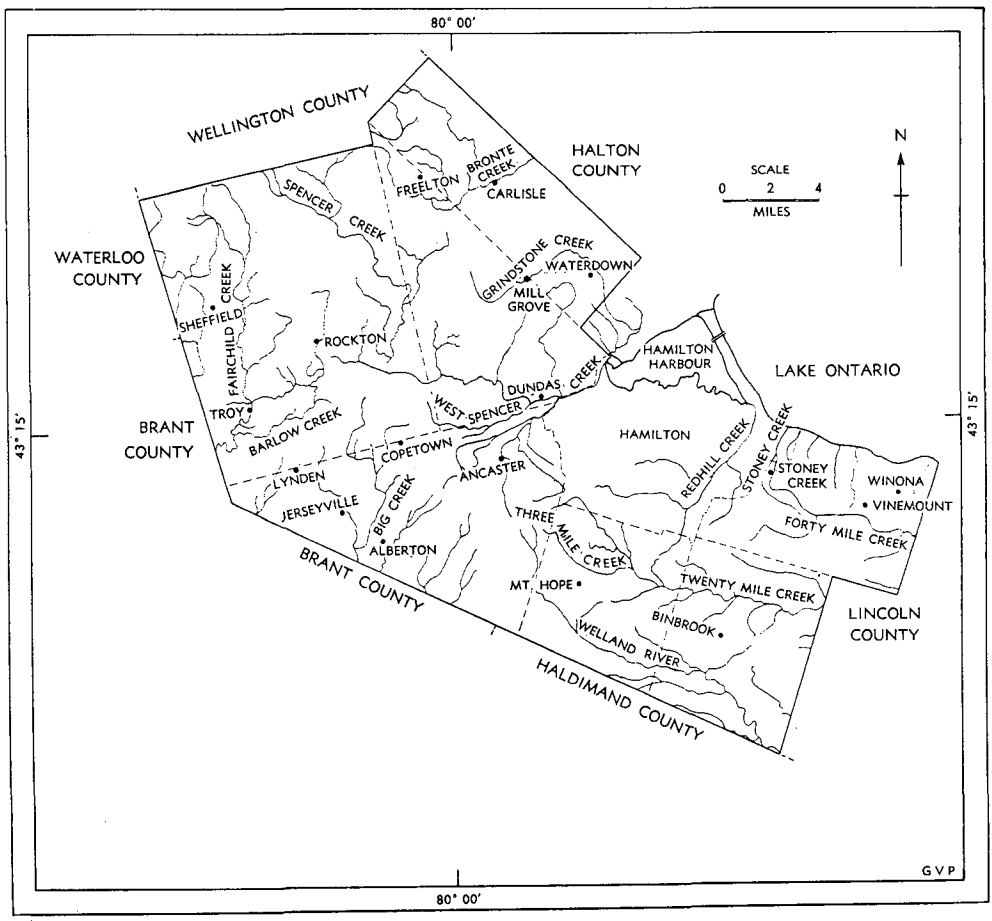



*Figure 4 — Outline Map Showing Principal Streams Draining Wentworth County.*

**Soil Parent Materials**

The soil materials of the northwestern section of the County have been described by Karrow (7) in considerable detail.

Practically all of the soil materials in Wentworth County are thought to have been deposited during the last glaciation, the Wisconsin. Perhaps the oldest deposit is the dense grayish clay till, which occurs over most of the southeastern part of the County above the escarpment. Increasing thicknesses of silt and sand overlie this till towards the west, where these soils are mapped as the Smithville and Binbrook series. In Ancaster township, this gray till outcrops only on the floor of stream valleys.

*Drumlin on the Flamborough Plain in Beverly Township. The soils between the drumlins are frequently shallow and poorly drained.*

The oldest till in the northwestern part of the County is considered to be the light brown loam and stony loam till which occurs in the Galt moraine and in the drumlinized region. The high sand and gravel contents of this till indicate that it has probably undergone considerable reworking by water.

A grayish-brown silty clay till is found in local areas near the escarpment. Above the escarpment it often overlies the bedrock; below the escarpment is commonly rests upon weathered Queenston shale. It is supposedly a younger till than the loam till found to the north.

The only other till which has a surface expression in the County is a silt loam to silty clay loam till which occurs near the margins of the Dundas Valley. It has more variation in texture, structure and color than the other tills in the County.

Glacial lake deposits make up the surface soil materials of most of the southwestern part of the County. Deposits of laminated or varved sand, silt and clay occur in a sector which extends west and south from the Dundas Valley to the Wentworth County boundary. These deposits are included in the Brantford and Brant soil series. Sands and silts which are usually non-laminated and probably

of shallow water origin, occur above and adjacent to these fine-textured, laminated sediments. Deep deposits of these coarser sediments are included in the Grimsby and Brant soil series. Where these sediments pinch out eastwards and westwards over the clay deposits of the Haldimand Plain, they are mostly mapped as Beverly and Binbrook soils. Coarse sands extend eastward into East Flamborough County where they are mapped as the Grimsby soil series. Towards the north these sands merge with the outwash sands and gravels of the drumlinized area. Below the escarpment, discontinuous lenses of lacustrine sand overlie the clay soils.

Sand and gravel outwash and ablation deposits are fairly common associates of the drumlins and terminal moraine which stretch across the northern part of the County. Often these deposits are found fringing the drumlins, or in the plains and valleys between drumlins. A few eskers are present in this region. Around the head of the Dundas Valley is an outwash area where reddish-colored gravels and sands occur.

**Climate**

The most significant climatic boundary in Wentworth is that related to the Niagara escarpment. The strip of frost-sheltered land bordering Lake Ontario and extending into the Dundas Valley has a longer, warmer, and slightly wetter season than the area above the escarpment. The climatic data from locations near Wentworth County, and above the escarpment, indicate that proceeding northwards, there is a slight, gradual decrease in mean annual temperatures and length of frost-free season in the upland part of the County.

The rainfall, temperature, and frost records for Grimsby, Stoney Creek, and Hamilton give a good indication of the climate for the land lying below the escarpment in Wentworth County. The Brantford data should apply to most of the southern and central part of the County which lies above the escarpment. The Guelph data may be applicable to the northern part of the County.

The favorable climate provided by the lake and the escarpment, to that part of Saltfleet township lying below the escarpment, has resulted in the extension of the Fruit Belt into this region. The moderate temperature and long frost-free season result in greater yields and reduced risks for the growing of all tree fruits. This is especially true for the more tender fruits such as peaches and sweet cherries, where a unique combination of soil and climate cause the Iroquois Plain to be the most important area in Ontario for these particular crops.

There are no striking climatic differences in the County, above the escarpment. Judging from the Brantford and Guelph weather records, the northern part of Wentworth County has slightly lower temperatures and a few days shorter frost-free period than the southern part. This might be expected with the increase in altitude and distance from the moderating influence of the lakes.

## TABLE 5
### MEAN MONTHLY AND ANNUAL PRECIPITATION

| | No. of Years Observed | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brantford | 51 | 2.6 | 2.1 | 2.2 | 2.5 | 2.9 | 2.7 | 3.1 | 2.9 | 2.6 | 2.5 | 2.4 | 2.2 | 30.7 |
| Grimsby | 19 | 2.8 | 2.2 | 2.4 | 3.0 | 2.9 | 3.2 | 2.8 | 3.0 | 2.7 | 2.8 | 2.4 | 2.0 | 32.2 |
| Guelph | 44 | 2.4 | 1.7 | 1.8 | 2.4 | 2.7 | 2.8 | 3.1 | 2.9 | 2.5 | 2.4 | 2.4 | 2.1 | 29.3 |
| Hamilton | 46 | 2.7 | 2.4 | 2.7 | 2.2 | 2.3 | 2.6 | 3.1 | 2.3 | 2.9 | 2.6 | 2.6 | 2.5 | 30.9 |

## TABLE 6
### MEAN MONTHLY AND ANNUAL TEMPERATURES

| | No. of Years Observed | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brantford | 51 | 22 | 20 | 31 | 43 | 55 | 65 | 70 | 67 | 61 | 48 | 37 | 26 | 45 |
| Grimsby | 19 | 25 | 24 | 33 | 45 | 54 | 64 | 71 | 69 | 62 | 51 | 40 | 29 | 47 |
| Guelph | 44 | 20 | 18 | 29 | 42 | 54 | 63 | 68 | 66 | 59 | 48 | 36 | 24 | 44 |
| Hamilton | 46 | 23 | 23 | 31 | 43 | 55 | 65 | 71 | 68 | 61 | 50 | 38 | 27 | 46 |

## TABLE 7
### FROST DATA

| | No. of Years Observed | Average Frost-Free Period (days) | Average Last Spring Frost | Only 10 percent chance of spring frost after | Average first Fall frost | Only 10 per cent chance of fall frost before |
|---|---|---|---|---|---|---|
| Brantford | 63 | 142 | May 13 | May 27 | Oct. 2 | Sept. 18 |
| Guelph | 65 | 135 | May 17 | May 30 | Sept. 29 | Sept. 15 |
| Hamilton | 59 | 170 | May 1 | May 22 | Oct. 18 | Sept. 27 |
| Stoney Creek | 37 | 163 | May 3 | May 20 | Oct. 13 | Sept. 27 |

## SOIL CLASSIFICATION

The surface deposits that make up the parent materials from which the soils have developed in Wentworth County, range from fine-textured clays to coarse gravels. Although most of the differences in the soils may be attributed to different parent materials, soils developed in similar parent material may differ because of variations in drainage, vegetation, or length of time of soil development.

All soil parent materials in the County are calcareous and have high base contents. However, the soils which have developed from them have become acid because of the loss of calcium and other bases. This loss has been effected by the leaching action of water percolating through the soil.

The cross-sectional exposure of soil which appears when a vertical cut is made in it, is known as the soil profile. It exhibits horizons that differ in color, thickness, structure, and texture. The various soil horizons are differentiated as A, B, and C horizons, which may be subdivided further when more detailed descriptions are required.

The A horizon is the surface horizon. It is the horizon which contains the greatest accumulation of organic matter, and which undergoes the maximum leaching of bases. It may be subdivided into a surface Ah horizon of organic matter accumulation, and a subsurface Ae horizon that is usually gray in color and leached. The B horizon usually contains more clay and sesquioxides than the overlying A horizon. The C horizon or parent material, underlies the B horizon, and is usually characterized by the presence of free carbonates and a relative lack of weathering in comparison with other horizons.

Poorly drained soils are those in which the ground water level is near the surface for a large part of the year. They are characterized by a "gley" condition brought about by reduction of iron compounds. The gleyed horizons are located just under the Ah horizon, and are usually gray or dark gray in color, often with orange or yellow mottling.

The classification of soils is based on the development and characteristics of soil horizons. One of the major units used in classifying soils is the Great Group. The Great Groups present in Wentworth County, are the Gray-Brown Podzolic, Brown Forest, Humic Gleysol, Regosol, and Organic.


*Gray-Brown Podzolic Soil Profile*

**Gray-Brown Podzolic Soils**

Most of the soils in Wentworth County are classified in the Gray-Brown Podzolic Great Group. The only exceptions are the poorly drained and very shallow soils. Gray-Brown Podzolic soils have a dark grayish-brown surface Ah horizon with an organic matter content that ranges from 6 to 12 percent. The underlying Ae horizon is light brown in color, slightly acid in reaction, and often becomes lighter in color and more acidic with depth. The B horizon is dark brown in color and contains accumulations of clay and sesquioxides. The calcareous C horizon most commonly occurs at a depth of 24 inches.

**Brown Forest Soils**

Brown Forest development occurs in the very shallow soils that are found on the Flamborough Plain. They have dark brown Ah horizons, moderately high in organic matter, which overlie dark brown B horizons that often contain slight accumulations of clay and sesquioxides. In these shallow soils, the B horizons are often thin, and lie directly on the dolomite bedrock.


*Humic Gleysol Soil Profile*

**Humic Gleysol Soils**

Humic Gleysol soils occur in poorly drained locations. Their Ah horizons have a high organic matter content, and are usually 6 to 10 inches thick. This horizon is underlain by gray or grayish-brown "gley" horizons which are commonly spotted by orange or yellow mottles.

### Regosol Soils

These soils are found mainly in the southern part of the County on flood plains of recent origin, and may range from 1 to 3 feet in thickness. They usually overlie clayey deposits. They are characterized by an Ah horizon that contains a large quantity of organic matter, and with a thickness of 3 to 6 inches. The material of these recent deposits shows little or no evidence of soil development other than surface organic accumulation.

### Organic Soils

Most of the Organic soils are in the northern part of the County, within and adjacent to the Beverley Swamp. Organic soils consist of 12 inches or more of organic material, which may be raw or decomposed, depending on the nature of the local vegetation and other environmental conditions. There is often a layer of marl separating the organic matter and the underlying, strongly gleyed soil material or dolomite bedrock.

### Soil Series, Types, Phases, and Complexes

The soil series, the principal mapping unit, includes soils that have similar profile development. It may consist of two or more soil types and phases. The soil type is a subdivision of the soil series based on the texture of the surface soil. The soil phase is a subdivision of the soil type and indicates characteristics such as stoniness, shallowness, degree of erosion, etc. that affect ease of cultivation. Soil complexes are combinations of two or more soil types that occur in such an intricate pattern that it is impractical to separate them. However, the characteristics of each soil type within a complex are the same as those in areas where they occur alone.

### Soil Key

| **A. Soils Developed on Calcareous Till** | Acreage |
|---|---|
| I. Gravelly, sandy loam parent material | |
| (a) Well drained | |
| 1. Dumfries loam (Dl) | 8,000 |
| 2. Dumfries loam — rocky phase (Dl-r) | 1,650 |
| 3. Dumfries loam — shallow phase (Dl-sh) | 1,300 |
| (b) Imperfectly drained | |
| 1. Killean loam (Kl) | 2,400 |
| (c) Poorly drained | |
| 1. Lily loam (Lyl) | 1,450 |
| II. Loam parent material | |
| (a) Well drained | |
| 1. Guelph loam (Gl) | 9,350 |
| 2. Guelph loam — shallow phase (Gl-sh) | 1,700 |
| (b) Imperfectly drained | |
| 1. London loam (Ll) | 2,650 |
| 2. London loam — shallow phase (Ll-sh) | 2,300 |
| (c) Poorly drained | |
| 1. Parkhill loam (Pl) | 1,500 |
| 2. Parkhill loam — shallow phase (Pl-sh) | 850 |
| III. Brown silty clay loam parent material | |
| (a) Well drained | |
| 1. Ancaster silt loam (Ansil) | 5,850 |

IV. Gray-brown clay loam parent material

(a) Well drained

1. Oneida loam (Ol) ..... 6,250
2. Oneida silt loam (Osil) ..... 2,950

(b) Imperfectly drained

1. Chinguacousy loam (Chl) ..... 1,900
2. Chinguacousy silt loam (Chsil) ..... 900
3. Chinguacousy silt loam — shallow phase (Chsil-sh) ..... 600

(c) Poorly drained

1. Jeddo loam (Jl) ..... 1,750
2. Jeddo sandy loam (Jsl) ..... 1,850

V. Reddish, silty clay loam parent material

(a) Imperfectly drained

1. Trafalgar silty clay loam (Trsicl) ..... 1,150

(b) Poorly drained

1. Morley silty clay loam (Msicl) ..... 700

VI. Gray clay parent material

(a) Imperfectly drained

1. Haldimand silty clay loam (Hsicl) ..... 6,700
2. Haldimand silt loam (Hsil) ..... 2,400

(b) Poorly drained

1. Lincoln silty clay loam (Lisicl) ..... 4,650

VII. Gray clay overlain by silty lacustrine deposits

(a) Moderately well drained

1. Smithville silt loam (Ssil) ..... 7,400

(b) Imperfectly drained

1. Binbrook silt loam (Bisil) ..... 16,800

**B. Soils Developed on Lacustrine Deposits**

I. Fine sandy loam and silt loam parent materials

(a) Well drained

1. Brant silt loam (Btsil) ..... 1,950
2. Brant silt loam — shallow phase (Btsil-sh) ..... 550

(b) Imperfectly drained

1. Tuscola silt loam (Tusil) ..... 1,650
2. Tuscola silt loam — shallow phase (Tusil-sh) ..... 1,600

(c) Poorly drained

1. Colwood silt loam (Cosil) ..... 1,150
2. Colwood silt loam — shallow phase (Cosil-sh) ..... 1,400

II. Silty clay loam and silty clay parent materials

(a) Well drained

1. Brantford silt loam (Bsil) ..... 15,750

(b) Imperfectly drained

1. Beverly silty clay loam (Bysicl) ..... 1,350
2. Beverly silt loam (Bysil) ..... 11,900
3. Beverly silt loam — shallow phase (Bysil-sh) ..... 4,550

(c) Poorly drained

1. Toledo silty clay loam (Tsicl) ..... 5,400
2. Toledo silt loam (Tsil) ..... 950
3. Toledo silt loam —shallow phase (Tsil-sh) ..... 1,500

**C. Soils Developed on Outwash Sand and Gravel Deposits**

I. Medium sand parent material

(a) Poorly drained

1. Granby sandy loam (Grs) ..... 300

II. Medium and fine sand parent materials
(a) Well drained
1. Grimsby sandy loam (Grsl) ..... 19,500
2. Grimsby sandy loam — shallow phase (Grsl-sh) ..... 2,100
(b) Imperfectly drained
1. Vineland sandy loam (Vsl) ..... 7,200
2. Vineland sandy loam — shallow phase (Vsl-sh) ..... 750
(c) Poorly drained
1. Flamborough sandy loam (Fosl) ..... 3,150
2. Flamborough sandy loam — shallow phase (Fosl-sh) ..... 1,000

III. Sand overlying calcareous clay till
(a) Imperfectly drained
1. Winona sandy loam (Wsl) ..... 2,950

IV. Sand overlying coarse, reddish gravel
(a) Well drained
1. Springvale sandy loam (Svsl) ..... 6,350

V. Loam overlying coarse gravel
1. Burford loam (Bul) ..... 2,900

VI. Coarse gravel and cobbly gravel deposits
(a) Well drained
1. Donnybrook gravelly loam (Dbgl) ..... 600

**D. Shallow Soils**

I. Loam till overlying dolomitic limestone
(a) Well drained
1. Farmington loam (Fl) ..... 9,850

**E. Soils Developed on Organic Deposits**

I. Muck (M) ..... 13,200

**F. Soils Developed on Recent Alluvial Deposits**

I. Silt loam and silty clay loam material
(a) Variable drainage
1. Alberton silt loam (Asil) ..... 8,200
2. Alberton silty clay loam (Asicl) ..... 7,100

II. Loam, silt loam and sandy loam materials
1. Stream courses (s.c.) ..... 7,950

**G. Miscellaneous Mapping Units**

I. Marsh (Ma) ..... 1,000
II. Ravines (R) ..... 5,100
III. Escarpment (Esc) ..... 2,500
IV. Quarries (Q) ..... 450

**H. Soil Complexes**

1. Ancaster silt loam — Oneida clay loam (Ansil-Ocl) ..... 900
2. Brantford silt loam — Brant silt loam (Bsil-Btsil) ..... 4,850
3. Brantford silt loam — Grimsby sandy loam (Bsil-Grsl) ..... 6,200
4. Beverly silt loam — Vineland sandy loam (Bysil-Vsl) ..... 3,300
5. Grimsby sandy loam — Ancaster silt loam (Grsl-Ansil) ..... 1,150
6. Grimsby sandy loam — Brant silt loam (Grsl-Btsil) ..... 6,150
7. Trafalgar silty clay loam — Morley silty clay loam (Trsicl-Msicl) ..... 300
8. Winona sandy loam — Jeddo sandy loam (Wsl-Jsl) ..... 1,300

## SOIL DESCRIPTIONS

### Dumfries Series

The Dumfries soils extend along the northern part of the County through the townships of Beverly, West and East Flamborough. The parent material of these soils is a calcareous gravelly, sandy loam which usually contains many dolomite stones and boulders.

The soils occurring on the hummocky topography associated with the end moraines are usually well-drained, although small, poorly drained swales and potholes are not uncommon.

The Dumfries soils have typical Gray-Brown Podzolic characteristics, and the profiles are often thin. The thin Ah horizon may be present but is often partially eroded away. The Ae horizons frequently become darker in color with depth, and overlie the B horizon which is higher in clay content and redder in color than the other horizons.

Rocky and shallow phases of the Dumfries soils occur in the northern part of East Flamborough township. Both soil phases are associated with weakly drumlinized stony moraine areas and dolomite bedrock outcrop. These areas are difficult to clear and cultivate due to the number and size of rock outcrop and boulders. Most of the land that has been cleared is used only for pasture, and would probably be best suited for wildlife or recreational purposes.

A large part of the deeper and less stony Dumfries soils has been cleared and is being used for general farming. Forage crops, small grains, and silage corn are the principal crops grown. These soils have special management problems associated with low fertility, stones and erosion and moisture problems associated with hummocky topography.

*A landscape scene of the Killean series. Stones are frequently turned up during plowing.*

### Killean Series

The Killean soils are the imperfectly drained associates of the Dumfries series and occur on level areas of the terminal moraine. These areas are often slightly hummocky but the major slopes are rarely greater than 2 percent.

Soil development is similar to that in the Dumfries soils, but with imperfect drainage the Ae and B horizons are slightly mottled, and the thickness of the profile is usually greater.

Almost all of the Killean soils have been cleared and are used for the same types of crops as the well-drained Dumfries soils. They are not as stony and droughty as the Dumfries.

### Lily Series

The Lily series includes the poorly drained, gravelly sandy loam soils that are found in depressions and stream valleys. These soils occur in small, scattered bodies throughout the morainic region in the northern part of the county.

The Lily soils have a thick organic surface horizon underlain by gleyed horizons. These horizons are drab gray and brown with orange mottles. The depth from the surface to free carbonates is variable but is often less than 18 inches.

Very few of these areas are cleared. Stoniness and wetness usually make them unsuitable for agricultural purposes.

### Guelph Series

The Guelph series includes the well-drained loam soils in the drumlinized region of the townships of Beverly, West and East Flamborough, just south of the Galt and Moffat terminal moraines.

The Guelph soils have developed on drumlins and other rolling land forms whose slopes range between 6 and 15 percent. Stoniness increases northwards in the direction of the terminal moraines and some Guelph soils next to the moraines in East Flamborough township are as stony as the Dumfries soils.

The Ah horizons are dark brown and overlie yellowish-brown Ae horizons. As in most well-drained soils in the County, the Ae horizons become lighter in color with depth, and can be subdivided into two horizons. The B horizon is dark brown with a more pronounced reddish hue and finer texture than the other horizons. The C horizon consists of calcareous brown, slightly weathered loam till, which usually occurs at a depth of 24 inches. The parent material contains many limestone pebbles derived from the underlying rock formations. Towards the eastern boundary of the County, the soil parent materials possess reddish hues produced by the incorporation of the reddish Clinton and Queenston sandstones and shales which outcrop east of the escarpment.

The Guelph soils are used principally for forage crops, spring grains and winter wheat. Some level areas are used for growing silage and grain corn and potatoes. Erosion is a problem in some areas, and gullies are frequently noticeable on some of the steeper slopes.

Along the southern boundary of the drumlinized area, where the Guelph soils merge into the shallow soils on the Flamborough Plain, a shallow phase of the Guelph series has been mapped. These soils have developed in material that has a thickness of 12 to 36 inches over bedrock. The parent material usually contains more unaltered bedrock fragments, gravel, and sand than the deeper

*Native grass being used for pasture on Dumfries loam—rocky phase soils. Trees are predominantly cedar.*

Guelph soils. Moisture deficiencies are also more marked in shallow soils than in similar but deeper soils.

### London Series

The London series comprises the imperfectly drained loam soils which are found in association with the Guelph soils. They occur mainly on level areas within the drumlin field and along the Flamborough Plain in Beverly township.

The London soils are often sandier than those of the Guelph series. Horizonation is similar to that of the Guelph soils, excepting the surface horizon which is usually thicker. Mottling is present in the subsoil horizons. The depth to the C horizon is somewhat greater than in the Guelph soils.

A shallow phase of the London soils occurs on the Flamborough Plain. Such soils are subject to the same limitations as the shallow Guelph soils.

These soils are used more extensively than the Guelph soils for row and market garden crops. This difference in land use may be due to the fact that they have a better moisture supply; are much less subject to erosion, and have fewer stones than the Guelph soils. Crops such as winter wheat and alfalfa which require good drainage, may suffer occasionally from winter-killing.

### Parkhill Series

The Parkhill soils are poorly drained and associated in the landscape with the Guelph soils. They occur mainly on the flat or depressional areas between drumlins.

The soil materials are variable, and outwash sand and gravel pockets are quite common. Stoniness is severe in many places, especially in areas of shallow soils, which are designated on the map as Parkhill shallow phase.

Parkhill soils have thick surface horizons with high organic matter content. These horizons are underlain by grayish-brown gleyed horizons which are variably mottled down to the parent material or the C horizon. There is often a thick, transitional BC horizon that is leached of free carbonates.

Most of the Parkhill soils in the County have been cleared at some time. Much of this cleared land is reverting to bush or being used as unimproved pasture. A small acreage is being utilized for market garden crops.

### Ancaster Series

The Ancaster soils consist predominately of brown silty clay loam soils which are found on the ridges and moraines surrounding and separating the ravines of the Dundas Valley.

The slopes on which the Ancaster soils have formed most commonly range between 10 and 15 percent. The surface materials, usually silt loams, erode very readily on such slopes if they are left exposed. Although silty clay loam materials predominate, there is wide variability in materials within the Ancaster soils, and layers and inclusions of sand, gravel, and clay loam are common. Stones are relatively scarce; most pebbles and boulders are composed of shale and sandstone.

A typical Ancaster profile has a relatively thin Ap horizon of dark grayish-brown silt loam underlain by a much thicker Ae horizon of brown silt loam. The B horizons of Ancaster soils are well-developed, and contain accumulations of clay and free iron, as do the majority of B horizons in the soils of this area. The calcareous C horizon may occur at variable depths, but most often at about 30 inches from the surface.

Only a small area of Ancaster soils occurring on the steepest slopes remains uncleared. Crop production on the Ancaster soils is mainly limited to forages and winter wheat. The growing of tree fruits is popular on these soils. In general, these soils are well-drained, easily worked and fertile but agricultural production is limited because of the many steep slopes and their accompanying problems of erosion and management.

### Oneida Series

The Oneida soils are well-drained clay loams which occur in the vicinity of the escarpment in Wentworth County. Below the escarpment, they occur on benches and slopes leading down from the scarp faces in the Dundas Valley and the Mount Albion region. Above the escarpment, the Oneida soils rarely extend more than one mile back from the brow of the scarp and usually occur on gently rolling ridges which run parallel to the course of the escarpment.

Slopes on the Oneida ridges are usually less than 6 percent, however those on the benches below the escarpment range up to 10 percent. In the Dundas Valley, slopes of the Oneida soils between the ravines are usually greater than 10 percent. The sparse stone fragments that are present in the Oneida soils are composed primarily of brown shale and sandstone. The parent materials consist of blocky, grayish-brown or brown clay loam till.

The surface horizons of the Oneida series consist of dark grayish-brown loam or silt loam. Silt loam surfaces are most commonly found south of the escarpment in Saltfleet township. The Ae horizons are composed of silt loam, loam or silty clay loam materials. The B horizons are made up of fine-textured materials, usually silty clay, and have a characteristic fine angular blocky structure. The cal-

careous clay loam till is usually found at a depth of 24 to 30 inches from the surface.

Forages, spring grain and winter wheat are the most important field crops grown on the Oneida soils. Fruit trees are also important, with apples, pears, and plums being most commonly grown.

### Chinguacousy Series

These soils are the imperfectly drained clay loams which occur on those very gently sloping and level areas in association with the Oneida soils above the escarpment.

Types and distributions of soil materials are similar to those of the Oneida series. A shallow phase of the Chinguacousy series has been shown on the soil map in Saltfleet township, south of the escarpment.

The sequence and colors of horizons in the Chinguacousy profiles are similar to those of the Oneida soils. Chinguacousy soils differ from Oneida soils in having slightly deeper surface horizons, mottling in the Ae and B horizons, and somewhat shallower profiles. Some Chinguacousy soils also possess a slight hardpan in the transitional area between the A and B horizons.

These soils are mainly used for forage and grain crops. Crops such as winter wheat, alfalfa, and tree fruits which require good drainage can usually be grown on these soils if drainage is improved.

### Jeddo Series

The Jeddo series consists of the poorly drained clay loam soils usually found associated with the Oneida soils. In Wentworth County, the Jeddo soils occur in two separate areas — in depressions and stream valleys between ridges of Oneida and Chinguacousy soils in East and West Flamborough townships, and on the flat Iroquois Plain bordering Lake Ontario, in Saltfleet township.

The subsoil materials of the Jeddo soils are somewhat finer in texture, have grayer colors and fewer stones than those of their better drained associates. An overburden of loam or sandy loam, up to 12 inches in depth, covers the clay subsoil. This surface material is mainly loam in the areas above the escarpment, and sandy loam on the Iroquois Plain. The organic-rich, loamy surface horizons are underlain by 12 to 18 inches of dark grayish-brown, gleyed clay loam and silty clay with bright yellowish-brown mottles The clayey materials of the C horizon are frequently lacking in free carbonates. They are very sticky when wet and usually have a columnar structure when dry.

The Jeddo soils above the escarpment, in the Waterdown area, are covered mainly by bush, or swamp, and used for pasture. Jeddo soils on the Iroquois Plain are used for the production of grapes and some of the less tender tree fruits such as apples, pears, and plums. These latter Jeddo soils have certain advantages over those above the escarpment in that they are deeper, have sandier surface material above the clay, and have some drainage improvement, mainly as open ditches. The climate of this region is also more favorable for fruit growing.

### Trafalgar Series

The Trafalgar soils are imperfectly drained, reddish silty clay loam soils, found on parts of the Iroquois Plain in Saltfleet township. Although their total acreage is small, they are nonetheless important soils for the growing of fruit crops in this area.

The soil materials are derived from the reddish Queenston shales which underlie these soils. The color, structure, and texture of the Trafalgar and Morley soils can be attributed to the influence of the Queenston shales. These soils commonly grade into the shale bedrock at depths of 3 to 5 feet.

The brown silty clay loam surface soil ranges up to 10 inches in thickness over the reddish clay subsoil. Although mottling occurs in the Ae and throughout the B horizon, the yellow mottles are especially prominent in the upper part of the reddish-brown clay B horizon. The calcareous C horizon material occurs 24 to 30 inches from the surface, and is similar in color and structure to that of the B horizon. It differs in texture and contains more silt and less clay than the overlying B horizon.

Although urban development is encroaching on the Trafalgar soils, there is still a considerable acreage planted to tree fruits and grapes. Like other clay soils in the Niagara fruit belt, the Trafalgar soils appear to be capable of producing tree fruits, except sweet cherries and peaches. The Trafalgar soils usually require artificial drainage.

### Morley Series

The Morley soils are the reddish, poorly drained, silty clay loam soils which occur in slightly depressed areas on the Iroquois Plain.

They are almost identical to the Trafalgar series in color, structure, and texture. However, the brown surface horizons are not as thick as in the Trafalgar series, and are frequently absent, so that the Morley soils are often uniformly reddish in color from surface to shale bedrock.

These soils, like the Trafalgar series, are used entirely for fruit growing. The high incidence of dead and diseased trees on the Morley soils may result from the poor drainage which can only be remedied by the use of artificial drainage.

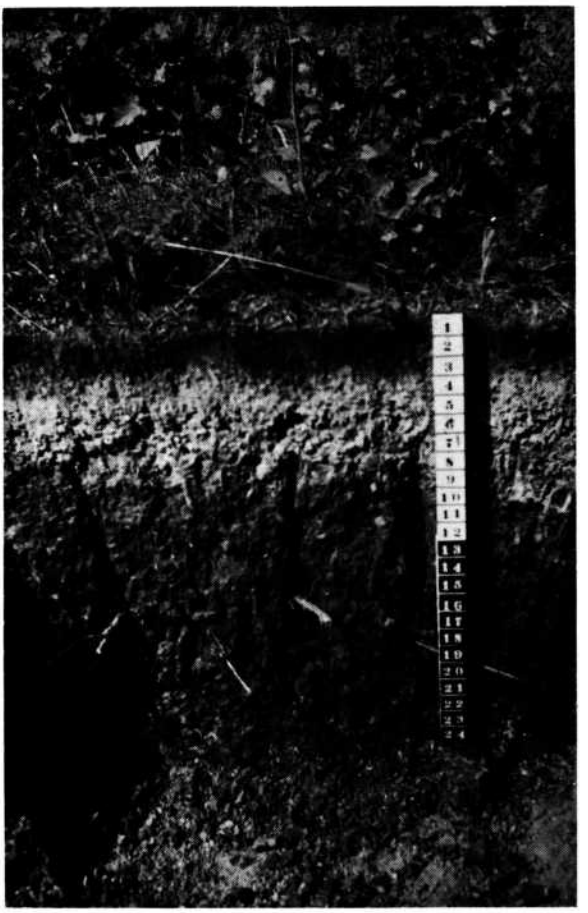
### Haldimand Series

The Haldimand series includes the imperfectly drained, grayish clay soils which are found in the southeastern part of the County. They occupy areas of the Haldimand Clay Plain which extend from Haldimand and Lincoln Counties into the townships of Binbrook and Saltfleet.

The topography of these areas ranges from flat to very gently sloping. The grayish-brown clay parent materials are relatively impermeable to water and very sticky when wet. The surface soils consist of up to 12 inches of either brown silt loam or silty clay loam overlying this heavier material. A type separation has been made on the basis of these two different surface textures.

In general, the Ap horizons of Haldimand soils consist of 4 to 6 inches of dark grayish-brown silt loam over a thin Ae horizon of pale brown silt loam. A thin AB horizon of silty clay loam is frequently the site of hardpan formation. Mottling is most prominent in the lower part of the Ae and in the AB horizons. The B horizon usually consists of 4 to 6 inches of dark grayish-brown silty clay with angular blocky structure. The grayish-brown clay material of the C horizon begins most commonly at a depth of about 18 inches.

The Haldimand soils have been cleared, and are used mainly for the production of hay, pasture, and spring grains. Increasing use is being made of these soils for grain, corn, and canning crops. Some drainage improvement is usually necessary for best results on these soils.



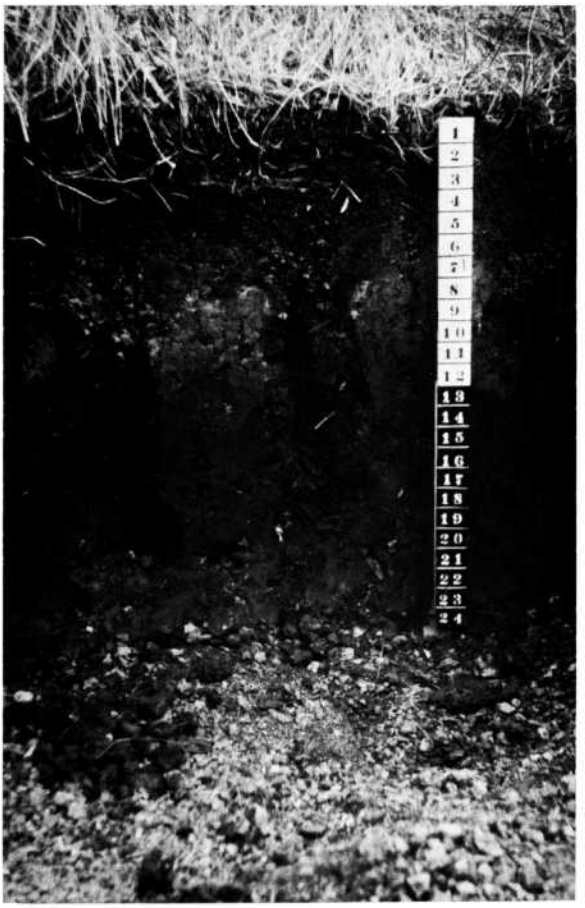
*A profile of the Haldimand Series.*
*This profile is 18 inches deep, and has well expressed Ae and Bt horizons.*

## Lincoln Series

These are the poorly drained, grayish clay soils which are found on level and depressional areas of the Haldimand Plain, and in association with the Haldimand soils. In Binbrook township the Lincoln soils occur in scattered, depressional areas. In Saltfleet township, most of the Lincoln soils are found on a broad plain which is located just south of the Vinemount moraine, and extends from the Lincoln County border almost as far west as Elfrida.

The parent materials of the Lincoln soils are similar to those of the Haldimand series. The Lincoln soils, however, have a deeper Ap horizon, and considerably more gleying in the subsoil horizons.

Most of the Lincoln soils which have been cleared are used for pasture or hay production. Where crops such as spring grains or grapes are being grown, tile or open ditches are used to facilitate water removal from these clay soils.



*A profile of the Lincoln clay*
*These clay soils are massive, and when dry possess vertical cracks with large prismatic structures.*

### Smithville Series

The Smithville series includes the moderately well-drained grayish clay till soils which are overlain by lacustrine silt loam. The depth of silt loam over the clay materials usually ranges from 12 to 20 inches.

The Smithville soils occupy most of the well-drained locations on the Haldimand Plain which extends into southeastern Wentworth County. They also occur on the well-dissected uplands along the Welland River.

The A horizons of the Smithville soils are developed in silt loam. The thickness of these horizons depends on the original depth of silt loam deposit and the degree of subsequent erosion. The B horizons are usually composed of dark grayish-brown silty clay with medium angular blocky structure. The calcareous C horizon, which is made up of a stonefree grayish-brown clay till, is usually present at a depth of 20 to 24 inches from the surface.

The Smithville soils are important agricultural soils in the townships of Glanford and Binbrook. They are successfully utilized for the growing of forage


*A profile of the Smithville silt loam*
*The Ae horizon is developed within the surface silt loam and lies directly on the massive clay. The dark brown Bt horizon extends to a depth of 18 inches.*

crops, spring grain, fall wheat, grain, and silage corn, canning crops, and tree fruits. The gently sloping topography and silt loam surface allow excess water to drain away. Drainage may be temporarily impeded in level areas, resulting in damage to certain crops.

### Binbrook Series

The Binbrook soils are imperfectly drained grayish clay till soils overlain by silt loam, and are most often found associated with the Smithville soils. They occupy considerable areas in Glanford and Binbrook townships where they are most prevalent on the level to very gently sloping stream divides such as that which occurs between Twenty Mile Creek and the Welland River.

The characteristics of the soil horizons are similar to those of the Smithville soils. The major difference is the presence of mottling in the Ae and B horizons. The frequent occurence of a slight hardpan at the junction of the A and B horizons may also be related to the presence of excess water.

Forage crops and spring grains are the main crops grown on the Binbrook soils, because of the large number of dairy cattle in Glanford and Binbrook townships. However, the growing popularity of other livestock enterprises, and of specialized cash crops, has led to an increase in such crops as grain corn, sweet corn, canning peas, and tomatoes. The need for artificial drainage in most of these soils may become more acute as crop and livestock specialization increase.

### Brant Series

The Brant series includes the well-drained soils developed on lacustrine silt loams and fine sandy loams in Ancaster Township near the Dundas Valley. A few bodies of Brant soils are also mapped north of the Dundas Valley. Small areas of Brant shallow phase occur in Beverly township bordering the Flamborough Plain.

The Brant soil materials usually consist of alternating layers of silt loam and fine sandy loam, in which individual layers may range from a few millimeters to one or more feet in thickness. The reddish hue which is noticeable in most of the Brant soils in Wentworth County is probably due to the inclusion of material from the reddish shales and sandstones of the Clinton and Queenston formations.

The Brant soils have a relatively thin surface horizon, since much of the original surface has been lost through erosion. It is underlain by thick Ae horizons of yellowish-brown silt loam and fine sandy loam, which often become more reddish with depth. The B horizons consist of reddish-brown silt loam that contains concentrations of clay and free iron, and which frequently alternates with layers of coarser material. Profiles are thick and the calcareous C horizon materials occur at 36 inches or more below the surface.

The easily-worked Brant soils have a high agricultural value for the growing of most common forage and row crops. Increasingly greater areas of specialized

*Landscape of the Brant soil series.*
*Gently rolling to moderately undulating topography.*

crops such as grain corn, sweet corn, and strawberries are being planted on these soils. They erode easily, and must be managed carefully to minimize erosion losses.

### Tuscola Series

The imperfectly drained soils developed on lacustrine silt loams and fine sandy loams are included in the Tuscola series. These soils occur in flat-lying upland locations and valleys in Ancaster township, just west of the Dundas Valley. They are also found on level areas in Beverly township between Troy and Rockton. In the vicinity of Rockton, fairly large areas of Tuscola shallow phase have been mapped.

The Tuscola soils contain less fine sandy loam than the well-drained Brant series, but the color and structure of the soils are similar. Mottling, a condition produced by water saturation, is found in the subsoil horizons of the Tuscola series. Profiles have not as a rule developed as deeply as in the Brant series.

The Tuscola soils are utilized for growing the same kind of crops as are found on the Brant soils. They rarely require artificial drainage, and during extended droughts most Tuscola soils will provide a better moisture supply to crops than will the Brant soils. The shallow phase Tuscola soils, however, will probably be more deficient in moisture than the Brant soils during a dry season.

### Colwood Series

The poorly drained Colwood soils are developed on lacustrine silt loams and fine sandy loam deposits. The deeper Colwood soils are found in depressional areas near the Dundas Valley. Shallow Colwood soils occur on the Flamborough Plain in Beverly township, and have been mapped as a shallow phase.

These soils have thick organic surface horizons, often consisting of up to 6 inches of undecomposed muck overlying several inches of organic-rich silt loam. Reducing conditions that are present under this organic mat have produced gleyed horizons of drab gray or grayish-brown. Mottling is usually but not always present. Free lime has often been leached from the upper part of the C horizon.

The areas where the Colwood soils occur are usually too wet, small, or shallow to be of much agricultural value. Most of these areas are still uncleared or being used for pasture.

### Brantford Series

Brantford soils have developed at well-drained locations on lacustrine deposits of silty clay loam and silty clay, which are extensively distributed throughout the southwestern part of Wentworth County.

The parent materials of the Brantford soils consist of layered and massive deposits of lacustrine silty clay loam and silty clay. Postglacial erosion has dissected the region and produced the gently to moderately sloping topography on which the Brantford soils presently occur. A thin deposit of silt loam covers the surface of most bodies of gently sloping Brantford soils.

The A horizon of the Brantford soils may be subdivided into two parts, an Ap horizon which consists of 5 inches or less of dark grayish-brown silt loam and an Ae horizon of brown silt loam. The silt loam of the A horizon has a granular or platy structure and is very friable. The Brantford soils usually have a well

developed B horizon, which consists of dark grayish-brown silty clay up to 15 inches thick. The calcareous, brown silty clay or silty clay loam C horizon usually occurs at 24 to 30 inches below the surface.

Brantford soils are ideally suited for the growing of many crops. They are used in Wentworth County for growing forage crops, spring and fall grains, grain corn and canning crops. Because of the extreme erodibility of the surface silt loam, finer materials in the B and C horizons may be exposed on cultivated slopes. These clay spots tend to bake when dry and are very sticky when wet and therefore affect cultivation and uniformity of crop maturity.

### Beverly Series

The Beverly soils are the imperfectly drained associates of the Brantford series. They have developed on level to very gently sloping areas of lacustrine silty clay loam and silty clay in southwestern Wentworth County.

Although they have similar parent materials and similar sequence of horizon development as the Brantford series, the imperfect drainage of the Beverly soils causes some differences in horizon characteristics. The Ah horizons are usually somewhat deeper and darker in color than in the Brantford soils. Also the Ae and B horizons of the Beverly soils display some reddish-brown mottling. Mottling is usually most intense at the junction of the A and B horizons, where a slight hardpan frequently develops.

Three separations have been made of the Beverly soils. Two separations were based on texture, namely the silt loam and silty clay loam. The third separation included soils less than 36 inches deep over bedrock, a common occurence on the Flamborough Plain.

The Beverly soils are used for the production of the same crops that are grown on the Brantford soils. The impeded drainage often imposes some limitations on growth and yields, and drainage improvement of the more level areas is usually necessary.

### Toledo Series

The Toledo soils are the poorly drained silty clay loams and silty clays that are found in low or level areas in association with the better drained Beverly and Brantford series. These occur predominately in Ancaster and southern Beverly townships.

The Toledo soils usually possess a thick, organic-rich Ah horizon of silty clay loam or silt loam. This horizon is underlain by 24 to 30 inches of gleyed, mottled, grayish-brown silty clay loam or silty clay. The gray or reddish-gray C horizon materials have similar textures, and are often leached of free carbonates, especially in the shallow deposits over bedrock.

The Toledo series, like the Beverly series, have been subdivided on the basis of surface textures into silt loam or silty clay loam, and on depth of profile over bedrock. The Toledo silt loam — shallow phase was separated for those Toledo soils less than 36 inches deep that occur on the Flamborough Plain.

A large proportion of the Toledo soils has been cleared and is being used mainly for pasture and hay. Small acreages are devoted to spring grains and truck crops. Drainage improvement is a necessity on these soils, if high and profitable crop yields are desired.

## Granby Series

These poorly drained, medium sandy loam soils are in the northeastern corner of East Flamborough township.

The Granby soils have fairly thick, black Ah horizons which are underlain by grayish or light brownish sandy loam horizons that are usually mottled. The calcareous C horizon occurs at shallow depths of 12 to 18 inches from the surface.

The Granby soil body in Wentworth County is practically all covered by second growth bush and swamp. If the land were to be used for crop production, some type of drainage improvement would be essential.

## Grimsby Series

The Grimsby soils have developed on well-drained medium and fine sandy loam in Wentworth County. These soil materials are of alluvial and lacustrine origin. They are centered in an area extending from the Dundas Valley westward to Brant County, but they also occur north of this region in Beverly township and eastwards into West and East Flamborough townships.

The topography is gently to moderately sloping. Erosion and droughtiness are problems on the moderately and steeply sloping Grimsby soils. Droughtiness is also a problem on the shallow Grimsby soils of the Flamborough Plain.

The Ah horizons of the Grimsby series are usually thin. The Ae horizons range up to 24 inches thick and may be subdivided into two or more distinct horizons. B horizons are typically thick and well-developed, have a reddish hue, and contain accumulations of clay and free iron. Profile development is deep in the Grimsby soils, and C horizons are usually more than 36 inches from the surface. The brown, calcareous C horizon materials have more reddish hues near the Dundas Valley and the escarpment, due probably to higher contents of reddish Ordivician shales and sandstones. A shallow phase of the Grimsby soils has been mapped on the Flamborough plain.

In addition to supporting general crops such as forages, grain corn, spring grains and fall wheat, Grimsby soils are being increasingly utilized for more specialized crops like sweet corn, tomatoes and strawberries. A large acreage of tree fruits is grown on the Grimsby soils north of Waterdown. Moisture deficiencies are common in Grimsby soils during dry periods, and are a major limitation to crop yields. Sprinkler irrigation is being increasingly used in some localities to overcome the droughtiness of these soils.

## Vineland Series

The Vineland soils are the imperfectly drained associates of the Grimsby series. They have developed on sands with level to very gently sloping topography. These soil areas are most common in Ancaster and southern Beverly townships.

The parent materials of the Vineland soils are similar to those of the Grimsby series. Some mottling is present in the Vineland soils as a result of impeded drainage. The sand on which the Vineland soils have developed has been deposited on finer-textured soil materials, and is rarely more than a few feet thick over these materials. A shallow phase of the Vineland soils has been mapped over the bedrock of the Flamborough Plain.

The Vineland soils are not as droughty or erodible as the Grimsby soils, and so are better suited for row crops such as field corn, sweet corn and tomatoes which require considerable moisture during the summer. Some drainage improvement may be necessary in depressional areas of the Vineland soils, if crops such as winter wheat or alfalfa are grown.

### Flamborough Series

The Flamborough series includes the poorly drained soils that have developed from calcareous sand deposits similar to those of the better drained Grimsby and Vineland series. Most of the Flamborough soils occupy level or depressional areas in the southern part of Beverly township. Small areas occur within the sand belt that extends through East and West Flamborough. A shallow phase of the Flamborough soils has been separated along the southern border of the Flamborough Plain.

A typical Flamborough soil profile exhibits a black, fine sandy loam Ap horizon overlying horizons of brown mottled sandy loam with weak platy structure. The calcareous C horizon has a reddish hue and usually occurs at a depth of 20 to 30 inches.

About one-half of the Flamborough soils still remain uncleared. Most of the cleared area is used for pasture; some is used for market gardening purposes. The drainage of these soils must be improved artificially if maximum plant yields are to be attained.

### Winona Series

The Winona soils are imperfectly drained sandy loams up to 24 inches deep over clay deposits. In Wentworth County these soils are mapped only along the southern shore of Lake Ontario on the Lake Iroquois plain.

The Ap horizons of the Winona series usually consist of fine or medium sandy loam. The Ae horizons are usually mottled, and have loamy sand textures. The sandy materials of the A horizons are separated from the clay C horizon materials by a dark, reddish-brown B horizon of sandy clay loam.

The rapidly dwindling areas of Winona soils that are still available for agricultural use, are used for the growing of tree fruits and grapes. The sand overburden seems to allow sufficient drainage and aeration for the healthy growth of all tree fruits including "tender" types such as peaches and sweet cherries.

### Springvale Series

The Springvale series includes well-drained soils with 12 to 36 inches of sand overlying coarse gravel. The largest bodies of Springvale soils occur near the head of the Dundas Valley. Other smaller bodies are found close to the edge of the valley, and in the Waterdown region.

The Springvale soils usually occur on plateau-like areas of level to gently sloping topography. There is often some cementation of sand grains just above the gravel layer that causes a slight impedence to drainage on the more level areas.

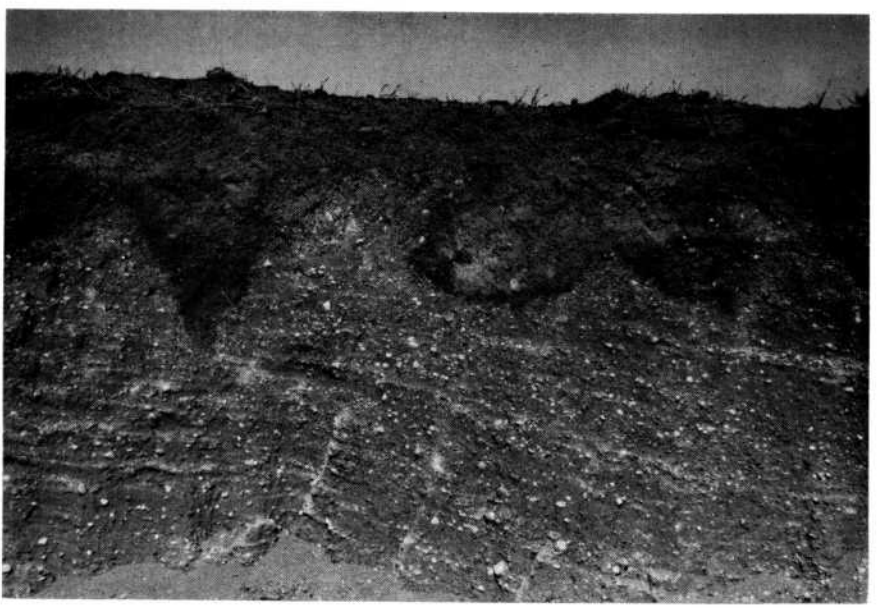
Typical A horizons of Springvale soils consist of 18 to 24 inches of fine or medium sandy loam. B horizons are usually fairly thick and consist of dark reddish-brown gravelly loam. The coarse gravel of the C horizon usually occurs at 30 to 36 inches from the surface, and has a reddish-brown hue.

The Springvale soils are extensively used for potato production in the Dundas Valley region. They are also used for growing tree fruits, corn, small grains, and forages. Crop production on the more rolling Springvale areas is limited by droughtiness and erosion. The Springvale soil areas contain a few gravel pits, but cemented layers and large stones in some of the gravels cause problems in the utilization of this gravel.

## Burford Series

The Burford series includes well-drained soils developed on deposits of loam over gravel. These soils are most prevalent on the gently rolling outwash plain that fringes the southern part of the drumlin field in Beverly, West Flamborough, and East Flamborough townships. Smaller acreages of Burford soils occur on the wave-cut terraces and wave-built gravel bars that are associated with the drumlins in Wentworth County.

The gravel deposits are stratified, and consist of layers of sorted gravel-sized material interspersed with occasional cobble layers. The loam overburden ranges up to 24 inches in thickness. On sloping areas erosion has removed some of the overburden material and incorporation of underlying gravel and cobbles into the surface layer has been brought about by plowing.



*Gravel pit cut in Burford loam.*
*The B horizon typically extends as tongues into the stratified gravel of the C horizon.*

The Burford soils in Wentworth County have a thin loam Ap horizon overlying 6 to 18 inches of brown or yellowish-brown loam or sandy loam Ae horizons. The B horizon is a dark reddish-brown, gravelly loam layer which extends as tongues into the C horizon. The calcareous, coarse gravel of the C horizon most often occurs at 20 to 30 inches from the surface.

Forage crops, spring grains, winter wheat, and corn are the major crops grown on the Burford soils. The gravel subsoil, which permits rapid water drainage, may also lead to moisture deficiencies during dry summers. Most of this gravel is suitable for construction purposes and many small gravel pits have been dug into these deposits. Many of these deposits are relatively shallow, and overlie the dolomite bedrock.

## Donnybrook Series

The Donnybrook series includes well-drained deposits of coarse gravel and cobbles found on eskers and eskeroid ridges. These steep-sided, often winding

ridges are associated with the drumlins and terminal moraines in the northern part of the County.

Where forest cover remains, a typical Donnybrook profile shows a very thin gravelly loam Ah horizon over a few inches of similar material in the Ae horizons. The B horizon consists of several inches of dark brown, gravelly loam. On eskers that have been cleared, erosion has usually removed the A horizon, and sometimes the B horizon as well. The C horizon material consists of stratified but poorly sorted coarse gravel and cobbles, occasional strata of sand, silt, or clay, and numerous stones and boulders.

These soils have a low agricultural value because of steep slopes, droughtiness and stoniness. The gravels have been used for construction purposes but are not as desirable as other gravel deposits because of the prevalence of large cobbles and stones.

### Farmington Series

The Farmington series includes well-drained, shallow soils with a depth of soil over bedrock that does not exceed 12 inches. These soils occur principally on the Flamborough Plain and among the drumlins in Beverly, West Flamborough, and East Flamborough townships. Small areas of Farmington soils also occur in Saltfleet township near the brow of the escarpment.

Most of the Farmington soils occur on level or very gently sloping areas of the Flamborough Plain where the topography is controlled by the underlying flat-bedded dolomite bedrock. In East Flamborough township, Farmington soils occur on variable sloping topography resulting from reefs and differential erosion of the underlying Lockport — Amabel dolomites.

The Farmington soil materials most often have loam textures, but silt, sand, and gravel inclusions are also fairly common. Rock fragments of the underlying

*A landscape scene of the Farmington series.*
*The surface is roughened by bedrock exposures. The thin soil cover supports bush and weed vegetation.*

bedrock occur throughout these soils. The Farmington soils usually have a dark grayish-brown Ap horizon underlain by a few inches of yellowish-brown B horizon which has formed directly upon the dolomite bedrock.

Most of the Farmington soils have been cleared, but only a small acreage is presently being cultivated. Most of it is lying waste or being used for pasture. The principal problem in the utilization of these soils is the moisture deficiency that occurs almost every summer. A few farmers have overcome this problem by employing sprinkler irrigation for high value crops such as strawberries. Another problem is the cultivation hazard provided by the numerous stones and outcroppings of bedrock. Some farmers have attempted to minimize tillage problems by planting forage such as birdsfoot trefoil, and using the land for permanent pasture.

### Muck

Muck soils include poorly drained soils consisting of deposits in which 12 inches or more of organic materials have accumulated. Most of the muck soils in Wentworth County are associated with the terminal moraines and drumlins in the northern part of the County. The largest of these muck soil areas, namely the Beverly Swamp, extends across most of Beverly township.

The surface material in the muck deposits consists of black, friable, well decomposed organic debris, which has been derived primarily from herbaceous plants and the leaves and needles of trees. At greater depths the material is usually not so well decomposed, and sticks and wood fragments are more common. The muck soils of the Beverly Swamp are rarely thicker than 3 feet and overlie fine textured, mineral soil materials or bedrock. A layer of marl or "limey mud" usually separates these muck deposits from the underlying soil or bedrock.

Practically all the muck soils in Wentworth County remain uncleared. Some small, cleared areas are used for market garden crops. The muck soils of the Beverly Swamp are too shallow for agricultural purposes. Before any extensive clearing or drainage of muck soils is contemplated, careful consideration should be given to the effect of such action on the water levels and wildlife of the area.

### Alberton Series

This series includes alluvial silt loam and silty clay loam sediments of variable drainage, which have been deposited in most of the stream valleys of Ancaster, Glanford, and Binbrook townships.

The lack of development in these soils indicates that they have been deposited fairly recently. They have probably been laid down during flood periods, when erosion processes were most active. The Alberton soils occur on level valley flats and frequently overlie finer sediments. The main factors affecting the internal drainage of these soils are the thickness of the alluvium and the nature of the underlying strata. These alluvial soils are most commonly imperfectly drained.

Soil development in the Alberton soils has consisted mainly of the formation of an organic surface horizon with a thickness ranging between 6 and 10 inches. Slight mottling or gleying occurs occasionally in the subsoil horizons, and free carbonates are rarely present. Because of their limited development, these soils have been classified as Regosolic soils. The depth of the silty sediments over heavier clayey materials is rarely more than 4 feet. A type separation has been made on the basis of surface texture, into silt loam and silty clay loam.

Most of the valleys in which the Alberton soils occur are subject to periodic flooding which increases the risks involved in crop production. The impeded drainage of many of these soils is a factor which can hinder growth of certain crops. However, these soils are easy to work, fertile, and are often used for growing corn. If flooding occurs every spring, the Alberton soils are best left in permanent pasture to keep soil erosion at a minimum. If flooding is only occasional, the risk of growing row crops such as corn is not so great, especially if the stalks are not plowed under until the main danger of spring flooding is past.

### Stream Courses

In Wentworth County, stream courses are defined as boulder beds or bedrock over which streams are actively flowing for most of the year. Stream erosion has removed most of the fine soil materials, leaving gravel, boulders, and bedrock as the main constituents of the stream bed. Stream courses, as defined, are most common in the northern part of the County because of the prevalence of stony till and shallow soil deposits.

### Marsh

Marshes are areas which are continuously flooded and where there is less than 1 foot of organic accumulation. Sedges and reeds make up the major types of vegetation. The areas in the County which have been mapped as marsh are a number of inlets of Lake Ontario where the oxygen content of the water remains sufficiently high to prevent excessive organic accumulation.

### Ravines

Ravines are V-shaped erosion channels which are present in the Dundas Valley, and in the soil and rock deposits which occur between the escarpment and Lake Ontario. In the Dundas Valley, ravines are up to one-half mile in width. The heads of these ravines may be cut in bedrock, but the lower reaches cut into the deep soil deposits of the Valley. Ravines which extend from notches in the escarpment to Lake Ontario also head in the dolomite bedrock. However, their lower sections are cut into both soil and bedrock, because the soil deposits along the Lake are relatively shallow, and the underlying Queenston shale is easily eroded.

The steep banks of most ravines are still covered by natural vegetation. A few acres have been cleared and planted to fruit crops, or used for pasture. Serious erosion may result if cleared ravine slopes are not managed carefully.

### Escarpment

The Niagara escarpment, in Wentworth County, includes cliffs of Lockport-Amabel dolomite and underlying Clinton, Cataract, and Queenston rocks which outcrop below the dolomite cliffs as steeply sloping benches. These underlying rocks are mainly shales and sandstones. They may be partially or wholly mantled by rock rubble and soil lying at a high angle of repose. The escarpment area is still practically all forest-covered, although small acreages are presently being cleared for residential sites.

### Ancaster—Oneida Complex

The Ancaster—Oneida complex of soils occupies the ridges of the strongly dissected areas in the Dundas Valley. These areas consist of silty till-like materials

which overlie clay till, except on the steeper slopes where erosion has removed the upper silty material. The clay or clay loam parent materials of the Oneida soils are usually exposed on the steeper slopes. The Ancaster silt loams usually occur on ridge tops and other areas where erosion has not been so severe.

Some of these areas have been partially cleared, but the steep, irregular slopes limit their agricultural use to pasture. They may be useful for wildlife or recreational purposes.

Small grains and forages are the most common field crops, but field corn, canning crops and strawberries are also grown on these soils. Drainage improvement may be necessary in areas where crop growth is adversely affected by effects of the high water table.

### Grimsby—Ancaster Complex

The Grimsby—Ancaster complex of soils occurs on areas of irregular, moderate slopes in the Copetown and Ancaster regions of Ancaster township.

These soils are mainly used for hay and pasture crops and small grains. There is a small acreage of fruit trees. Erosion is a continuous hazard because of the numerous slopes and the high degree of erodibility of the soil materials.

### Grimsby—Brant Complex

Most of these soils occupy areas which extend westward from the Ancaster and Springvale soils at the head of the Dundas Valley. Some isolated bodies of these soils also occur near Rockton in Beverly township.

The topography of these soils is steeply sloping near the Dundas Valley. Slopes are most gentle on the Flamborough Plain. The Grimsby soils include the medium and fine sandy loams, and the Brant soils include the silt loams in this complex.

Forage crops and small grains are common crops on all areas of these soils. Tree fruits are grown near the Dundas Valley on the steeper sloping land. Field corn and canning crops are more prevalent on the outlying, gently sloping areas. Soil materials of this complex will readily erode, and careful soil management is necessary on all slopes. The low moisture-holding capacity of the Grimsby soils, may result in adverse effects on crops during droughts.

### Brantford—Brant Complex

The Brantford—Brant soil complex occupies 4,850 acres of moderately sloping ridges and hummocks in Ancaster township near Duffs Corner.

Although most of this area has a surface of silt loam, the subsurface materials are variable, ranging from silt loam to silty clay loam and silty clay. Crops are similar to those grown on Brant and Brantford soils elsewhere in the County, except for a higher incidence of field and sweet corn.

### Brantford—Grimsby Complex

The Brantford—Grimsby complex of soils covers extensive areas of rolling land in the southwestern corner of Beverly township and along stream valleys in the western part of Ancaster township. Slopes may range up to 15 percent in these soils and are usually greatest along stream valleys.

The Grimsby sandy loam occurs as deposits on silt loam materials in a complex network of small ridges and hummocks. Brantford soil materials are present

on most of the steeper slopes, while the Grimsby materials are predominant on the upland, ridge tops. Forage crops, winter wheat, spring grains and corn are the most common crops on these soils. Careful management of slopes is necessary to minimize erosion on these highly erodible soils.

### Beverly—Vineland Complex

The Beverly—Vineland soil complex occupies an imperfectly drained plain in Ancaster township southwest of Jerseyville. The plain is relatively level. The only relief is due to some very gently sloping hummocks.

Like the Brantford—Grimsby complex areas, this area is characterized by irregularly distributed deposits of Vineland sandy loam over Beverly silt loam. The sand deposits range up to several feet in thickness.

### Trafalgar—Morley Complex

This complex of imperfectly drained Trafalgar silty clay loam and poorly drained Morley silty clay loam makes up a small acreage of the Iroquois Plain in Saltfleet township. These reddish soils occur on level and slightly depressional areas just below the Lake Iroquois bench in the Winona region.

Although these soils comprise only 300 acres, they are agriculturally important, being solely for the growing of tree fruits and grapes.

### Winona—Jeddo Complex

This complex consists of imperfectly drained Winona sandy loam and poorly drained Jeddo sandy loam and occurs on the Iroquois Plain in Saltfleet township.

The drainage of these soils varies with the depth of sand over clay, the Winona soils, which have 12 to 14 inches of sand over clay, are better drained than the Jeddo soils, which have a surface sand layer less than 12 inches thick over clay. The Winona—Jeddo soils are in the centre of an important fruit-growing area and are successfully used for growing all the common tree fruits.

## Soil Capability Classification for Wentworth County

A capability classification is an interpretive grouping of the soils of a county for agricultural purposes. In this system the mineral soils are grouped into 7 classes. These classes are arranged according to the suitability of soils for agricultural use. Class 1 soils have no important limitations in use for agricultural crops. Limitations increase from Class 1 to Class 7. Class 7 soils have the most limitations and are unsuitable for agriculture.

In general, soils in Classes 1, 2, and 3 are considered suitable for sustained production of common field crops. Class 4 soils are not suitable for sustained production of cultivated field crops. Soils in Classes 5 and 6 are considered as unsuitable for cultivated field crops, but suitable for permanent pasture.

This capability classification is based on certain assumptions which should be understood before attempting to apply the data. The assumptions are:

1. It is an interpretive classification of soils, consisting of 7 classes in which there are increasing limitations to agricultural use, produced by greater and greater adverse effects from various combinations of climate and soil characteristics.
2. It is assumed that good soil management practices, feasible under a largely mechanized system of agriculture, will be followed.

3. Each capability class includes different kinds of soils, some of which may require unlike management and treatment. The class indicates the scale of the limitation, whereas the subclass provides information on the kind of limitation.
4. Soils considered suitable for improvement by methods such as drainage or stone removal, are classified according to their future limitations in use after the improvements have been made. If major reclamation works permanently change limitations or reduce the risks of soil or crop damage, the capability classification of soils may be changed.
5. Factors that are not criteria for capability groupings are: distance to market, kinds of roads, location, size of farms, characteristics of land-ownership and cultural patterns, and the skill or resources of individual operators.
6. Capability groupings are subject to change as new information about the behavior and responses of the soils becomes available.
7. Research data, recorded observations, and experience are used as the basis for placing soils in capability classes and subclasses.
8. The level of generalization of the soil capability classification is indicated by the scale at which the information is published.

Subclasses are divisions of soils within classes, that have the same kind of limitation. In Wentworth County the following subclasses have been recognized, and are shown on the classification map by their reference letters.

**Subclass "d"** — soils adversely affected by soil structure and/or permeability.

**Subclass "e"** — soils where actual damage from erosion is a limitation.

**Subclass "f"** — soils having naturally low fertility that may or may not be corrected feasibly by the use of fertilizers or amendments.

**Subclass "i"** — soils subjected to inundation by streams or lakes.

**Subclass "m"** — soils adversely affected by drouthiness owing to inherent soil characteristics.

**Subclass "p"** — soils sufficiently stony to significantly increase the difficulty of tillage, planting, and harvesting.

**Subclass "r"** — soils where the rooting zone is restricted by consolidated bedrock.

**Subclass "s"** — soils where the limitations are caused by combinations of adverse inherent soil characteristics rather than single limitations covered by subclasses d, f, or m.

**Subclass "t"** — soils where the topography (slope and pattern) is a limitation in agricultural use.

**Subclass "w"** — soils where excess water, apart from that brought about by inundation, is a limitation in their use for agriculture.

## Class 1

Class 1 soils have no important limitations that will restrict their use for crops. The topography of these soils ranges from level to gently sloping. They are deep, well to imperfectly drained and have good water-holding capacity. These soils are naturally well supplied with plant nutrients. They are easily maintained in good tilth and fertility and damage from erosion is slight. They are moderately high to high in productivity for a wide range of field crops.

Class 1 soils in Wentworth County are —

Ancaster silt loam, 0 to 5% slopes
Beverly silty clay loam
Beverly silt loam
Binbrook silt loam
Brant silt loam, 0 to 5% slopes
Brantford silt loam, 0 to 5% slopes
Chinguacousy loam
Chingaucousy silt loam
Guelph loam, 0 to 5% slopes
London loam
Oneida loam, 0 to 5% slopes
Oneida silt loam, 0 to 5% slopes
Smithville silt loam, 0 to 5% slopes
Tuscola silt loam

## Class 2

These soils have moderate limitations that reduce the choice of crops or require moderate conservation practices. They have good water-holding capacity and are either naturally well supplied with plant nutrients or are highly responsive to inputs of fertilizer. They are moderate high to high in productivity for a fairly wide range of crops. The limitations are not severe and good soil management and cropping practices can be applied without serious difficulty.

The limitations include the adverse effects of one of the following: accumulative undesirable soil characteristics, low fertility, structure or permeability, erosion, topography, overfllow, and wetness.

### Subclass 2d

Haldimand silt loam
Haldimand silty clay loam
Smithville silt loam, 0 to 5% slopes

These soils are adversely affected by the slow permeability of a dense clay subsoil. Some level or very gently rolling areas of Smithville, and most areas of Haldimand require some drainage improvement.

### Subclass 2e

Guelph loam, 6 to 9% slopes

Because of the length of slopes, sheet and rill erosion is a greater problem on Guelph soils than on soils with shorter slopes. Strip cropping or contour plowing may be applied in certain areas. If hay-pasture crops are part of the rotation and adequate fertilizer is used, most other grain and row crops can also be grown.

### Subclass 2f

Vineland sandy loam
Winona sandy loam

These coarse, sandy soils have naturally low fertility, and will probably require constant additions of fertilizers for most crops.

**Subclass 2mf**

Burford loam
Grimsby sandy loam, 0 to 5% slopes
Springvale sandy loam, 0 to 5% slopes

These are coarse, gravelly and sandy loams which have low water-holding capacities and naturally low fertility. They require constant additions of fertilizer for most crops. Supplemental moisture from irrigation may be economical on certain crops.

**Subclass 2w**

Colwood silt loam
Parkhill loam

The presence of excess water limits the use of these soils for agriculture. Artificial drainage is required for optimum yield of most crops.

## Class 3

Soils in this class have moderately severe limitations that reduce the choice of crops or require special conservation practices. They have more severe limitations than soils in Class 2. These limitations affect one or more of the following farm practices: the timing and ease of tillage, planting and harvesting, the choice of crops, the application and maintenance of conservation practices.

The limitations include the adverse effects of one or two of the following: accumulative undesirable soil characteristics, low fertility, deficiencies in the storage capacity or release of soil moisture to plants, structure or permeability, erosion, topography, overflow, wetness, stoniness, and depth of soil to unconsolidated bedrock.

**Subclass 3d**

Trafalgar silty clay loam

This soil has a dense, fine-textured subsoil which is especially impermeable when wet. Some artificial drainage will probably be necessary to improve aeration in this soil.

**Subclass 3wd**

Jeddo loam
Toledo silt loam
Lincoln silty clay loam
Toledo silt loam
Toledo silty clay loam

These soils have relatively impermeable subsoils which provide an impediment to water movement. They require artificial drainage if profitable crop yields are to be attained.

**Subclass 3e**

Guelph loam 6 to 9% slopes
Smithville silt loam 6 to 9% slopes

These soils on moderately sloping topography have suffered some loss in productivity due to surface erosion. Forage crops should be emphasized on these slopes, to lessen the amount of erosion. Strip cropping or contour tillage may also be employed to reduce erosion.

**Subclass 3te**

Ancaster silt loam 6 to 9% slopes
Brant silt loam 6 to 9% slopes
Brantford silt loam 6 to 9% slopes

The irregular topography and moderate slopes on which these soils occur cause erosion losses and difficulties in machinery use. Forage crops should predominate in the rotations used on these soils, to reduce both erosion and machinery use.

**Subclass 3wi**

Alberton silt loam
Alberton silty clay loam

These alluvial soils are subject to stream flooding. They also usually suffer from excess wetness due to high water tables or impermeable subsoils. The safest crops to grow on these soils are forage crops that can best withstand flooding, and act as a protective cover for the soil. Where the risk of flooding is low, and where fair or improved drainage is present, the growing of cash crops such as corn may be feasible.

**Subclass 3p**

Guelph loam 0 to 6% slopes, stoniness 3

A considerable amount of time must be spent on stone removal before normal tillage operations are possible on this soil.

**Subclass 3sp**

Dumfries loam 0 to 6% slopes, stoniness 2 and 3

Stone removal is necessary on these soils. In addition, conditions of drouthiness and low fertility often provide limitations to crop growth.

**Subclass 3r**

Beverly silt loam — shallow phase
Brant silt loam — " "
Chinguacousy silt loam — shallow phase
Guelph loam — " "
Tuscola silt loam — " "

These soils have a depth of 1 to 3 feet over bedrock. They have more limited supplies of moisture for crop use than deeper soils. Rock outcrops and broken bedrock fragments are often a hindrance to cultivation. These soil bodies are often difficult units to manage, because of their shallowness and because they are frequently situated like small, irregular islands within an area of nontillable Farmington soils.

**Subclass $3^{s}_{t}$**

Grimsby sandy loam 6 to 9% slopes
Springvale sandy loam 6 to 9% slopes

These soils have limiting conditions of drouthiness and low fertility which are a direct result of their coarse textures. They have the additional limitation of irregular topography. The nutrient and moisture-holding capacities of these soils must be maintained by additions of plant food and the presence of sufficient organic matter.

**Subclass 3t**

Oneida silt loam 6 to 9% slopes

The main limitation of this soil is the adverse effect of the irregular topography on machinery use.

## Class 4

Class 4 soils have such limitations that they are suited only for a few crops, or the yield for a range of crops may be low, or the risk of crop failure is high. The limitations may seriously affect such farm practices as the timing and ease of tillage, planting, and harvesting, and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops but may have higher productivity for a specially adapted crop.

The limitations include the adverse effects of one or more of the following: accumulative undesirable soil characteristics, low fertility, deficiencies in the storage capacity or release of soil moisture to plants, structure or permeability, erosion, topography, overflow, wetness, stoniness, depth of soil to consolidated bedrock.

**Subclass $4^{d}_{w}$**

Morley silty clay loam

The low permeability of this soil results in the presence of excess water during much of the year. Although the Morley soil is used exclusively for fruit growing, it is one of the poorer soils for this purpose unless extensive artificial drainage measures are carried out.

**Subclass 4e**

Ancaster silt loam 10 to 15% slopes
Guelph silt loam 10 to 15% slopes, stoniness 1

Actual damage from erosion is a limitation to agricultural use of these soils. In many locations, erosion has removed the original surface, exposing the B horizon, and occasionally even the materials of the C horizon. Forage crops should make up as much of the rotation as possible on these soils.

**Subclass $4^{e}_{t}$**

| | | |
|---|---|---|
| Ancaster silt loam | 15 to 30% slopes | |
| Brant silt loam | 10 to 15% slopes | |
| Brantford silt loam | 10 to 15% slopes | |
| Guelph loam | 10 to 15% slopes, | stoniness 2 |
| Smithville silt loam | 10 to 15% slopes | |

These soils have the limitation of irregular topography imposed upon that of damage from erosion. They should be planted to hay and pasture crops, and used only sparingly for grain crops.

**Subclass 4$^{f}_{r}$**

Vineland sandy loam — shallow phase.

In addition to being naturally low in fertility, this soil is frequently drouthy during dry summers, due to its shallowness over bedrock. With adequate fertility and moisture, this soil can support most forage and row crops.

**Subclass 4$^{f}_{w}$**

Flamborough sandy loam.

Agricultural use of this soil is limited by excess moisture and low fertility. However, if this soil is artificially drained and adequately fertilized, it can be used for corn and other row crops.

**Subclass 4p**

Guelph loam 6 to 9% slopes, stoniness 3

The stoniness of this soil is a distinct limitation to cultivation. Extensive stone removal operations must precede any attempts to set up a rotation on this soil.

**Subclass 4$^{r}_{s}$**

Grimsby sandy loam — shallow phase

The agricultural capability of this soil is limited by its shallowness over bedrock, low fertility, and drouthiness. Sprinkler irrigation may be profitable on certain areas of this soil where market garden crops are grown.

**Subclass 4$^{r}_{w}$**

Colwood silt loam — shallow phase
Parkhill loam — shallow phase
Toledo silt loam — shallow phase

These soils have limitations of shallowness above bedrock, and excessive wetness owing to their position in low-lying areas and depressions. They are difficult to drain artificially, and should probably be used for pasture that is broken up and reseeded every few years.

**Subclass 4s**

Dumfries loam 6 to 9% slopes, stoniness 2

Low natural fertility, drouthiness, and stoniness are the major limitations of this soil. Regular additions of plant food, and a rotation consisting predominantly of perennial forage crops are necessary on areas of this Dumfries soil.

**Subclass 4$^{s}_{t}$**

Grimsby sandy loam 10 to 15% slopes
Springvale sandy loam 10 to 15% slopes

As a direct result of their coarse textures and the slopes on which they occur, these soils are drouthy and low in natural fertility. The occurrence of these soils

on irregular topography is an added limitation to their use. They require constant additions of fertilizer, retention of high organic matter contents, and careful management to minimize erosion.

**Subclass 4t**

Dumfries loam 9 to 15% slopes, stoniness 2 and 3
Guelph loam 10 to 15% slopes, stoniness 3

The major limitation of these soils is imposed by the irregular topography on which they are found. The use of machinery and the possible crop rotation sequences are restricted by the irregular topography. These soils are also stony and many fields would require some stone removal before they could be tilled economically. Perennial forage crops should provide fewer management problems than other field crops on these soils.

## Class 5

Soils in this class are capable only of producing perennial forage crops and improvement practices are feasible. They have such soil or other limitations that they are not capable of use for the production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Feasible improvement practices may include clearing of bush, cultivation, seeding, fertilizing, and water control.

**Subclass $5^{e}t$**

Ancaster silt loam, 10 to 30% slopes
Dumfries loam, 10 to 15% slopes, stoniness 2 and 3
Oneida clay loam, 10 to 30% slopes

The Ancaster and Dumfries soils in this subclass have been subjected to more severe erosion and occur on more irregular topography than the same soils in similar slope and stoniness categories that appear under subclass $4^{e}t$.

**Subclass $5^{p}t$**

Guelph loam, 10 to 15% slopes, stoniness 3

This soil has more and larger-sized stones than the Guelph soil in similar slope and stoniness categories of subclass 4t.

**Subclass $5^{p}w$**

Lily loam

**Subclass 5r**

Dumfries — shallow phase

**Subclass 5w**

Granby sandy loam

## Class 6

Soils in this class are capable only of producing perennial forage plants and improvement practices are not feasible. They have some natural sustained grazing capacity for farm animals but have such serious soil or other limitations as

to make impractical the application of improvement practices that can be carried out on Class 5 soils. Soils may be placed in this class because their physical nature prevents the use of farm machinery to improve them, or because the soils are not responsive to improvement practices, or because of a short grazing season. Such improvement practices as may be effected by seeding and fertilizing by hand or by aerial methods will not change the classification of these soil areas.

**Subclass 6$^{p}_{t}$**

Dumfries loam, 10 to 15% slopes, stoniness 3

Dumfries soil in this subclass has larger, more numerous stones, and more irregular topography than that in subclass 5$^{e}_{t}$.

**Subclass 6$^{p}_{r}$**

Dumfries loam — rocky phase

**Subclass 6r**

Farmington loam

**Subclass 6$^{r}_{w}$**

Flamborough sandy loam — shallow phase

**Subclass 6$^{t}_{s}$**

Donnybrook gravelly loam

## Class 7

Soils and lands in this class have limitations so severe that they are not capable of use for arable agriculture or permanent pasture. They may or may not have a high capability for trees, native fruits, wildlife, and recreation.

**Subclass 7$^{e}_{t}$**

Ravines

**Subclass 7i**

Marsh

**Subclass 7$^{i}_{e}$**

Stream courses

**Subclass 7$^{p}_{r}$**

Farmington loam; stoniness 3 or 4

**Subclass 7r**

Quarries

**Subclass 7$^{r}_{t}$**

Escarpment

## APPENDIX

Taxonomic Classification, Profile Description and Analytical Data

### Alberton Series

**Location:** Concession IV, Lot 22, Ancaster Township

**Parent Material:** Alluvial silt loam or silty clay loam

**Classification:**
Order — Regosolic
Great Group — Regosol
Sub Group — Orthic regosol
Family — Alberton

**Description:**

Ah — 0 to 8 inches silt loam; dark yellowish-brown (10YR3/4); fine granular structure; friable consistence.

$C_1$ — 8 to 18 inches silty clay loam; grayish-brown (10YR5/2); weak medium platy; firm; slightly mottled.

$C_2$ — Silty clay loam; yellowish-brown (10YR5/4); weak angular blocky; very firm; mottled.

### TABLE 8

**ANALYSIS OF ALBERTON PROFILE**

| Location | | | | Sand | Silt | Clay | | $CaCO_3$ | Total Bases |
|---|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | % | % | % | pH | % | meq/100 g soil |
| Ancaster | IV | 22 | Ah | 19 | 61 | 20 | 6.9 | 0.27 | .06 |
| | | | $C_1$ | 5 | 42 | 53 | 7.0 | 0.20 | .04 |
| | | | $C_2$ | 7 | 63 | 30 | 7.0 | 0.27 | 16.80 |

### Ancaster Series

**Location:** Concession II, Lot 54, Ancaster Township

**Parent Material:** Silty clay loam till

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Orthic Gray Brown Podzolic
Family — Honeywood

**Description:**

Ap — O to 5 inches silt loam; very dark grayish-brown (10YR3/2); fine granular structure; very friable consistence.

Ae — 5 to 12 inches silt loam; brown (10YR5/3); fine granular; very friable.

$Bt_1$ — 12 to 24 inches clay; dark grayish-brown (10YR4/2); medium angular blocky; very firm; slightly stony.

$Bt_2$ — 24 to 30 inches silty clay loam; olive-brown (2.5YR4/4); medium subangular blocky; firm; slightly stony.

C — Silty clay loam till; dark brown (10YR4/3); weak large platy; firm; slightly stony; calcareous.

## TABLE 9

### ANALYSIS OF ANCASTER PROFILE

| Location | | | | | | | | Organic | Free | Free |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sand | Silt | Clay | | Matter | Iron | Aluminum |
| Township | Con. | Lot | Horizon | % | % | % | pH | % | % | % |
| Ancaster | II | 55 | Ah | 19.5 | 54.3 | 26.2 | 6.0 | 3.72 | 2.3 | 0.23 |
| | | | Ae | 20.2 | 59.4 | 20.4 | 5.6 | 1.65 | 2.1 | 0.18 |
| | | | $Bt_1$ | 3.3 | 52.5 | 44.2 | 5.5 | 0.61 | 5.3 | 0.28 |
| | | | $Bt_2$ | 4.6 | 36.0 | 59.4 | 6.7 | 0.83 | 2.4 | 0.11 |
| | | | C | 6.7 | 57.7 | 35.6 | 7.9 | 0.37 | 2.5 | 0.08 |

## Beverly Series

**Location:** Concession III, Lot 9, Beverly Township

**Parent Material:** Lacustrine silty clay loam or silty clay

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Gleyed Gray Brown Podzolic
Family — Beverly

**Description:**

Ap — 0 to 6 inches silt loam; dark brown (10YR3/3); medium granular structure; friable consistence.

$Aeg_1$ — 6 to 9 inches silt loam; brown (10YR4/3); slightly mottled; medium subangular blocky; friable.

$Aeg_2$ — 9 to 12 inches silty clay loam; brown (10YR4/3); mottled, mottles reddish-brown (5YR4/4); medium angular blocky; firm.

Btg — 12 to 18 inches silty clay loam; dark brown (7.5YR4/2); mottled; medium angular blocky; very firm.

C — Silty clay loam; dark brown (10YR4/3); weak large angular blocky; very firm; slightly stony; calcareous.

## TABLE 10

### ANALYSES OF PROFILE SAMPLES — BEVERLY SERIES

| Location | | | | | | | | | Organic |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sand | Silt | Clay | | $CaCO_3$ | Matter |
| Township | Con. | Lot | Horizon | % | % | % | pH | % | % |
| Beverly | III | 9 | Ap | 0 | 79 | 21 | 7.3 | 1.46 | |
| | | | $Aeg_1$ | 22 | 53 | 25 | 7.2 | 0.31 | |
| | | | $Aeg_2$ | 16 | 55 | 29 | 7.2 | 0.27 | |
| | | | Bt | 4 | 59 | 37 | 7.4 | 1.29 | |
| | | | C | 3 | 62 | 35 | 7.5 | 8.13 | |
| Ancaster | V | 35 | Ah | 17.1 | 63.9 | 19.0 | 7.1 | 0.73 | 3.6 |
| | | | $Aeg_1$ | 15.4 | 61.1 | 23.5 | 6.9 | 0.30 | 0.9 |
| | | | $Aeg_2$ | 10.3 | 62.2 | 27.5 | 7.2 | 0.40 | 0.7 |
| | | | Bt | 5.0 | 68.1 | 26.9 | 7.5 | 0.40 | 0.5 |
| | | | C | 4.1 | 66.3 | 29.6 | 7.8 | 4.58 | 0.4 |

## Binbrook Series

**Location:** Concession IV, Lot 29, Binbrook Township

**Parent Material:** Lacustrine silt loam over gray clay till

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Gleyed Gray Brown Podzolic |
| Family | — Beverly |

**Description:**

Ap — O to 5 inches silt loam; very dark grayish-brown (10YR3/2); fine granular structure; very friable consistence; pH 7.3.

Aeg — 5 to 8 inches silty clay loam; brown (10YR5/3); slightly mottled; weak platy; friable; pH 7.1.

BA — 8 to 11 inches silty clay; dark brown (10YR4/3); mottled; medium subangular blocky; firm; slight hardpan often forms when dry; slightly stony; pH 6.9.

Btg — 11 to 21 inches silty clay; dark grayish-brown (10YR4/2); slightly mottled; medium angular blocky; very firm; slightly stony; pH 7.3.

C — Clay till; grayish-brown (10YR5/2); weak columnar; extremely firm; slightly stony; calcareous; pH 7.5.

## Brant Series

**Location:** Concession II, Lot 30, Ancaster Township

**Parent Material:** Lacustrine silt loam and fine sandy loam

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Brunisolic Gray Brown Podzolic |
| Family | — Honeywood |

**Description:**

Ap — O to 5 inches silt loam; dark brown (10YR3/3); fine granular structure; very friable consistence; pH 6.7.

$Ae_1$ — 5 to 12 inches fine sandy loam; yellowish-brown (10YR5/4); weak medium granular; friable; pH 6.0.

$Ae_2$ — 12 to 28 inches fine sandy loam; strong brown (7.5YR5/6); weak medium platy; friable; pH 5.7.

$Bt_1$ — 28 to 34 inches silt loam; reddish-brown (5YR4/3); medium subangular blocky; firm; pH 5.3.

$Bt_2$ — 34 to 52 inches silt loam; reddish-brown (5YR4/4); weak platy; firm; pH 5.8.

C — silt loam and fine sandy loam; brown (7.5YR4/4); weak platy; friable; weakly calcareous; pH 7.5.

## Brantford Series

**Location:** Concession V, Lot 31, Ancaster Township

**Parent Material:** Lacustrine silty clay loam and silty clay

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — Brantford

**Description:**

Ap — 0 to 4 inches silt loam; very dark grayish-brown (10YR3/2); fine granular structure; very friable consistence.

$Ae_1$ — 4 to 9 inches silt loam; brown (10YR5/3); fine platy; friable.

$Ae_2$ — 9 to 14 inches silt loam; brown (10YR5/3); medium platy; friable.

Bt — 14 to 27 inches silty clay; dark grayish-brown (10YR4/2); medium angular blocky; very firm.

C — silty clay; brown (10YR5/3); large angular blocky; very firm; slightly stony; calcareous.

## TABLE 11

### ANALYSIS OF BRANTFORD PROFILE

| Location | | | | | | | | Organic | |
|---|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | Sand % | Silt % | Clay % | pH | Matter % | $CaCO_3$ % |
| Ancaster | V | 31 | Ap | 2.4 | 74.8 | 22.8 | 7.5 | 5.0 | 1.60 |
| | | | $Ae_1$ | 1.2 | 76.4 | 22.4 | 7.7 | 1.3 | 0.72 |
| | | | $Ae_2$ | 1.3 | 73.3 | 25.4 | 7.5 | 0.8 | 0.45 |
| | | | Bt | 0.7 | 51.2 | 48.1 | 7.5 | 0.6 | 0.64 |
| | | | C | 1.3 | 52.9 | 45.8 | 7.6 | 0.6 | 21.17 |

## Burford Series

**Location:** Concession VIII, Lot 9, West Flamborough Township

**Parent Material:** Loam over coarse gravel

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — Burford

**Description:**

Ap — 0 to 5 inches loam; dark brown (10YR3/3); medium granular structure; friable consistence; slightly stony; pH 7.5.

$Ae_1$ — 5 to 12 inches loam; yellowish-brown (10YR5/4); medium granular; friable; slightly stony; pH 7.4.

$Ae_2$ — 12 to 16 inches sandy loam; brown (10YR4/3); medium subangular blocky; firm; slightly stony; pH 7.4.

Bt — 16 to 22 inches gravelly loam; dark reddish-brown (5YR3/3); weak large subangular blocky; firm; pH 7.4.

IIC — Gravel; brown (7.5YR4/4); single grain; loose; calcareous; pH 7.6.

## Chinguacousy Series

**Location:** Concession II, Lot 5, East Flamborough Township

**Parent Material:** Gray-brown clay loam till

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Gleyed Gray Brown Podzolic
Family — Haldimand

**Description:**

Ap — 0 to 4 inches silty clay loam; dark grayish-brown (10YR4/2); fine granular structure; friable consistence.

Aeg — 4 to 9 inches silty clay loam; dark yellowish-brown (10YR4/4); fine subangular blocky; friable.

BA — 9 to 14 inches clay loam; dark brown (10YR4/3); mottled; medium angular blocky; firm; slightly stony.

Btg — 14 to 25 inches silty clay loam; dark grayish-brown (10YR4/2); mottled; large angular blocky; very firm.

C — silty clay till; brown (10YR4/3); medium angular blocky; very firm; moderately stony; calcareous.

### TABLE 12

**ANALYSIS OF CHINGUACOUSY PROFILE**

| Location | | | | Sand | Silt | Clay | | $CaCO_3$ | Free Iron | |
|---|---|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | % | % | % | pH | % | % | |
| | | | | | | | | | Dithionite Method | Oxalate Method |
| Flamborough East | II | 5 | Ap | 24 | 49 | 27 | 7.2 | 1.75 | 1.00 | 0.48 |
| | | | Aeg | 1 | 74 | 25 | 7.0 | 0.50 | 1.04 | 0.50 |
| | | | AB | 21 | 47 | 32 | 6.4 | 0.50 | 1.16 | 0.50 |
| | | | Btg | 18 | 61 | 21 | 6.9 | 1.12 | 1.82 | 0.34 |
| | | | C | 24 | 46 | 30 | 7.5 | 15.66 | 1.30 | 0.20 |

## Colwood Series

**Location:** Concession I, Lot 30, Beverly Township

**Parent Material:** Lacustrine fine sandy loam and silt loam

**Classification:**
Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Colwood

**Description:**

L-H — 0 to 5 inches muck; very dark brown (10YR2/2); pH 6.7.

Ah — 5 to 10 inches silt loam; black (10YR3/2); fine granular structure; friable consistence; pH 6.6.

Bmg — 10 to 20 inches silt loam; grayish-brown (2.5Y5/2); weak medium subangular blocky; friable; pH 6.5.

Cg — silt loam; gray (5Y5/1; massive; firm; pH 6.4.

## Donnybrook Series

**Location:** Concession X, Lot 8, East Flamborough

**Parent Material:** Esker gravel and cobbly gravel

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Brunisolic Gray Brown Podzolic |
| Family | — Dumfries |

**Description:**

Ah — 0 to 3 inches gravelly loam; very dark brown (10RY2/2); fine granular structure; very friable consistence; slightly stony; pH 7.3.

$Ae_1$ — 3 to 5 inches gravelly loam; dark yellowish-brown (10YR3/4); weak fine subangular blocky; friable; moderately stony; pH 7.4

$Ae_2$ — 5 to 9 inches gravelly loam; dark brown (10YR4/3); single grain; loose; moderately stony; pH 7.5.

Bt — 9 to 17 inches gravelly loam; dark brown (7.5YR4/2); weak fine subangular blocky; friable; pH 7.6.

C — Coarse gravel and cobbles; brown (7.5YR5/4); single grain; loose; very stony; calcareous; pH 7.8.

## Dumfries Series

**Location:** Concession IX, Lot 6, Beverly Township

**Parent Material:** Gravelly sandy loam till

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Brunisolic Gray Brown Podzolic |
| Family | — Dumfries |

**Description:**

Ap — 0 to 5 inches loam; very dark grayish-brown (10YR3/2); fine granular structure; friable consistence; pH 7.5.

$Ae_1$ — 5 to 9 inches loam; dark yellowish-brown (10YR4/4); fine granular; friable; pH 7.4.

$Ae_2$ — 9 to 12 inches loam; dark brown (10YR4/3); fine granular; friable; pH 7.3.

Bt — 12 to 17 inches clay loam; dark brown (7.5YR4/2); medium angular blocky; very firm; slightly stony; pH 7.2.

C — Gravelly sandy loam till; light yellowish-brown (10YR6/4); medium subangular blocky; firm; very stony; calcareous; pH 7.9.

## Farmington Series

**Location:** Concession VI, Lot 18, Beverly Township

**Parent Material:** Loam till over dolomite limestone bedrock

**Classification:**

| | |
|---|---|
| Order | — Brunisolic |
| Great Group | — Brown Forest |
| Sub Group | — Orthic Brown Forest |
| Family | — Farmington |

**Description:**

Ap — 0 to 6 inches loam; very dark grayish-brown (10YR3/2); medium granular structure; friable consistence, slightly stony; pH 7.5.

Bm — 6 to 10 inches loam; yellowish-brown (10YR5/4); medium subangular blocky; firm consistence; moderately stony; pH 7.4.

IIC — Dolomite bedrock; occasionally rubbly at surface.

## Flamborough Series

**Location:** Concession II, Lot 18, Beverly Township

**Parent Material:** Outwash medium and fine sand

**Classification:**

Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Granby

**Description:**

Ah — 0 to 5 inches fine sandy loam; black (10YR2/1); medium granular structure; friable consistence; pH 7.0.

$Bmg_1$ — 5 to 14 inches sandy loam; brown (10YR5/3); medium platy; firm; pH 6.8.

$Bmg_2$ — 14 to 23 inches sandy loam; yellowish-brown (10YR5/6); mottled; medium platy; friable; pH 7.6.

Cg — Fine sand; light brown (7.5YR6/4); weak platy; friable; calcareous; pH 7.9.

## Granby Series

**Location:** Concession XIII, Lot 3, East Flamborough Township

**Parent Material:** Outwash medium sand

**Classification:**

Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Granby

**Description:**

Ah — 0 to 6 inches sandy loam; black (10YR2/1); fine granular structure; very friable consistence; pH 7.8.

$Bmg_1$ — 6 to 9 inches sandy loam; dark gray (10YR4/1); fine granular; friable; pH 7.7.

$Bmg_2$ — 9 to 14 inches sandy loam; light brownish-gray (10YR6/2); slightly mottled; single grain; loose; pH 8.1.

Cg — Medium sand; pale brown (10YR6/3); single grain; loose; calcareous; pH 8.2.

## Grimsby Series

**Location:** Concession II, Lot 18, Beverly Township

**Parent Material:** Outwash medium and fine sand

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — Fox

**Description:**

Ah — O to 2 inches sandy loam; dark brown (10YR3/3); fine granular structure; very friable consistence.

$Ae_1$ — 2 to 8 inches sandy loam; strong brown (7.5YR5/6); weak fine platy; very friable.

$Ae_2$ — 8 to 15 inches loamy sandy; yellowish-brown (10YR5/4); single grain; loose.

$Ae_3$ — 15 to 21 inches loamy sand; brown (10YR5/3); single grain; loose.

$Bt_1$ — 21 to 32 inches sandy loam; reddish-brown (5YR4/3); medium subangular blocky; firm.

$Bt_2$ — 32 to 39 inches sandy loam; brown (7.5YR5/4); fine subangular blocky; friable.

C — Sandy loam; brown (10YR5/3); weak platy; friable; calcareous.

### TABLE 13

**ANALYSIS OF GRIMSBY PROFILE**

| Location | | | | | | | | Organic | |
|---|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | Sand % | Silt % | Clay % | pH | Matter % | $CaCO_3$ % |
| Beverly | II | 18 | Ah | 77.2 | 13.7 | 9.1 | 6.3 | 2.8 | 0.79 |
| | | | $Ae_1$ | 76.1 | 17.8 | 6.1 | 6.4 | 1.1 | 0.40 |
| | | | $Ae_2$ | 82.3 | 14.7 | 3.0 | 6.4 | 0.5 | 0.50 |
| | | | $Ae_3$ | 81.6 | 16.4 | 2.0 | 6.6 | 0.4 | 0.45 |
| | | | $Bt_1$ | 60.0 | 27.9 | 12.1 | 6.5 | 0.6 | 0.38 |
| | | | $Bt_2$ | 59.8 | 32.1 | 8.1 | 6.5 | 0.5 | 0.39 |
| | | | C | 66.6 | 29.4 | 4.0 | 6.9 | 0.4 | 20.02 |

## Guelph Series

**Location:** Concession VII, Lot 34, Beverly Township

**Parent Material:** Loam till

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — Guelph

**Description:**

Ap — O to 5 inches loam; dark brown (10YR3/3); fine granular structure; very friable consistence; slightly stony; pH 7.6.

$Ae_1$ — 5 to 7 inches loam; dark yellowish-brown (10YR4/4); fine granular; very friable; slightly stony; pH 7.6.

$Ae_2$ — 7 to 12 inches loam; dark brown (7.5YR4/4); fine subangular blocky; friable; slightly stony; pH 7.4.

Bt — 12 to 17 inches clay loam; dark brown (7.5YR4/2); fine subangular blocky; firm; moderately stony; pH 6.8.

BC — 17 to 22 inches loam; dark yellowish-brown (10YR4/4); medium subangular blocky; friable; stony; pH 7.6.

C — Loam till; brown (10YR4/3); weak medium subangular blocky; friable; stony; calcareous; pH 8.0.

## TABLE 14

### SURFACE TEXTURES — GUELPH SERIES

| Location | | | | | | |
|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | Sand % | Silt % | Clay % |
| Beverly | VII | 20 | Ap | 46.6 | 38.6 | 14.8 |
| Beverly | VII | 31 | Ap | 46.2 | 37.4 | 16.4 |
| Beverly | VI | 7 | Ap | 41.1 | 43.8 | 15.1 |

## Haldimand Series

**Location:** Concession VIII, Lot 11, Saltfleet Township

**Parent Material:** Gray clay till

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Gleyed Gray Brown Podzolic
Family — Haldimand

**Description:**

Ap — 0 to 6 inches silt loam; dark grayish-brown (10YR4/2); fine granular structure; very friable consistence; pH 7.3.

Aeg — 6 to 9 inches silt loam; pale brown (10YR6/3); slightly mottled; weak platy; friable; pH 5.2.

AB — 9 to 11 inches silty clay loam; pale brown (10YR6/3; mottled; medium subangular blocky; friable; slightly stony; pH 5.7.

Btg — 11 to 18 inches silty clay; dark grayish-brown (2.5YR4/2); mottled; small angular blocky; firm; slightly stony; pH 6.6.

C — Clay till; grayish-brown (2.5Y5/2); columnar; very firm; slightly stony; calcareous; pH 7.6.

## TABLE 15

### SURFACE TEXTURES — HALDIMAND SERIES

| Location | | | | | | |
|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | Sand % | Silt % | Clay % |
| Saltfleet | V | 2 | Ap | 10.0 | 47.4 | 42.6 |
| Saltfleet | VI | 3 | Ap | 10.8 | 65.5 | 23.7 |
| Saltfleet | VI | 1 | Ap | 8.1 | 60.5 | 31.4 |
| Saltfleet | VII | 3 | Ap | 7.1 | 59.3 | 33.6 |

## Jeddo Series

**Location:** Concession B.F., Lot 3, Saltfleet Township

**Parent Material:** Grayish-brown clay loam till

**Classification:**

| | |
|---|---|
| Order | — Gleysolic |
| Great Group | — Humic Gleysol |
| Sub Group | — Orthic Humic Gleysol |
| Family | — Lincoln |

**Description:**

Ap — 0 to 6 inches sandy loam; dark brown (10YR3/3); fine subangular blocky structure; firm consistence; pH 7.8.

$Bmg_1$ — 6 to 11 inches clay loam; dark grayish-brown (2.5Y4/2; mottled; mottles yellowish-brown (10YR5/8); medium subangular blocky; firm; slightly stony; pH 7.6.

$Bmg_2$ — 11 to 19 inches silty clay; dark grayish-brown (2.5Y4/2); mottled; medium platy; very firm; slightly stony; pH 7.6.

Cg — Grayish-brown clay loam till; dark grayish-brown (2.5Y4/2); mottled; columnar; very firm; moderately stony; calcareous; pH 7.4.

## Killean Series

**Location:** Concession X, Lot 7, Beverly Township

**Parent Material:** Gravelly sandy loam till

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Gleyed Gray Brown Podzolic |
| Family | — Killean |

**Description:**

Ap — 0 to 5 inches loam; very dark grayish-brown (10YR3/2); fine granular structure; very friable; slightly stony; pH 7.4.

$Aeg_1$ — 5 to 8 inches loam; dark yellowish-brown (10YR3/4); fine granular; very friable; slightly stony; pH 7.2.

$Aeg_2$ — 8 to 12 inches loam; light yellowish-brown (10YR6/4); slightly mottled; fine subangular blocky; friable; slightly stony; pH 7.2.

Bt — 12 to 19 inches clay loam; dark brown (7.5YR4/2); slightly mottled; medium subangular blocky; firm; very stony; pH 7.7.

C — Gravelly sandy loam till; yellowish-brown (10YR5/4); single grain; loose; very stony; calcareous; pH 7.7.

## Lily Series

**Location:** Concession X, Lot 10, Beverly Township

**Parent Material:** Gravelly sandy loam till

**Classification:**

| | |
|---|---|
| Order | — Gleysolic |
| Great Group | — Humic Gleysol |
| Sub Group | — Orthic Humic Gleysol |
| Family | — Lyons |

**Description:**

Ah — 0 to 6 inches loam; very dark gray (10YR3/1); fine granular structure; very friable consistence; pH 7.3.

Bmg — 6 to 13 inches loam; very dark gray (5Y3/1); mottled fine subangular blocky; firm; slightly stony; pH 7.3.

Cg — Gravelly sandy loam till; olive-gray (5Y5/2); mottled; medium subangular blocky; firm; stony; pH 7.7.

## Lincoln Series

**Location:** Concession V, Lot 2, Saltfleet Township

**Parent Material:** Gray clay till

**Classification:**

Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Lincoln

**Description:**

Ah — 0 to 6 inches silty clay loam; very dark gray (10YR3/1); fine angular blocky structure; firm consistence; pH 7.1.

$Bmg_1$ — 6 to 9 inches clay; very dark grayish-brown (2.5Y3/2); slightly mottled; medium angular blocky; very firm; pH 6.9.

$Bmg_2$ — 9 to 15 inches clay; dark gray (5Y4/1); mottled; columnar; very firm; slightly stony; pH 7.1.

Cg — Clay till; olive-gray (5Y4/2); mottled; columnar; very firm; slightly stony; calcareous; pH 6.3.

## London Series

**Location:** Concession IX, Lot 25, Beverly Township

**Parent Material:** Loam till

**Classification:**

Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Gleyed Gray Brown Podzolic
Family — London

**Description:**

Ap — 0 to 8 inches loam; very dark brown (10YR2/2); fine granular structure; friable consistence; slightly stony; pH 7.4.

$Aeg_1$ — 8 to 13 inches loam; light yellowish-brown (10YR6/4); mottled; mottles yellowish-brown (10YR5/6); fine subangular blocky; friable; pH 7.3.

$Aeg_2$ — 13 to 17 inches sandy loam; very pale brown (10YR7/4); slightly mottled; mottles brownish-yellow (10YR6/6); weak medium platy; very friable; pH 7.8.

Btg — 17 to 21 inches clay loam; yellowish-brown (10YR5/4); mottled; mottles yellowish-brown (10YR5/6); large subangular blocky; firm; slightly stony; pH 7.6.

C — Loam till; pale brown (10YR6/3); slightly mottled; weakly subangular blocky; firm; moderately stony; pH 7.9.

## Morley Series

**Location:** Concession I, Lot 5, Saltfleet Township

**Parent Material:** Reddish silty clay loam till

**Classification:**
Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Brookston

**Description:**

Ap — 0 to 7 inches silty clay loam; dark brown (7.5YR3/2); medium subangular blocky structure; firm consistence; pH 7.2.

$Bmg_1$ — 7 to 13 inches clay loam; brown (7.5YR4/2); mottled; medium angular blocky; very firm; slightly stony; pH 6.6.

$Bmg_2$ — 13 to 16 inches clay; brown (7.5YR5/4); mottled; medium angular blocky; very firm; slightly stony; pH 5.8.

Cg — Silty clay loam till; reddish-brown (5YR4/3); massive; extremely firm; slightly stony; pH 6.1.

## Oneida Series

**Location:** Concession 11, Lot 21, W. Flamborough Township

**Parent Material:** Gray brown clay loam till

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — South Bay

**Description:**

Ap — 0 to 6 inches loam; very dark grayish-brown (10YR3/2); fine granular structure; friable consistence; pH 7.5.

$Ae_1$ — 6 to 8 inches silty clay loam; brown (10YR4/3); fine subangular blocky; friable; pH 7.6.

$Ae_2$ — 8 to 11 inches silty clay loam; brown (10YR5/3); fine subangular blocky; friable; pH 7.6.

AB — 11 to 16 inches clay loam; dark brown (10YR4/3); fine angular blocky; firm; slightly stony; pH 7.0.

$Bt_1$ — 16 to 21 inches silty clay; dark brown (7.5YR3/2); fine angular blocky; very firm; slightly stony; pH 7.7.

$Bt_2$ — 21 to 29 inches silty clay; brown (7.5YR4/2); fine angular blocky; very firm; slightly stony; pH 7.8.

C — Clay loam till; brown (10YR4/3); medium angular blocky; very firm; stony; calcareous; pH 7.9.

## Parkhill Series

**Location:** Concession VII, Lot 2, West Flamborough Township

**Parent Material:** Loam till

**Classification:**
Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Lyons

**Description:**

Ah — 0 to 10 inches loam; very dark brown (10YR2/2); medium granular structure; very friable consistence.

$Bmg_1$ — 10 to 15 inches sandy clay loam; pale brown (10YR6/3); mottled; mottles yellowish-brown (10YR5/6); weak large subangular blocky; friable; slightly stony.

$Bmg_2$ — 15 to 21 inches loam; grayish-brown (2.5Y5/2); mottled; mottles yellowish-brown (10YR5/6); weak large subangular blocky; firm; slightly stony.

Cg — Loam till; grayish-brown (2.5Y5/2); slightly mottled; weak blocky; firm; stony.

## TABLE 16

### ANALYSIS OF PARKHILL PROFILE

| Location | | | | Sand | Silt | Clay | | $CaCO_3$ |
|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | % | % | % | pH | % |
| West Flamborough | VII | 2 | Ah | 41 | 32 | 27 | 7.3 | 6.02 |
| | | | $Bmg_1$ | 62 | 14 | 24 | 7.5 | 11.59 |
| | | | $Bmg_2$ | 51 | 36 | 13 | 7.5 | 18.26 |
| | | | Cg | 49 | 36 | 15 | 7.5 | 19.32 |

## Smithville Series

**Location:** Concession I, Lot 18, Binbrook Township

**Parent Material:** Lacustrine silt loam over gray clay till

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — Brantford

**Description:**

Ap — 0 to 4 inches silt loam; very dark grayish-brown (10YR3/2); fine granular structure; friable consistence; pH 7.2.

$Ae_1$ — 4 to 7 inches silt loam; brown (10YR5/3); fine platy; friable; pH 6.9.

$Ae_2$ — 7 to 10 inches silt loam; brown (10YR4/3); fine platy; friable; pH 6.9.

BA — 10 to 12 inches silty clay loam; dark brown (10YR4/3); slightly mottled; medium subangular blocky; firm; slightly stony; pH 7.0.

Bt — 12 to 21 inches silty clay; dark grayish-brown (10YR4/2); medium, angular blocky; very firm; slightly stony; pH 7.3.

C — Clay till; grayish-brown (10YR5/2); large angular blocky; extremely firm; slightly stony; calcareous; pH 8.0.

## Springvale Series

**Location:** Concession IV, Lot 41, Ancaster Township

**Parent Material:** Outwash sand over coarse reddish gravel

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Brunisolic Gray Brown Podzolic
Family — Burford

**Description:**

Ap — 0 to 5 inches sandy loam; dark yellowish-brown (10YR4/4); fine granular structure; friable consistence.

$Ae_1$ — 5 to 9 inches loam; yellowish-brown (10YR5/6); weak fine platy; friable.

$Ae_2$ — 9 ot 17 inches sandy loam; brown (7.5YR4/4); fine platy; friable.

AB — 17 to 21 inches sandy loam; brown (7.5YR5/4); medium subangular blocky; firm; hardpan sometimes occurs.

IIBt — 21 to 35 inches loam; dark reddish-brown (5YR3/4); large subangular blocky; friable.

IIC — Gravel; dark brown (7.5YR4/2); single grain; loose; slightly stony.

**TABLE 17**
**ANALYSIS OF SPRINGVALE SERIES**

| Location | | | | Sand | Silt | Clay | | $CaCO_3$ | Free Iron % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | % | % | % | pH | % | Dithionite Method | Oxalate Method |
| Ancaster | IV | 41 | Ap | 37 | 47 | 16 | 7.0 | 0.46 | 0.78 | 0.36 |
| | | | $Ae_1$ | 40 | 45 | 15 | 6.3 | 0.39 | 1.04 | 0.42 |
| | | | $Ae_2$ | 62 | 22 | 16 | 6.2 | 0.35 | 1.28 | 0.46 |
| | | | AB | 49 | 34 | 17 | 6.4 | 0.31 | 1.90 | 0.50 |
| | | | IIBt | 71 | 19 | 10 | 6.3 | 1.33 | 2.10 | 0.64 |
| | | | IIC | 89 | 7 | 4 | 7.0 | 16.62 | 1.26 | 0.38 |

## Toledo Series

**Location:** Concession VII, Lot 2, Beverly Township

**Parent Material:** Lacustrine silty clay loam and silty clay

**Classification:**
Order — Gleysolic
Great Group — Humic Gleysol
Sub Group — Orthic Humic Gleysol
Family — Brookston

**Description:**

Ap — 0 to 8 inches silty clay loam; very dark brown (10YR2/2); medium granular structure; friable consistence; pH 7.0.

$Bmg_1$ — 8 to 18 inches silty clay loam; dark grayish-brown (2.5Y4/2); mottled; mottles yellowish-brown (10YR5.6); medium subangular blocky; firm; pH 7.0.

$Bmg_2$ — 18 to 25 inches silty clay; brown (10YR4/3); mottled; mottles yellowish-brown (10YR5/6); medium angular blocky; very firm; pH 6.9.

Cg — Silty clay; dark reddish-gray (5YR4/2); mottled; mottles reddish-brown (5YR4/4); weak columnar; extremely firm; pH 7.6.

## Trafalgar Series

**Location:** Concession II, Lot 11, Saltfleet Township

**Parent Material:** Reddish silty clay loam

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Gleyed Gray Brown Podzolic
Family — Trafalgar

**Description:**

Ah — 0 to 5 inches silty clay loam; dark brown (10YR3/3); fine granular structure; friable consistence.

Aeg — 5 to 9 inches silty clay loam; brown (7.5YR5/4); slightly mottled; medium subangular blocky; firm.

$Btg_1$ — 9 to 17 inches clay; reddish-brown (2.5YR4/4); mottled; mottles yellow (10YR7/6); angular blocky; very firm; slightly stony.

$Btg_2$ — 17 to 28 inches silty clay; reddish-brown (2.5YR4/4); mottled; columnar; very firm; slightly stony.

C — Silty clay loam till; reddish-brown (2.5YR4/4); columnar; very hard; slightly stony; calcareous.

**TABLE 18**

**ANALYSIS OF TRAFALGAR PROFILE**

| Location | | | | Sand | Silt | Clay | | $CaCO_3$ | Organic Matter |
|---|---|---|---|---|---|---|---|---|---|
| Township | Con. | Lot | Horizon | % | % | % | pH | % | % |
| Saltfleet | II | 11 | Ah | 14.6 | 47.2 | 38.2 | 7.4 | 1.98 | 5.9 |
| | | | Aeg | 8.5 | 45.6 | 37.1 | 7.1 | 0.37 | 1.8 |
| | | | $Btg_1$ | 1.4 | 34.3 | 64.3 | 5.4 | 0.50 | 1.4 |
| | | | $Btg_2$ | 1.1 | 46.8 | 52.2 | 6.2 | 0.38 | 1.0 |
| | | | C | 0.5 | 60.0 | 35.5 | 7.1 | 11.62 | 0.5 |

## Tuscola Series

**Location:** Concession III, Lot 8, Beverly Township

**Parent Material:** Lacustrine fine sandy loam and silt loam

**Classification:**
Order — Podzolic
Great Group — Gray Brown Podzolic
Sub Group — Gleyed Gray Brown Podzolic
Family — Tuscola

**Description:**

Ap — 0 to 6 inches silt loam; dark brown (10YR3/3); fine granular structure; friable consistence; pH 7.2.

$Aeg_1$ — 6 to 14 inches silt loam; dark yellowish-brown (10YR4/4); slightly mottled; weak fine platy; very friable; pH 6.5.

$Aeg_2$ — 14 to 20 inches silt loam; yellowish-brown (10YR5/4); slightly mottled; weak platy; friable; pH 6.7.

Btg — 20 to 27 inches loam; strong brown (7.5YR5/6); mottled; medium subangular blocky; very firm; pH 7.1.

C — Silt loam; light yellowish-brown (10YR6/4); weak large platy; firm; calcareous; pH 8.1.

## Vineland Series

**Location:** Concession III, Lot 11, Ancaster Township

**Parent Material:** Outwash medium and fine sand

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Gleyed Gray Brown Podzolic |
| Family | — Brady |

**Description:**

Ap — 0 to 5 inches sandy loam; dark brown (10YR3/3); weak medium granular structure; very friable consistence; pH 6.1.

$Aeg_1$ — 5 to 20 inches sandy loam; yellowish-brown (10YR5/6); slightly mottled; weak granular; very friable; pH 6.0.

$Aeg_2$ — 20 to 31 inches sandy loam; very pale brown (10YR7/3); mottled; mottles yellowish-brown (10YR5/4); medium subangular blocky; friable; pH 6.3.

Btg — 31 to 40 inches sandy loam; brown (7.5YR4/4); slightly mottled; medium subangular blocky; friable; pH 6.4.

C — Medium sand; dark yellowish-brown (10YR4/4); single grain; loose; calcareous; pH 7.7.

## Winona Series

**Location:** Concession III, Lot 26, Saltfleet Township

**Parent Material:** Sand over clay till

**Classification:**

| | |
|---|---|
| Order | — Podzolic |
| Great Group | — Gray Brown Podzolic |
| Sub Group | — Gleyed Gray Brown Podzolic |
| Family | — Berrien |

**Description:**

Ap — 0 to 7 inches sandy loam; dark brown (10YR3/3); fine granular structure; very friable consistence; pH 6.9.

$Aeg_1$ — 7 to 12 inches loamy sand; brown (7.5YR4/4); slightly mottled; single grain; loose; pH 6.9.

$Aeg_2$ — 12 to 21 inches loamy sand; dark reddish-brown (5YR3/4); mottled; single grain; loose; pH 6.7.

Btg — 21 to 28 inches sandy clay loam; dark reddish-brown (5YR3/4); slightly mottled; medium platy; friable; slightly stony; pH 6.6.

CB — 28 to 34 inches silty clay; dark grayish-brown (2.5Y4/2); medium platy; firm; slightly stony; pH 7.4.

IIC — Clay till; dark grayish-brown (2.5Y4/2); large platy; very firm; slightly stony; calcareous; pH 7.9.

## Literature Cited


1. Bolton, T. E. 1957. Silurian stratigraphy and paleontology of the Niagara escarpment in Ontario. Geological Survey of Canada, Memoir 289.

2. Caley, J. F. 1940. Paleozoic geology of the Toronto-Hamilton area, Ontario. Geological Survey of Canada. Memoir 224.

3. Canada Department of Transport. 1947. Climatic Summaries for Selected Meteorological Stations in the Dominion of Canada, Vol. 1, Temperature, precipitation, sunshine. Meteorological Division, Toronto.

4. 1956. Climatic Summaries for Selected Meteorological Stations in Canada, Vol. III, Frost data. Meteorological Division, Toronto.

5. Chapman, L. J. and Putnam, D. F. 1951. The Physiography of Southern Ontario, University of Toronto Press.

6. Johnson, C. M. 1958. The Head of the Lake: A history of Wentworth County. Wentworth County Council, Hamilton.

7. Karrow, P. F. 1963. Pleistocene geology of the Hamilton-Galt area. Ontario Department of Mines, Report No. 16.

8. National Soil Survey Committee of Canada and Canada Land Inventory, A. R.D.A. 1964. Outline of the Canadian Soil Capability Classification for Agriculture, Mimeograph.

9. Ontario Agricultural Commission
   1881. Appendix B, Vol. II, C. Blackett Robinson, 5 Jordan St., Toronto.

10. Ontario Department of Economics and Development.
    1963. Niagara Region. Economic Survey. Special Research and Surveys Branch.