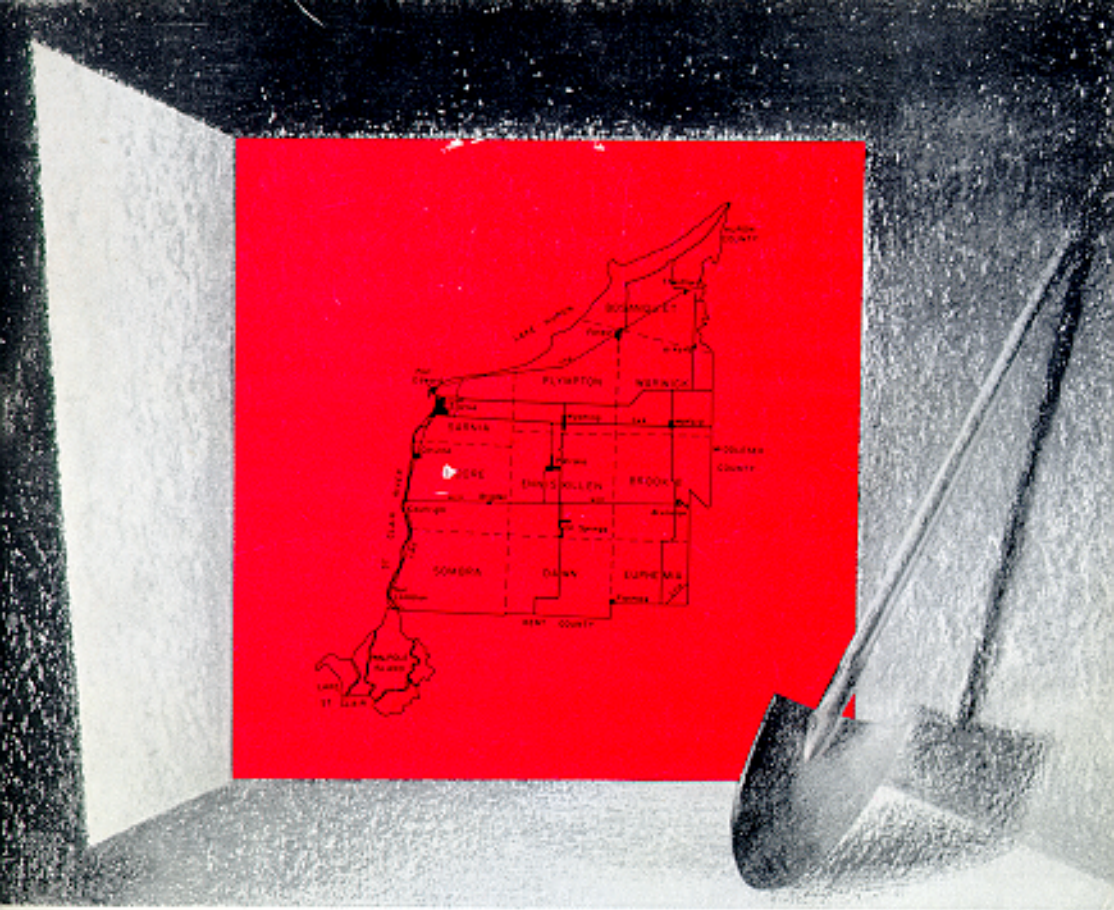

SOIL SURVEY OF LAMBTON COUNTY

REPORT NO. 22 OF THE ONTARIO SOIL SURVEY

Ontario

Ministry of
Agriculture
and Food

Jack Riddell, Minister

Agriculture
Canada

Research
Branch

Direction générale
de la recherche

SOIL SURVEY
of
LAMBTON COUNTY

by

B. C. Matthews and N. R. Richards
Ontario Agricultural College

and

R. E. Wicklund
Experimental Farms Service

GUELPH, ONTARIO

January, 1957

REPORT NO. 22 OF THE ONTARIO SOIL SURVEY

For other Counties and
Districts Survey Information,
Contact the
Consumer Information Centre,
Ontario Ministry of Agriculture and Food,
Main Floor,
801 Bay St.,
Toronto, Ontario
M7A 2B2

ACKNOWLEDGEMENTS

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The original field survey was done by Mr. A. G. Caldwell. Helpful suggestions pertaining to the soil classification and correlation and assistance in critically reviewing the manuscript came from Dr. P. C. Stobbe and Dr. A. Leahey.

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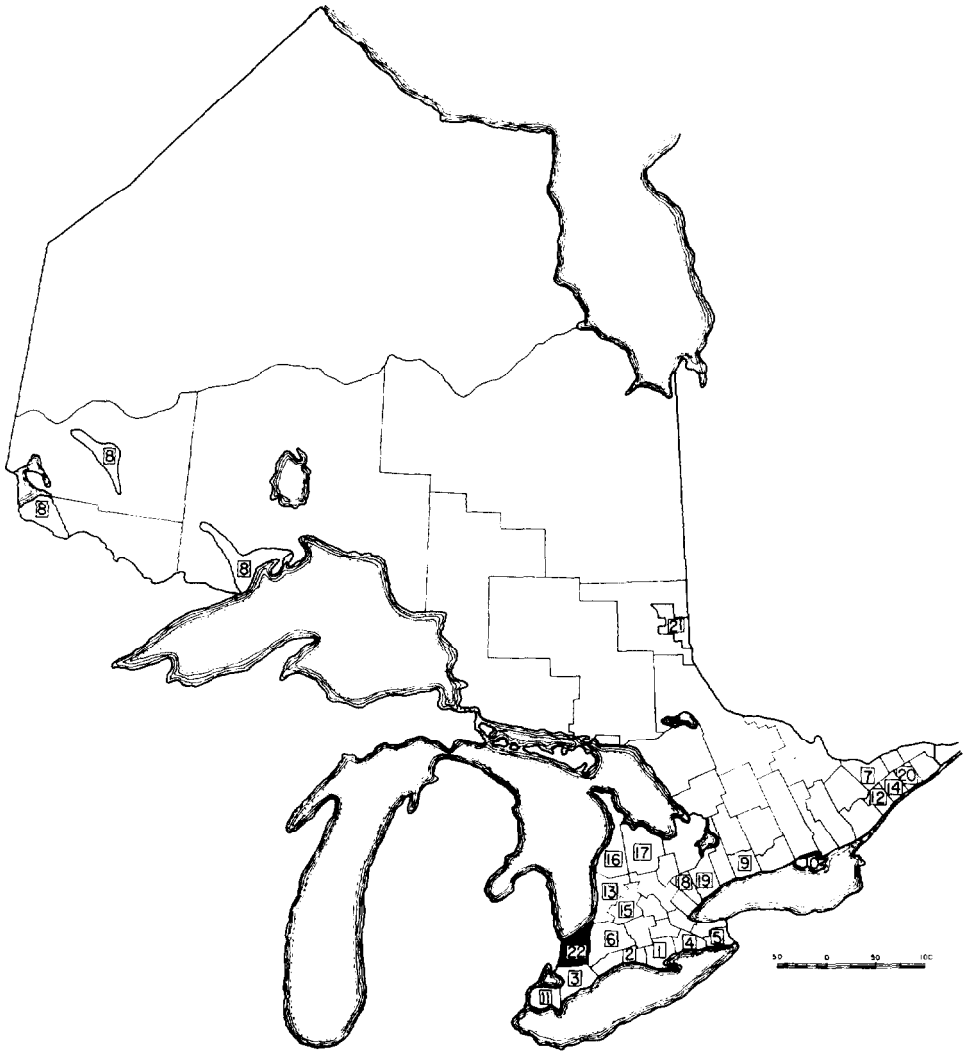


Fig. 1 Outline map of Ontario showing location of Lambton County and other areas for which soil reports have been published

Soil Survey of Lambton County

by

B. C. MATTHEWS, N. R. RICHARDS AND R. E. WICKLUND.

INTRODUCTION

The primary purpose of a soil survey is to classify and describe the soils of an area. Such features as colour, structure, texture, depth, and number of horizons in the soil profile are used in classifying soils. In the light of the knowledge gathered by the survey, some recommendations for land use are suggested. In seeking information regarding the soils of Lambton County, reference should be made to the map as well as to the report.

The Map—the soil map that is contained in the pocket at the back of the report presents all the important features of the County such as cities, towns, railways, roads, post offices, lakes, and rivers as well as the soils information. The areas of different soils are delineated by solid black lines and the soil type is identified on the map by the use of colours, letter combinations and symbols, the key for which appears on the map sheet as well as in the written report. In using the map, it must be kept in mind that the scale of the map (1 inch = 1 mile) prevents the presentation of sufficient detail to show soil variations of less than twenty-five acres in extent. The map and report, however, when used properly can furnish valuable basic information for estimating the productivity and land use problems of a single farm.

The Report—the report is divided into several sections as listed in the table of contents. Several tables of statistics in the text and in the appendix are presented to support statements made in the text of the report.

How to Use the Soil Survey Report

The individual reader may be interested in the whole report or only in some particular part. Ordinarily he will be able to obtain the information he needs without reading the whole report. The report is designed to meet the needs of a wide variety of readers of three general groups: (1) those interested in the County as a whole, (2) farmers and others interested in specific parts of it and (3) students and teachers of soil science and related sciences.

Readers interested in the area as a whole include those concerned with land use planning, the placement and development of urban centres, industries, highways, community co-operatives and processing plants, and locating areas for forestry, wildlife, and recreation. Such persons should read the sections entitled General Description of the Area in which location, organization, population, industries and transportation and markets are discussed, Soil Problems in Lambton County in which physiography, relief and drainage, climate, and soil use problems are discussed, and Land Use and Soil Management in which soil improvement practices are suggested.

Readers interested in specific areas—such as some particular locality, farm, or field—include farmers, agricultural fieldmen who are interested in planning operations in communities or on individual farms as well as real estate men, land appraisers, tax assessors, and prospective purchasers. These readers should (1) locate on the map the tract with which they are concerned, (2) identify the soils on the tract by locating

in the legend on the margin of the map the symbols and colours that represent them and (3) locate the section on Description of Soils where each soil type is described in detail and its suitability for use and its relations to crops and agriculture are discussed. Useful information will also be found in the section on Land Use and Management.

Students and teachers of soil science will find valuable information in the section on Factors Affecting Soil Genesis in Lambton County as well as in the Summary of the Classification of Soils of Lambton County in which the general scheme of classification and a detailed description of each soil type are presented. The basis and methods of classification and mapping of soils are described in the section entitled How Soils are Classified.

Soil Problems in Lambton County

Some soils of Lambton County are well suited to a wide variety of crops and can be used equally well for crops or pasture. Other soils have limited use, but can be improved and diversified through good management practices.

TABLE 1

DRAINAGE CONDITION OF LAMBTON COUNTY SOILS

Drainage Class	Soil Series	Acreage	% of Total
Well Drained	Guelph	500	—
	Huron	19,100	2.8
	Fox	4,700	.6
	Burford	8,000	1.1
Total		32,300	4.5
Imperfectly drained	Perth	139,300	19.3
	Caistor	71,000	9.9
	Brady	23,300	3.2
	Brisbane	13,600	1.9
	Berrien	7,200	1.0
	Lambton	11,400	1.6
Total		265,800	36.9
Poorly drained	Brookston	313,000	43.5
	Granby	1,800	.3
	Gilford	100	—
	Colwood	15,300	2.2
	Toledo	1,500	.2
	Clyde	1,900	.3
Total		332,600	46.5
Very Poorly drained	Blackwell	8,600	1.2
	Muck	4,500	.6
	Marsh	16,500	2.3
	Peat	900	.1
Total		30,500	4.2

Drainage

Most of the land in Lambton County is quite level and much of the level soil is fine in texture. The strongest relief is in the area south and east of Arkona. The altitude varies from the level of Lake Huron, 580 feet above sea level to about 850 feet in north-eastern Warwick Township. The Sydenham River system drains most of Lambton County but numerous small creeks empty into Lake Huron and the St. Clair and Ausable Rivers.

Many soils in the County require drainage improvement before they can be utilized for production of cultivated crops. In general, the soils having the greater content of organic matter and higher natural fertility need drainage improvement and on these soils drainage is most economical. Level relief, high water table, or substrata that are compacted and relatively impervious to water are the factors causing the poor drainage condition. Approximately 60 per cent of Lambton County requires artificial drainage for cultivated crops.

Many farms in the County contain no well drained soils and so drainage is of vital importance to the farmer. Drainage may be accomplished by open ditches or tile. Tile is preferable as it requires less maintenance and permits cultivation across the drainage lines.

Fertility

Natural soil fertility is related to texture. In general sandy soils are low in fertility due to low content of nutrients in the original soil material as well as to rapid leaching through the large pore spaces. Clay soils, on the other hand, are usually high in fertility. Lambton County, therefore, as a whole, consists of fertile soils because of the predominance of fine textured soils as shown in Table 2.

TABLE 2

APPROXIMATE ACREAGE AND PERCENTAGE OF TOTAL AREA OF SOILS OF DIFFERENT TEXTURE

Textural Class	Acreage	% of Total Area
Sands and sandy loams	50,500	7.0
Loams and fine sandy loams	38,600	5.4
Silt loams and clay loam	20,900	2.9
Clay	536,000	74.5
Sand and clay complex	13,100	1.8

Fertilizers are commonly used for increasing crop production on the soils of this County. In general complete fertilizers give best results on the mineral soils. Profitable response to lime is generally obtained on the Caistor soils and on the Brookston soils in the central and southern parts of the County.

Organic Matter

Soil organic matter, or more specifically humus, aids in conserving plant nutrients and, by its gradual decomposition it partially controls the availability of the nutrients. Humus also promotes good soil structure and moisture-holding capacity.

Grasses and legumes are recommended as soil-builders because their root residues add much active organic matter to the soils. All crop residues such as straw and corn stalks should be incorporated with the soil whenever possible.

Organic matter helps to maintain and improve soil productivity. In general the need for more organic matter is greater in the sandy soils than in the clay soils.

Land Use and Soil Management

The land use of any area has been developed, in most instances, by a system of trial and error, Certain crops tend to predominate in one region and not in another (1) because the land operators have obtained good returns or (2) because of tradition. A soil survey permits the evaluation of the soils and is a basis for using results of experimental work on similar soils for recommendations for better land use and management. The general uses and management requirements of the soils in this County are discussed in the following paragraphs.

TABLE 3

PRESENT LAND USE (1951 CENSUS)

	ACRES	PER CENT
Total Land Area	719,360	100
Occupied Farm Land	613,215	85.2
Improved Cleared Land	479,739	66.6
Unimproved Occupied Land	133,476	18.6
Including:		
Woodland	59,085	8.2
Other	74,391	10.4
Number of farms	4,646	—
Acreage Under Crops	171,167	23.8

Present Agriculture

The agriculture of the early settlers consisted mainly of growing wheat, corn, potatoes and garden crops for home consumption. As transportation facilities improved and markets were created farmers began to raise more livestock and to sell their crops for cash.

Beef raising continues **to** *be an important farm enterprise in Lambton County*

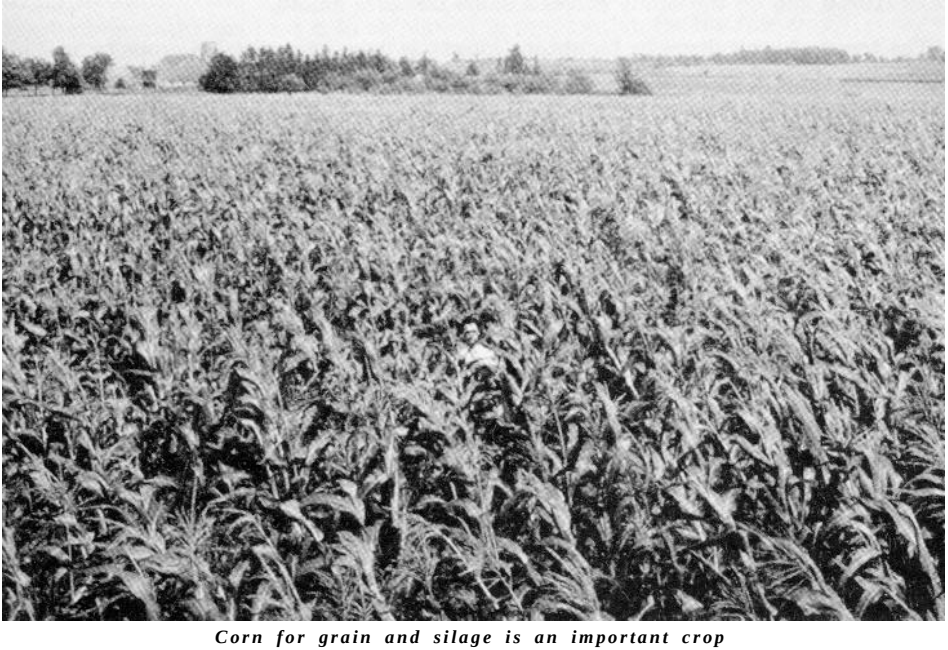
Since 1920 the farm acreage and farm population have been quite stable despite the fact that during the last twenty years many factory workers have established rural homes in the vicinity of Sarnia.

TABLE 4

TRENDS IN POPULATION (1951 CENSUS)

YEAR	RURAL POPULATION	URBAN POPULATION	TOTAL
1901.....	36,519	20,125	56,642
1911.....	31,077	20,255	51,332
1921.....	28,060	24,819	52,879
1931.....	27,160	27,514	54,674
1941.....	28,347	28,578	56,925
1951.....	32,329	42,631	74,960

A gradual change in crops has accompanied the shifts in population and land use in the County. Corn, an important crop from the time the County was first settled has increased in acreage from 28,000 in 1940 to 60,000 in 1952 and at the same time there has been an increase in the relative amount of corn for husking with almost twice as many acres devoted to husking corn as to fodder corn in 1952. The introduc-



Corn for grain and silage is an important crop

tion of hybrid varieties of corn along with improved soil management has increased the average yield of grain corn from 38 bus. per acre to 61 bushels per acre since 1940. The 66,000 acres of oats grown in 1952 represents a slight decrease in the last fifteen years. Likewise the acreage of wheat has decreased by thirty per cent since 1940. Soybeans which were not listed in the 1940 Census occupied 12,000 acres in Lambton County in 1952.

TABLE 5

ACREAGES OF PRINCIPAL CROPS IN LAMBTON COUNTY IN SELECTED YEARS (AGRICULTURAL STATISTICS)

Crop	1940	1947	1952	1954
Corn, total	28,660	30,533	59,000	74,400
for husking	13,221	12,526	38,000	55,000
for fodder	15,439	18,007	21,000	19,400
Oats	78,547	40,604	66,100	48,000
Barley	15,144	6,573	8,100	3,000
Fall Wheat	64,716	61,603	45,500	46,000
Flax	142	303	3,800	500
Hay			74,100	74,100
Soybeans		4,316	12,000	36,000
Pasture (seeded)		125,943	156,000	146,000

The acreage devoted to wheat, oats, and barley has decreased in favour of increased production of corn, soybeans, and sugarbeets. These crops are well adapted to the dark coloured fine textured soils of the Brookston and Perth series that predominate in the County.

The acreage devoted to pasture has remained relatively constant, however, during the last thirty years and livestock raising is still an important industry.

Since 1910 the fruit industry has expanded particularly along the south shore of Lake Huron and on the sandy ridges a short distance inland.

The trend of agriculture in Lambton County is from general farm crops to specialized crops. This shift in agricultural production requires a shift in soil management practices if productivity is to be maintained. In some instances, however, there has been a tendency to ignore the soil depleting effects of corn, beans and sugarbeets. Such crops grown for cash necessitate the application of sound management practices designed to maintain soil structure, organic matter content and fertility.

General Management Requirements

In a County such as this where specialized crops are grown the farmer must use the best methods available to assure maximum profitable production over the longest period of time.

Tillage

Tillage requirements vary with the kind of soil. Soils of fine texture, such as silt loam, clay loam and clay, require the most power for plowing. They are highly retentive of water and warm slowly in the spring. Fall plowing is recommended on level areas of such soil as there is little erosion hazard from wind or water. The freezing and thawing of the plowed soil during the winter helps to improve the structure and allows earlier seeding of spring crops.

Fall plowing is nor recommended on any soil where the slope is such that washouts and erosion by water are likely to occur. Sandy soils and others that are subject to erosion by water should be protected by a cover crop or left in grass over winter. Wherever possible it is advisable to plow across the slope rather than up and down the slope.

Rolling with an implement such as a cultipacker is beneficial in preparing good seedbeds particularly on the clay soils and the sandy soils. This is particularly beneficial if seeding is to follow soon after plowing and harrowing. Disking of the fine

textured soils is usually necessary to break up large lumps or to loosen the seedbed if a considerable length of time has elapsed between plowing and planting.

Some of the soils, particularly the Caistor clay loam, have a compact subsoil that prevents good percolation of water through the soil. Deep tillage may be profitable in such instances but insufficient information is available on which to base recommendations for deep tillage.

Organic Matter

Although the organic matter content of Lambton County soils was adequate originally, the increased acreage of row crops and inadequate crop rotations and organic matter maintenance has resulted in the excessive depletion of the soil organic matter. Soil organic matter is easily destroyed but costly to replenish. Crop residues (straw from combines, corn stalks, etc.) should be turned under with 80 to 100 pounds of ammonium nitrate or its equivalent per acre to ensure rapid decomposition. Failure to add nitrogen may result in decreased yield of the succeeding crop. The use of legumes in the hay and pasture mixtures is an ideal means of maintaining the organic matter content and improving the soil structure as well as fixing nitrogen from the air. For best results the crop rotation should include forage crops (legume-grass-mixture) along with cereal grains and row crops.

Farmyard manure where available should be carefully handled and applied to avoid nutrient losses. The best time to apply manure is before the row crop in the rotation or on the sod that is to be plowed in preparation for the row crop.

Fertilization

The use of commercial fertilizers for increasing crop production has been stimulated by the shift toward specialized cash crops.

In general complete fertilizers give best results on the mineral soils. The response from fertilizers is increased by addition of lime to acid soils such as Caistor in amounts sufficient to neutralize the soil acidity. A soil test is the only satisfactory basis for making lime and fertilizer recommendations. When barnyard manure is used regularly (15-20 tons every second year) and a green manure crop or leguminous sod is plowed down at least once during the rotation, superphosphate and potash are usually the only plant nutrients required on the fine textured soils.

Because organic matter decays rapidly and fertilizer nutrients are leached readily on sandy soils, frequent small applications of manure and fertilizer are more effective than large less frequent applications.

Specific Soil Management Requirements

Profitable farming is dependent in a large measure on the farmer's ability to adapt his farming practices to the physical characteristics of his land. Such physical features as topography, texture, depth to bedrock, etc., in general cannot be modified by the farmer. Instead he must fit his farming program to the soil conditions as they are. Other factors such as moisture-holding capacity, fertility, structure, and natural drainage can be changed to increase the productivity of the soils.

For purposes of this discussion the soils of Lambton County have been grouped on the basis of texture and drainage. Soils of similar drainage and texture usually have similar management requirements.

1. Fine textured, well drained soils.

Soil Type	Acreage
Huron clay	13,900
Huron clay—eroded phase	5,200
Total	19,100
% of Total Acreage	2.8

These soils are suitable for most general farm crops with a minimum of special management. They are well supplied with lime and fertility. The eroded phase, however, requires crop rotations that include a higher proportion of sod crops to add organic matter and reduce the erosion.

2. Fine textured, imperfectly drained soils.

Soil Type	Acreage
Caistor clay	69,100
Lambton silt loam	10,800
Lambton loam	600
Perth clay	137,300
Perth clay loam	300
Total	206,700
% of Total Acreage	30.4

Fine textured imperfectly drained soils make up 30.4 per cent of the total acreage of Lambton County. For the most part the crops produced on Perth and Caistor soils are the same as those on the previous group of soils. The same management requirements apply to these soils as for the Brookston soils except that fewer tile drains may be required.

The Perth soils contain more organic matter and lime than the Caistor soils. For most crops, particularly legumes, the Caistor soils require lime. The low levels of phosphorus in these soils can be corrected by applications of fertilizer high in this nutrient.

3. Fine textured, poorly drained soils.

Soil Type	Acreage
Brookston clay	308,300
Toledo clay loam	1,200
Toledo clay	300
Blackwell clay	600
Clyde clay	1,900
Total	311,700
% of Total Acreage	44.6

These soils are well suited to general farming, dairying, and stock raising as well as to certain specialized crops. Wheat and clover can be grown if drainage is improved. Tile are usually placed 3 to 4 rods apart. These soils, when drained, are well adapted to the production of cash crops of corn, soybeans, and sugar beets.

Under the cash crop system of farming, however, the organic matter content is rapidly lowered unless green manure and crop residues are returned regularly. A common rotation that seems to maintain the productivity of these soils is corn, sugar beets or soybeans—oats, barley or wheat; and two years of alfalfa, clover, or mixed clover and grasses. Although injury by heaving may occur in some winters, yields of wheat and alfalfa are generally high.

Fall plowing of these soils is a recommended practice as it improves the soil tilth.

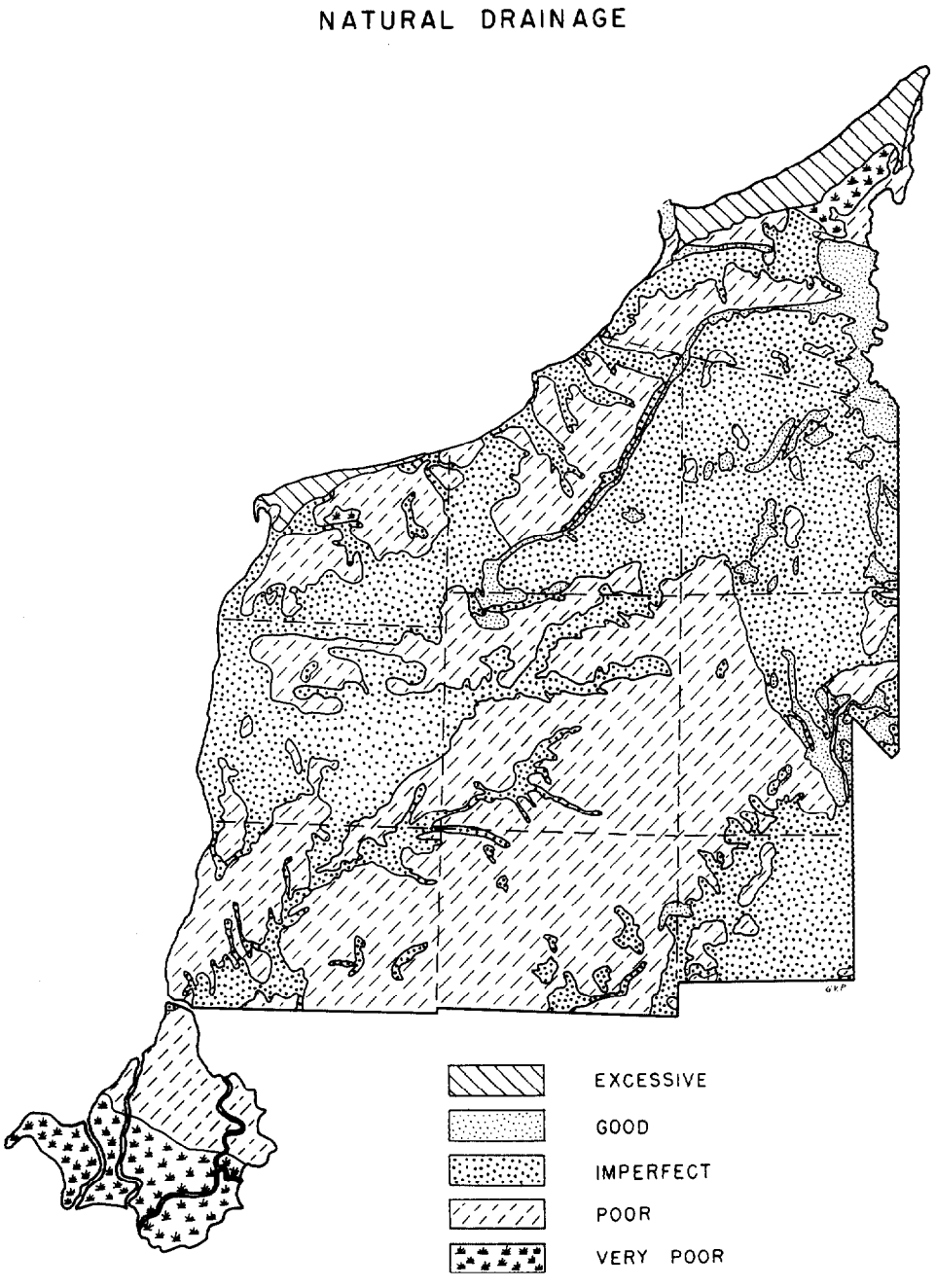


Fig. 2 Natural drainage of Lambton County Soils

Little if any lime is required but commercial fertilizers are required for best yields of row crops and grain.

4. Medium textured, imperfectly and poorly drained soils.

Soil Type	Acreage
Colwood fine sandy loam	15,300
Brisbane loam	13,600
Gilford loam	100
Total	29,000
% of Total Acreage	4.0

Drainage improvement by means of tile drains is the prime requirement for increasing productivity of these soils. Corn, beans, and small grains as well as alfalfa can be grown on the Colwood and Brisbane soils but complete fertilizer must be used and additional nitrogen applied as a side dressing is usually recommended for row crops. Although under natural conditions these soils are about neutral in reaction, when drained and cultivated they tend to become acid and may require small amounts of lime.

These soils have a lower moisture-holding capacity than the fine textured soils. Hence, the production of early summer crops whenever possible is advisable to avoid losses by midsummer drought. Fall plowing is not required on these soils and where there is much loss of soil by blowing it is best to leave the soil covered over winter. On the other hand, these soils are generally late in the spring and therefore some farmers plow in the fall so that early spring crops can be planted at the proper time.

5. Coarse to medium textured well drained soils.

Soil Type	Acreage
Burford loam	6,800
Burford loam—shallow phase	1,200
Shashawandah loam	500
Fox sandy loam	4,700
Guelph loam	300
Guelph loam—shallow phase	200
Total	13,200
% of Total Acreage	1.9

The soils of this group are used largely for specialized crops. The coarse texture and pervious subsoil of the Fox and Burford soils permit early spring cultivation and the production of early vegetables and small fruits.

The Fox soils are low in fertility and usually require lime. Heavy applications of phosphate and potash are required and nitrogen requirements vary with the crop to be grown.

The Burford and Guelph soils are better supplied with plant nutrients but are usually improved by applications of complete fertilizers.

The establishment and maintenance of an adequate content of organic matter in this group of soils is of prime importance particularly as it assists in moisture conservation. This is important in view of the frequency of drought in the area. The crop rotations on these soils are usually short with a minimum of sod crops included. It is necessary therefore, to rely on green manure and barnyard manure to maintain satisfactory organic matter levels.

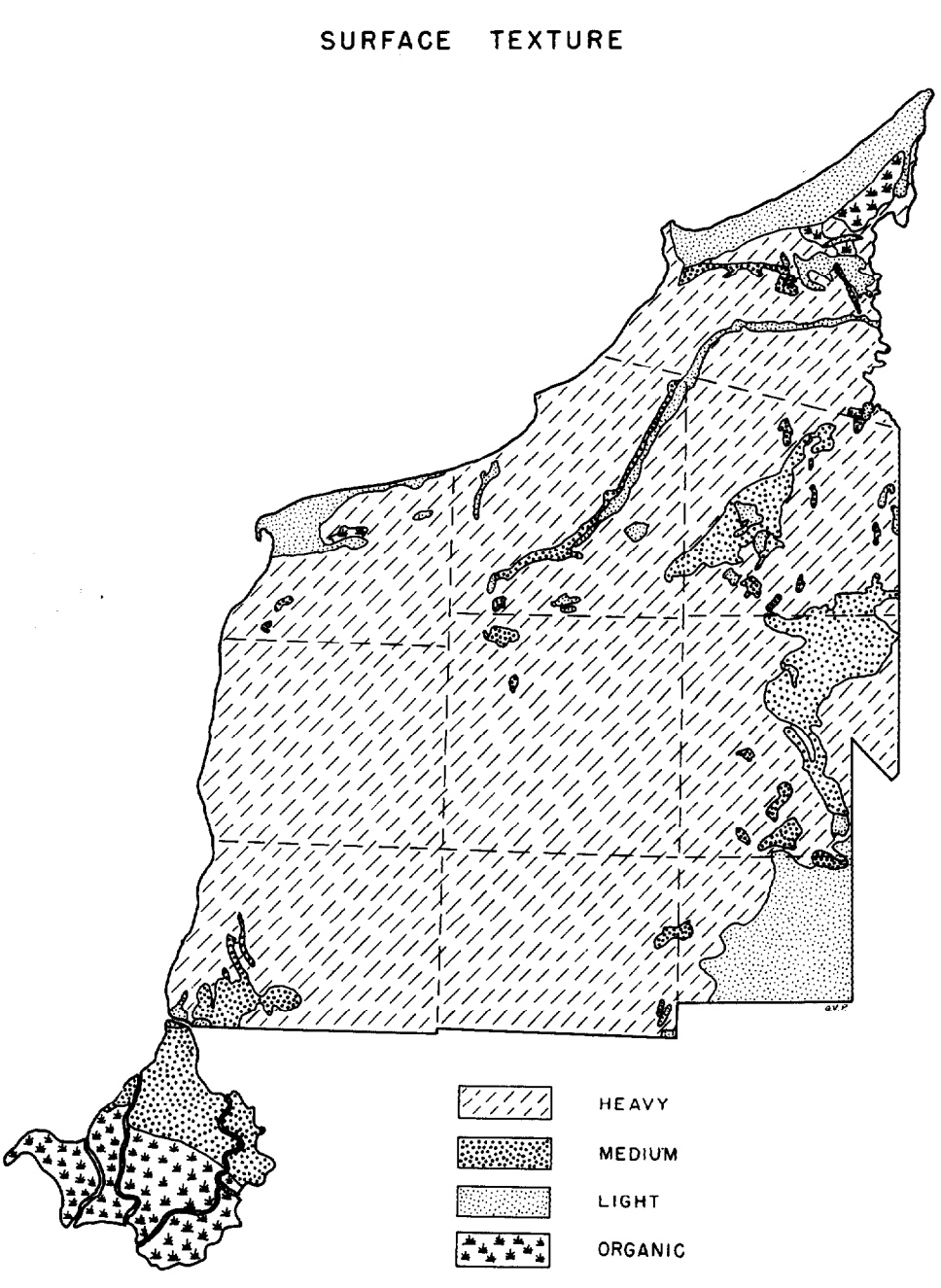


Fig. 3 Surface Texture of Lambton County Soils

6. Coarse textured, imperfectly and poorly drained soils.

Soil Type	Acreage
Berrien sandy loam	7,100
Berrien sand	100
Granby sandy loam	1,800
Brady sand	10,700
Brady sandy loam	7,800
Total	27,500
% of Total Acreage	3.8

The Berrien soils, which are underlain by clay at three feet or less, and Brady soils are used for general farming for the most part although experience elsewhere would indicate that they are suitable for canning crops, early vegetables and flue-cured tobacco production. Drainage improvement and high rates of fertilization are needed for adequate production on these soils. Use of green manure crops and barnyard manure is highly recommended to build up and maintain adequate levels of organic matter.

The Granby soils are poorly drained and deficient in all plant nutrients. Usually it is not profitable to improve these soils for crop production.

7. Coarse textured and fine textured soil complexes.

Soil Complex	Acreage
Perth clay and Berrien sandy loam	1,700
Caistor clay loam and Berrien sandy loam	1,900
Brookston clay and Berrien sandy loam	4,700
Brady sandy loam and Brookston clay	4,800
Total	13,100
% of Total Acreage	1.8

The areas in Lambton County that have been mapped as complexes of two soil series have the same management problems and requirements as the soil series when mapped separately. They have the additional problem that the management requirements of the different soil types in the complex are not the same and yet they are so closely associated in the field that they must be managed alike. In most areas, however, one of the components is present in larger area than the other. Hence, the general recommendation is to treat the entire area of the complex as recommended for the dominant soil in the complex.

General Description of the County

Location and Area

Lambton County is situated along the extreme south-eastern shortline of Lake Huron. It is bounded on the east by the Ausable River and Middlesex County, on the south by the County of Kent and on the west by the River St. Clair and the Chanel Ecarte. Walpole Island Indian Reserve, the delta of the St. Clair River, is included with the County. The city of Sarnia in the north-west corner of the County is 67 miles from London and 186 miles from Toronto.

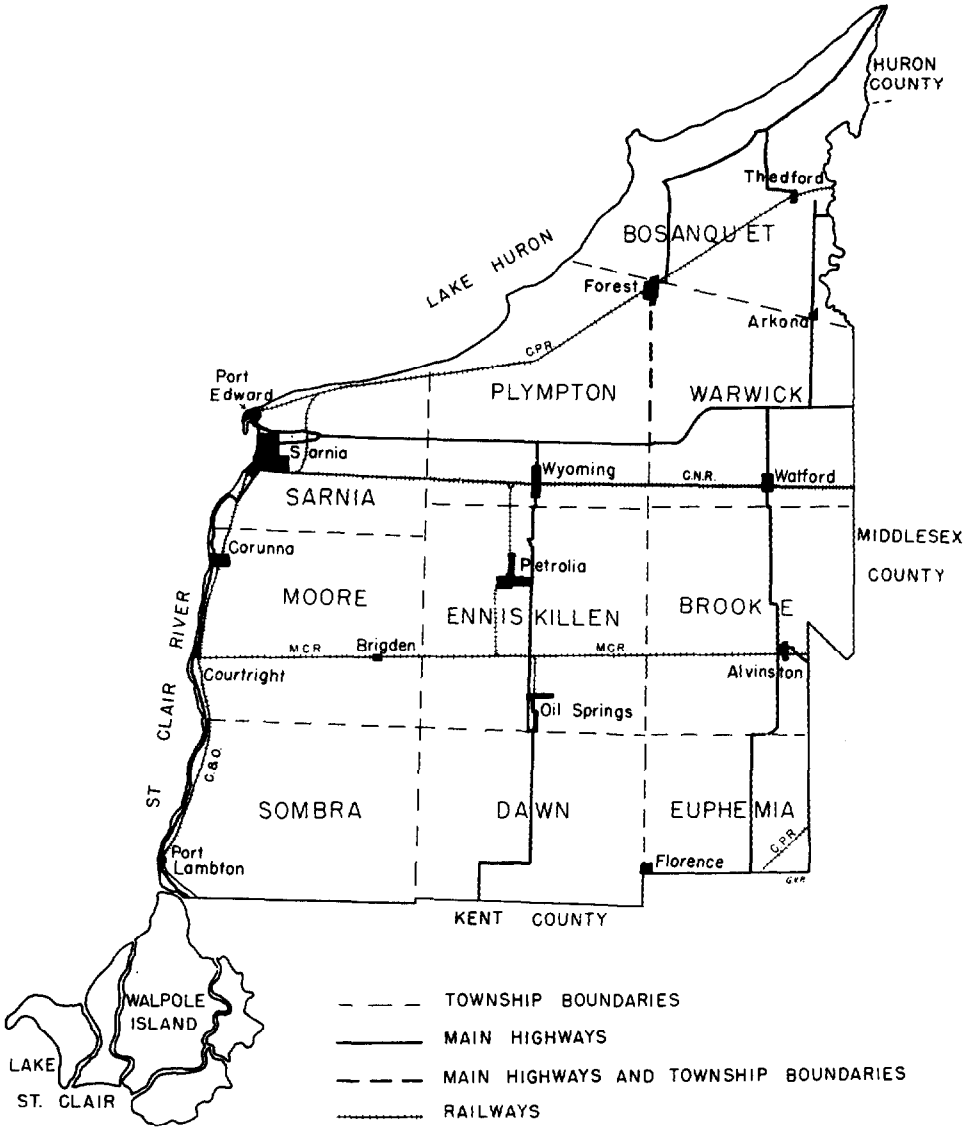


Fig. 4 Townships, Principal Centres and Railways in Lambton County

The area of the County is approximately 719,360 acres (1951 census). The area in farms is approximately 606,805 acres, the rest of the area being taken up by road allowances, centres of population, waste land, etc.

County Seat and Principal Towns

The City of Sarnia, important for its oil and rubber industries and situated near the junction of Lake Huron and the St. Clair River is the County Seat.

The town of Petrolia in which the Ontario Department of Agriculture maintains an office is located at the approximate centre of the County. Point Edward just north of Sarnia is an industrial and lake shipping centre. Forest is a pleasant town in the fruit growing district in the northern part of the County. Thedford, to the north-east, is the outlet for produce from the Thedford Marsh, a short distance to the north. Watford, near the eastern side of the County, is an important business and shipping centre for the surrounding area. Wyoming, on the main line of the Canadian National Railways, is a shipping point for the district. Alvinston, ten miles south of Watford, is a business centre for the busy farming community. Corunna, Courtright, Sombra and Port Lambton, villages along the St. Clair River have many summer residents.

Population and Racial Origin

According to the 1951 census, the population of Lambton County was 74,960 persons of whom 19,415 were on farms, 42,631 were urban dwellers and 12,914 were living in the rural areas but were not carrying on agricultural pursuits.

Total population	74,960
British	57,979
French	4,996
All others	11,985

Transportation and Markets

Lambton County is well supplied with roads and railways that connect it with other parts of the Province.

No. 7 highway is the main east and west road, connecting Sarnia with the east. No. 22 highway, branching off No. 7 north of Watford is a more direct route to London. Along the St. Clair River is highway No. 40 which joins Sarnia and the other river municipalities with Wallaceburg and Chatham. Highway No. 21 is an important north and south connection from Dresden and Chatham in the south through Oil Springs, Petrolia, Wyoming, and Forest to Grand Bend and other points along the Lake Huron shore. On the eastern side of the County another north and south road, highway No. 79 links Watford and Alvinston with highways No. 7 and No. 2. The "Plank Road" is a historic thoroughfare joining Petrolia and Sarnia (this road was originally surfaced with 4" oak planks).

In addition to these much travelled routes there is a complete network of county and township roads serving every part of the County.

The main line of the Canadian National Railways from Toronto to Sarnia and Chicago passes through the County and connects Watford and Wyoming with points east and west. A branch of the Canadian National Railways joins Sarnia, Forest, and Thedford with Stratford and eastern points. The Michigan Central Railway operates a line between Courtright on the St. Clair River, through Brigden and Alvinston to St. Thomas to the east. Branch lines connect it with Petrolia, Oil Springs, and Edys

Mills. The Pere Marquette Railway parallels the St. Clair River and joins Sarnia with Wallaceburg, Dresden and Chatham.

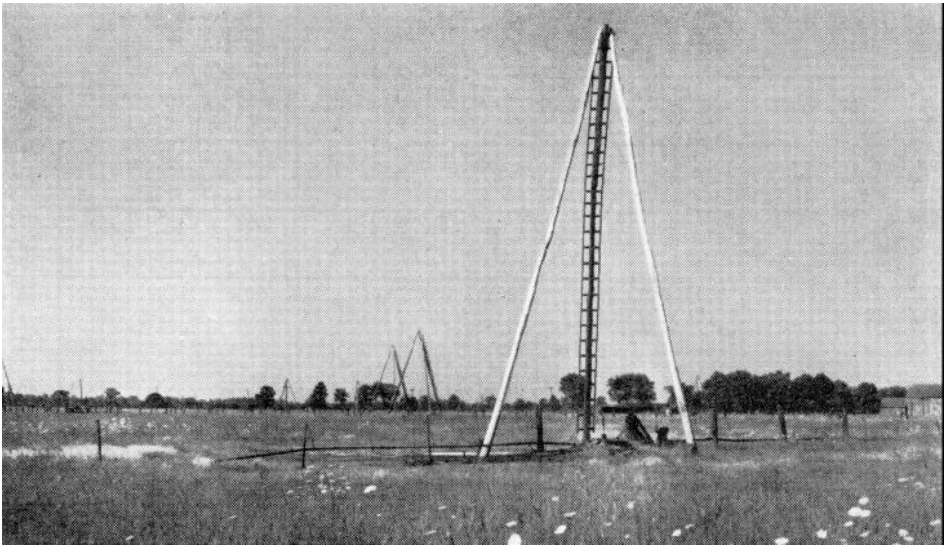
With this excellent system of roads and railways, the County is in a very good position to market its produce.

Early Settlement and Agricultural Development

It is reported in the "Ontario Agricultural Commission Report" of 1881 that settlement commenced in Dawn and Sombra Townships in 1820 and in about twenty years the whole of the remaining townships were more or less settled.

In 1881 forty eight per cent of the County was still in timber and only forty five per cent of the cleared land was free of stumps. Fences were chiefly of oak and black ash rails. The chief agricultural exports were fat cattle and winter apples to England and the United States.

Little or no commercial fertilizer was being used at that time. All townships claimed to have very fertile soils. Even at this time there had been considerable tile drains laid in the flatter areas of the County with very good results.



The first oil field in Canada was located at Petrolia. Some of these wells are still being operated

Fall wheat, oats, and barley were important crops while a considerable acreage of corn was grown. Some spring wheat was grown but yields were comparatively low.

The commission of 1881 noted that the County was equally well adapted to grain growing, stock raising and dairying. However, Lambton County farmers turned mostly to beef raising. In the last few years there has been an increased demand for whole milk for the urban population as well as for processing. For this reason, many more dairy herds are seen throughout the County.

With the excavation of "The Cut" across the Thedford Marsh to Port Franks, a

large area of muck and marl soils were made available for agricultural purposes. It has since been used intensively for the production of sugar beets, celery, onions and market vegetables. Another reclaimed area is that south of Blackwell. Here extensive acreages of potatoes and sugar beets are grown most seasons.

It can be seen that drainage has been an important factor in the development of Lambton County. The network of ditches and tile drains instituted by the pioneers and continued by their descendants has allowed for a high state of agricultural development.

Climate

Climate has an important bearing on the growth of plants and indeed is often a controlling factor in the varieties of crops that can be grown satisfactorily, and of the yields that can be obtained. Lambton is one of the most favoured Counties in the Province from the point of view of climate for agricultural crops.

The climate is moderated by the Great Lakes. The average length of growing season is about 200 days from the middle of April to the first week of November. The frost-free period ranges from 150 to 160 days, depending on the distance from the Lakes. The mean annual temperature varies from 45° to 47°F. The mean winter temperature is 23°F and the mean summer temperature is 67°F. The lowest tempera-

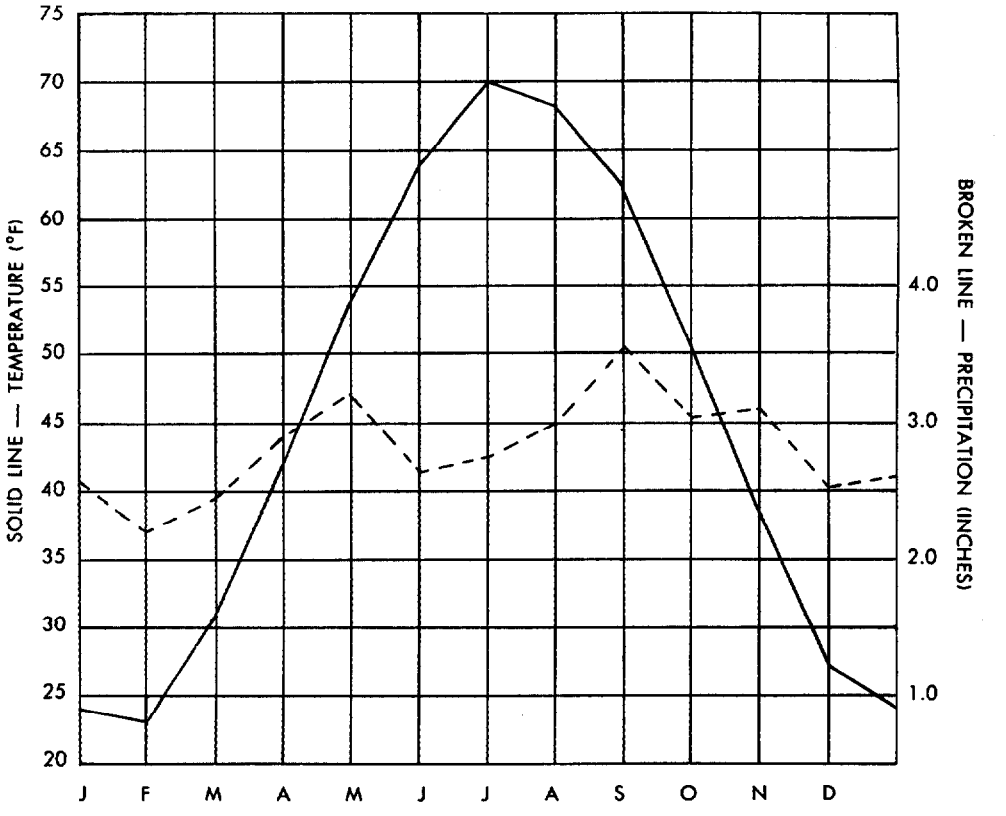


Fig. 5 Seasonal Variation in Temperature and Precipitation at Forest, Ontario (18 year average)

TABLE 6

MONTHLY AND ANNUAL AVERAGES OF DAILY MEAN TEMPERATURE FOR SEVERAL SELECTED POINTS

	Period of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Immediate Stations														
Chatham	48	25	24	34	46	58	67	73	71	64	52	40	29	48
Wallaceburg	30	23	22	33	45	56	67	72	69	62	51	38	28	47
London	54	22	21	30	44	55	65	69	67	61	49	37	26	46
Forest	18	24	23	31	42	54	64	70	68	62	50	38	27	46
Distant Stations														
Ottawa	65	12	13	24	41	55	65	70	66	58	46	32	17	42
Guelph	44	20	18	29	42	54	63	68	66	59	48	36	24	44
Stratford	64	21	20	29	42	54	64	69	67	61	48	36	25	45
Kapuskasing	19	-2	2	14	31	46	57	62	60	51	39	22	6	32
Huntsville	30	14	12	24	39	52	61	66	64	57	45	32	19	41
Leamington	21	25	25	34	44	56	70	75	74	66	54	41	29	49

Temperature in degrees Fahrenheit

TABLE 7

AVERAGE MONTHLY AND ANNUAL PRECIPITATION IN INCHES FOR SEVERAL SELECTED POINTS

	Period of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	year
Immediate Stations														
Chatham	60	2.23	2.06	2.21	2.34	2.94	2.62	2.82	2.45	2.57	2.39	2.33	2.23	29.19
Wallaceburg	30	1.54	1.61	1.73	2.95	3.28	2.59	2.62	2.65	2.51	2.42	1.86	1.36	27.12
London	54	3.97	3.45	2.81	2.87	2.81	3.11	3.21	2.80	2.96	2.91	3.74	3.53	38.17
Forest	18	2.58	2.20	2.44	2.87	3.20	2.64	2.73	2.98	3.54	3.03	3.10	2.51	33.82
Ottawa	65	2.92	2.17	2.77	2.70	2.47	3.52	3.39	2.56	3.23	2.93	2.98	2.58	34.23
Guelph	44	2.39	1.74	1.79	2.38	2.72	2.84	3.07	2.86	2.50	2.39	2.44	2.14	29.26
Stratford	64	3.20	2.65	2.93	2.67	3.08	3.17	3.36	3.04	3.31	3.29	3.59	3.42	37.71
Kapuskasing	19	2.00	1.06	1.56	1.82	2.12	2.33	3.43	2.94	3.54	2.50	2.39	1.90	27.59
Huntsville	30	3.09	2.45	2.78	2.09	2.85	3.69	2.96	2.70	3.84	3.44	3.24	3.28	36.41
Leamington	21	2.41	1.72	2.44	2.91	2.34	3.01	2.11	2.22	2.89	2.35	2.14	2.29	28.83

ture on record is -30°F and the highest 104°F. The temperate nature of the climate permits the production of tender crops such as tomatoes, tobacco and peaches on the well drained gravelly soils at Arkona and Wyoming.

The mean annual precipitation varies from 30 to 34 inches, slightly over 50 per cent of which falls during the growing season. The average rainfall in May and September (the two wettest months) is about 3.5 inches. In June, July and August, the average rainfall is less than three inches per month and commonly there is less than one inch of rainfall in one of these months. Hence, reduced crop yields as a result of lack of moisture is not uncommon in Lambton County.

Some loss of moisture through runoff during spring thaws occurs on the fine textured soils. Some areas of cropland may be flooded in spring or immediately following heavy rains, but the period of flooding is usually short.

The normal snowfall varies from 40 to 60 inches per year. Deep snows do not ordinarily accumulate so that winter transportation is not hindered to any extent.

Tornadoes and twisters are not common but when they do occur they cause considerable damage to small areas. The tornado of May 1963 caused considerable damage to the City of Sarnia as well as in the farming areas to the east. Hail storms are common and may cause considerable damage to certain crops that are susceptible to injury.

Vegetation

Before Lambton County was settled, the entire area was covered by deciduous and coniferous trees and swamp. Many southern species of trees such as oak, hickory and chestnut grew in association with the more common beech, sugar maple and basswood. The large tracts of poorly drained land produced elm trees for the most part. The importance of the big trees to the early agricultural economy is indicated by the

A few small woodlots such as this remain on the poorly drained soils at Lambton County

fact that thirteen sawmills operated in the County in 1851. In 1871 more than 200,000 feet of oak were marketed from the County. There are few native coniferous trees except on the dry sand area near Lake Huron.

In a few areas, notably the Thedford and Blackwell marshes and part of Walpole Indian Reserve, the native vegetation was wet grassland and marsh grass. The deep black soils of th :se areas are a result of the grass-like vegetation.

How Soils are Classified

The development of a soil from unweathered broken rock is an intriguing story. Under the influence of vegetation, climate, and drainage acting on the raw soil material, called parent material, different soil layers develop over a period of time. So it is that in a vertical cut through the soil, two or more layers or horizons may be observed above the grey parent material. The different soil horizons from the surface down to the parent material make up the soil profile.

Entire Soil Profile is Important

The entire soil profile must be considered in estimating the productivity of a given soil. Two soils, for instance, may have similar surface layers but one may have a compact subsoil that restricts water movement and root penetration, while the other may have an open porous subsoil that permits rapid water movement and easy root penetration.

In classifying soils, therefore, the entire soil profile is considered. In Lambton County, thirty-five different soils have been recognized and delineated on the map. These soils differ from one another in one or more of the following features of the soil profile—number, colour, thickness, texture, structure, and chemical composition of the different horizons.

The Soil Profile

Soil layers or horizons are designated as A_1, A_2, B, G, and C. The A_1 horizon has been leached of some mineral constituents but contains accumulated organic matter. It is commonly referred to as the topsoil and is usually dark in colour. Under forest vegetation an A_0 horizon consisting of leaves and twigs in varying stages of decomposition is usually present. The A_2 horizon immediately below the A_1 contains little or no organic material and is the most strongly leached layer in the profile. In some profiles, the A_2 horizon consists of a pale brown A_{21} horizon underlain by a grey A_{22} horizon.

The B horizons are usually browner than the A_2, finer in texture and the structural aggregates are usually well formed. It contains some of the materials, chiefly iron, alumina, and clay, that were removed from the A horizon by the leaching process. The B_2 horizon is the layer of maximum accumulation and the B_1 and B_3 are layers transitional from A to B and B to C respectively.

The parent material from which the soil has developed is designated as the C horizon. The upper slightly weathered part of the C horizon is sometimes designated as the C_1 horizon.

In poorly drained soils a B horizon does not develop. Instead a grey mottled reddish brown layer designated as the G horizon appears. The mottled colour has developed by alternate oxidation and reduction, an indirect result of a fluctuating water-table.

Soil Type and Soil Series

The principal unit of soil mapping is the soil type. The soil type consists of a group of soils with profiles having similar genetic horizons, developed from similar parent material.

In using the map it is important to keep in mind that a given soil type may include

a limited range in properties. The boundaries between soil types vary in sharpness. Between two soil types in the field there is a zone that includes some of the features of each type. Also within a given type there are often areas of other types too small to be shown on the soil map. Soil types do not occur at random, nor is their nature a matter of chance. The factors that have determined soil type differences in Lambton County are discussed in the section, "Factors Affecting Soil Genesis in Lambton County".

Two or more soil types that are developed on similar parent material, under similar drainage conditions, but differing in texture of the surface horizon are grouped together as a Soil Series.

In certain instances, a soil type may have features that limit its agricultural value; hence phases of a soil type or soil series are mapped. For example, a physical characteristic such as stoniness or topography may drastically change the agricultural value of a soil without altering the profile characteristics sufficiently to place it in another soil type; hence phases of soil types have been mapped to delineate areas that have special problems for agricultural use.

Soil Mapping

Frequent examinations of the soil were made along all roads in the County. Traverses on foot through sections between roads were made, where necessary, to trace the soil boundaries. Notes were taken of the characteristics of the soil profiles, external and internal drainage, topography, vegetation, stoniness, and fertility.

The soil boundaries were plotted on maps of scale one inch equals one mile of the National Topographic Series (Department of National Defense, Ottawa). The contours at intervals of 25 feet are reproduced on the soil map so that they may be used to estimate the relief of the land. In some instances, the soil boundaries indicate a relatively sharp break in soil features but more commonly the change from one soil to another is gradual, not sharp as the boundary would indicate.

The soils differ widely in such features as colour, drainage, kind of parent material, relief, and erosion. Full use of the soil survey requires an understanding of all of the soil types and phases and their relationships to one another. In Table 8 the soils have been grouped on the basis of texture, parent material, and drainage. Soil types whose names appear in the same vertical column and in the same textural group generally have similar problems in land use.

TABLE 8

CHARACTERISTICS OF THE SOIL SERIES IN LAMBTON COUNTY

Parent Material	Texture of Surface Soil	Drainage				
		Excessive	Good	Imperfect	Poor	Very Poor
Outwash sand Outwash sand over clay	Sand, sandy loam Sand, sandy loam	Plainfield Eastport	Fox	Brady Berrien	Granby	
Outwash medium gravel Shaley gravel Loamy till	Loam Loam Loam		Burford Shashawandah Guelph	Brisbane	Gilford	
Clay till	Clay loam, clay		Huron	Perth Caistor	Brookston	
Lacustrine fine sand	Fine sandy loam				Colwood	
Silt and clay	Clay, clay loam Loam, silt loam			Toledo Lambton	Clyde	
Recent alluvium Organic	Clay				Blackwell	Muck Peat

Factors Affecting Soil Genesis in Lambton County

The characteristics of the soil at any given place depend on (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil has developed, (3) the plant and animals that live in and on the soil, (4) the relief and drainage and (5) the length of time the forces of development have been acting on the parent material.

Bedrock Geology

Almost everywhere in Lambton County, the bedrock is covered with a mantle of unconsolidated material as deep as one hundred feet or more. Rock exposures are infrequent. Most of the area is underlain by shale of the Kettle Point formation and limestone of the Hamilton formation. The areal distribution of the bedrock formations is shown on the geological sketch map.

Surface Geology

The glacial lakes had a most profound effect on the soil parent materials of Lambton County. The glaciers deposited large amounts of drift. During the retreat of the last (Wisconsin) glacier, however, glacial lakes covered parts of the County to various depths. During this inundation, the waves smoothed out the ridges and considerable amounts of sediment and outwash material were deposited.

The sandy and gravelly shorelines of some of the glacial lakes are important features of the landscape. One of the largest shorelines in the County is that of glacial Lake Warren. It forms a triangle from Thedford to Forest, Wyoming and back to Alvinston. The topography of the soils below the shoreline is level but above the shoreline where the land was not inundated the topography is undulating. In addition to the Lake Warren shoreline there are numerous other gravelly ridges that are believed to be remnants of the shorelines of other glacial lakes.

In Euphemia and Sombra townships, there are areas of sand that were deposited as deltas of glacial streams emptying into Lake Warren. The islands in Lake St. Clair have been formed by recent deltaic fine sands deposited at the mouth of the St. Clair River.

The large area of dune sands along the Lake Huron shore between Kettle Point and Grand Bend was formed by wind carrying fine sand up from the beach.

On the inland side of the sand dunes there is a low lying area that consists of recently deposited alluvium. The surface soil material consists of organic material, sand, clay and gravel that have been deposited during the long periods of inundation that occurred before "The Cut" was built to permit drainage of the area and the development of the Thedford marsh as it appears to-day.

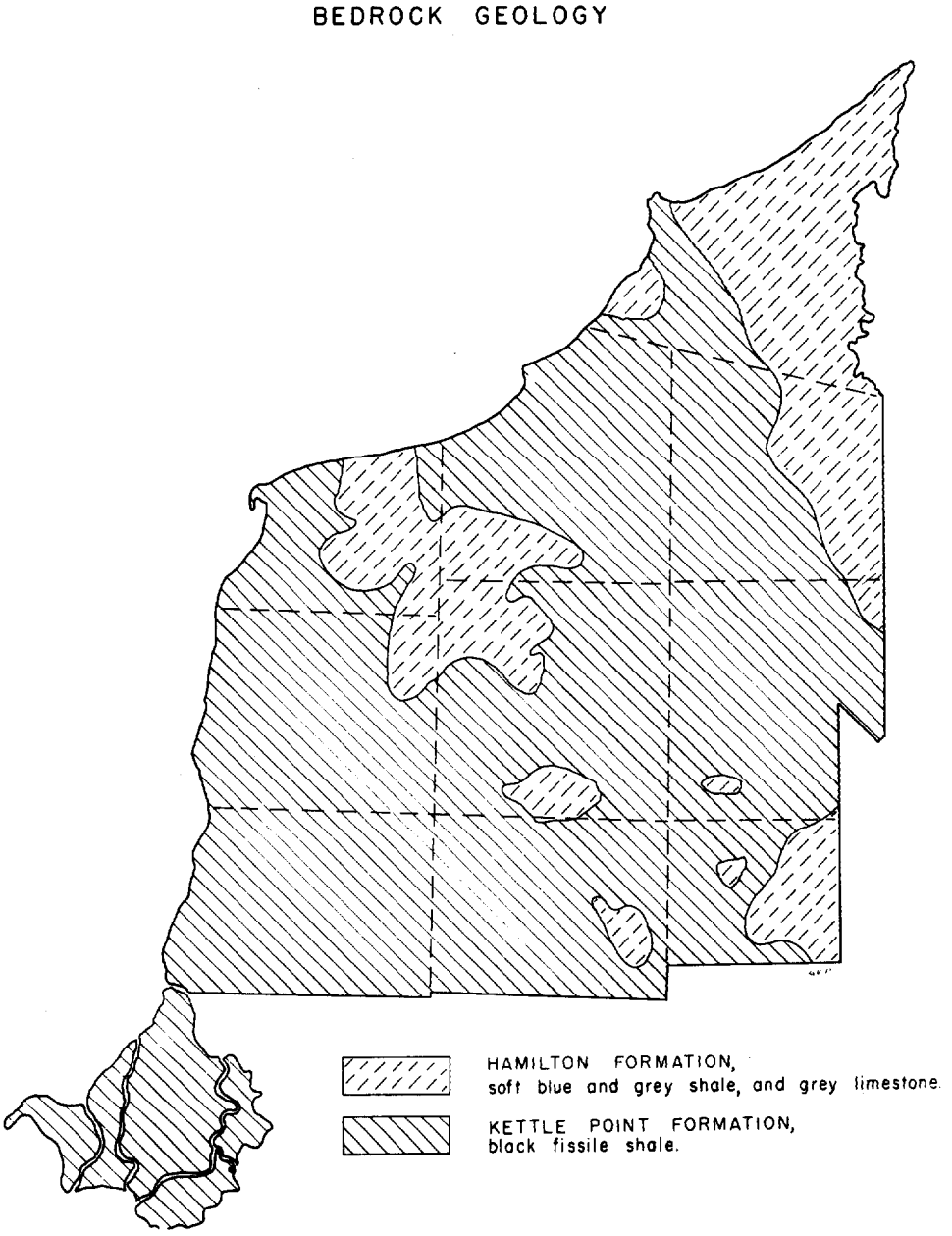


Fig. 6 Bedrock Geology of Lambton County

TABLE 9

SURFACE DEPOSITS IN LAMBTON COUNTY

Deposit	Composition	Topography	Stoniness	Underlying Material
Glacial till.....	loams, clay loams	undulating	many stones	bedrock
Lacustrine.....	clay and clay loam	undulating to level	some stones	bedrock
Outwash.....	sand, sandy loam	level	stonefree	clay, or till
Shorelines and Beaches.....	sand, gravel	rolling ridge	gravelly	till
Alluvial.....	variable	depressional	stonefree or some erratic boulders	clay or till
Organic.....	partially decomposed plant material	depressional	stonefree	clay, sand or till

Climate

The climate is relatively uniform over the County and so soil profile differences resulting from variations in rainfall or temperature are not noticeable. Because of the level topography, slope has had little effect on soil development except as it is reflected in soil drainage.

Vegetation

Although the vegetation varied somewhat in the area the variation is largely correlated with differences in drainage and texture of parent material.

Soil Age

The effects of time of exposure to weathering on the kind of soil developed is difficult to evaluate. Although this region is one of the oldest in Ontario, it is still young as indicated by the narrow, widely spaced and sharply trenched stream valleys and the level areas between the streams.

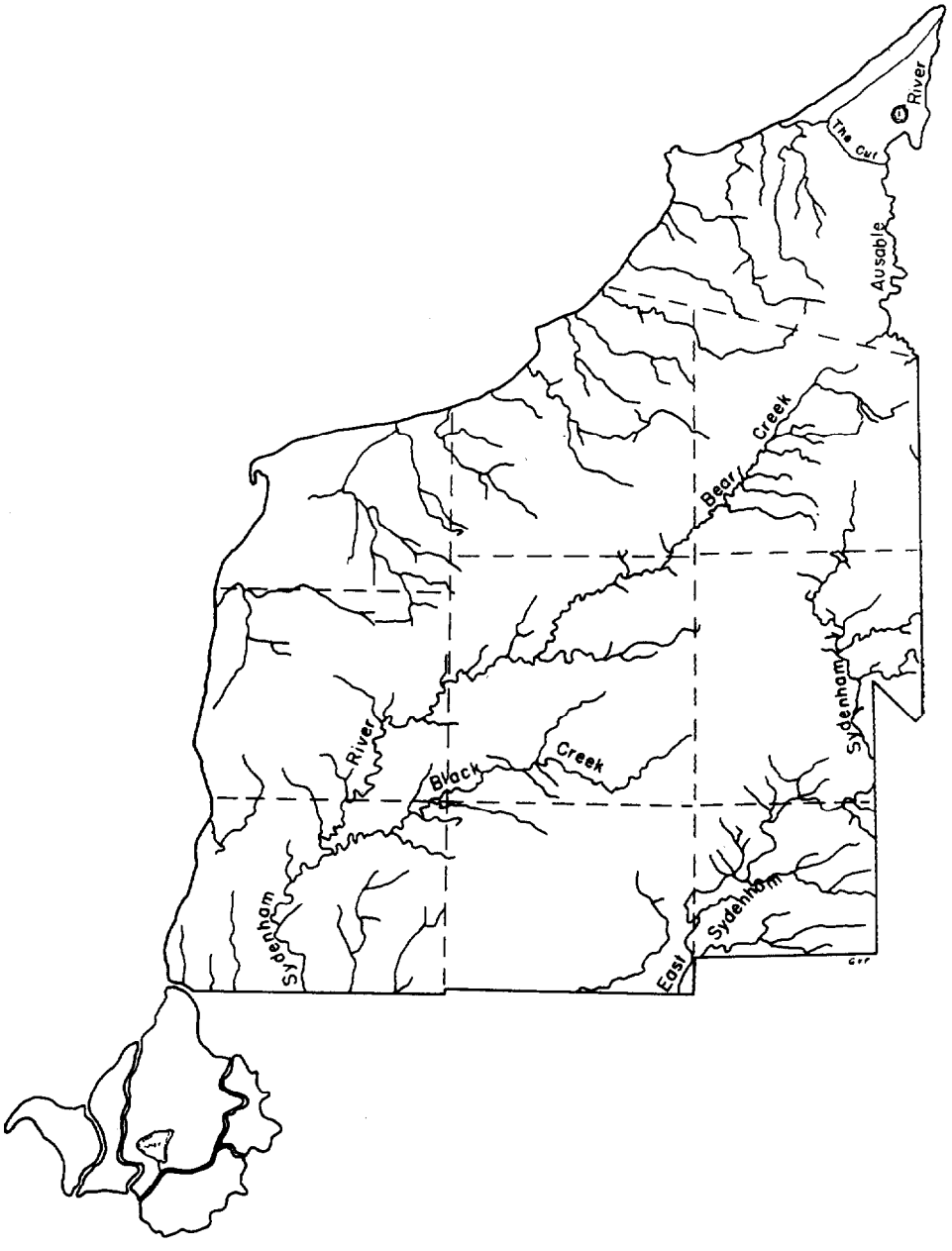


Fig. 7 Natural Drainage Courses in Lambton County

Taxonomic System of Classification

Soils that have developed where the factors of climate and vegetation have reached their full expression are known as zonal soils. In most of Lambton County, however, normal soil development has been hindered by inadequate drainage and intrazonal soils have developed. In areas where relief or excessive drainage has prevented the development of a profile, the soils are known as azonal soils.

Great Soil Groups

Soils that have the same kind, number, and sequence of major genetic horizons are classified in the same Great Soil Group. The classification of the soils of Lambton County is indicated in Table 10.

Representatives of only one zonal great soil group, Grey-Brown Podzolic, have developed in the County. These soils develop in well drained or imperfectly drained locations where moisture relations and nutrient content were favourable for the growth of hardwood trees.

The Caistor Series, although classified as a Grey-Brown Podzolic soil, has a very compact B_2 horizon characteristic of a Planosol.

The soil profile described below is representative of the well drained Grey-Brown Podzolic soils of the County.

A_0 —½-0 inches of partially decomposed litter of deciduous trees.

A_1 —0-4 inches of very dark brown soil; crumb structure; friable; pH 6.0-7.0.

A_{21}—4-12 inches of light brown soil; weak crumb structure; friable; pH 5.5-6.5.

B_2 —12-28 inches of greyish brown soil; medium sub-angular blocky structure; friable to hard; pH 6.5-7.2.

C —Grey or brownish grey calcareous material; pH 7.4.

In imperfectly drained locations the Grey-Brown Podzolic soils exhibit some mottling in the B_2 and A_2 horizons as well as in the C horizons. Moreover the colour of the B_2 horizon is more yellowish brown in the imperfectly drained profile.

Two intrazonal great soil groups—Dark Grey Gleisolic, Organic—occur in the County.

The poorly drained Dark Grey Gleisolic soils of Lambton County have profile features as described below.

A_1 —0-8 inches of very dark grey soil; medium crumb structure; friable; high in organic matter; pH 6.5-7.0.

G_1 —8-20 inches of light grey mottled with yellowish brown; weak coarse blocky structure; pH 7.0-7.2.

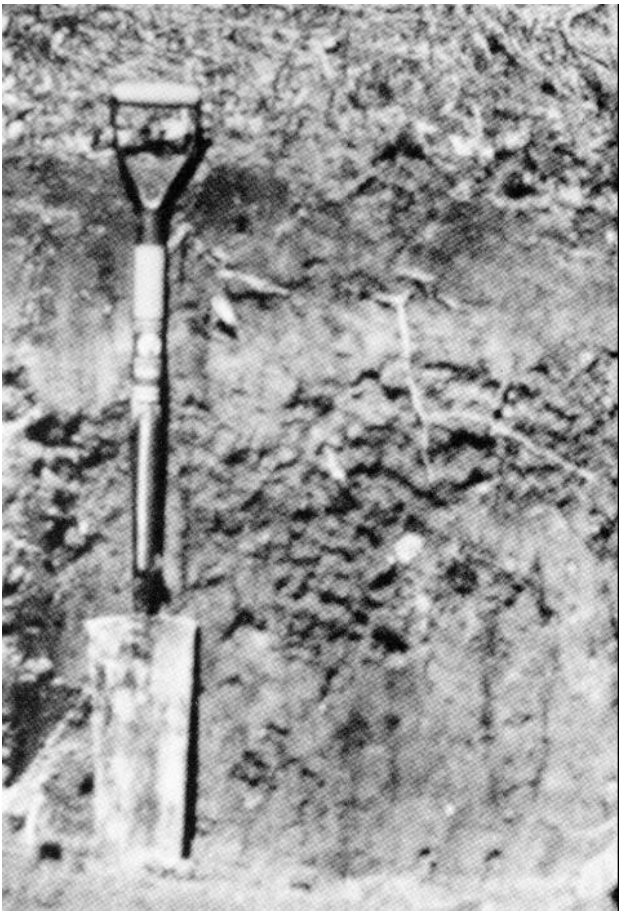
G_2 —20-30 inches of light brownish grey mottled soil of massive structure; pH 7.0-7.5.

C —Light grey calcareous soil; mottled; pH 7.4+

TABLE 10

CLASSIFICATION OF SOIL SERIES IN LAMBTON COUNTY

Parent Material	Great Soil Group					
	Grey Brown	Podzolic	Dark Grey Gleisolic	Bog	Alluvial	Regosol
	Well drained	Imperfectly drained	Poorly drained	Very Poorly drained	Poorly drained	Well drained
Glacial till						
loamy calcareous	Guelph					
water modified clay till	Huron	Perth	Brookston			
shaley clay till		Caistor				
Outwash materials						
sand	Fox	Brady	Granby			Plainfield
gravels	Burford	Brisbane	Gilford			Shashawandah
sand over clay till		Berrien				
Lacustrine material						
fine sandy loam and silt			Colwood			
silt and clay			Toledo			
silt and clay (grass vegetation)			Clyde			
silt over clay till		Lambton				
Recent Alluvium					Blackwell	
Organic deposits						
well decomposed				Muck		
poorly decomposed				Marsh		
				Peat		



A Grey-Brown Podzolic Profile

The very poorly drained soils belonging to the Organic Great Soil Group differ from the poorly drained soils in that they have a layer of muck or peat varying from a few inches to several feet underlain by grey mineral soil material. The largest tract of such soils is in the Thedford Marsh area.

Two azonal great soil groups-Alluvial and Regosol-are also found in small areas.

Alluvial soils occur in stream bottoms or in the Thedford Marsh and Blackwell areas where genetic horizons have not developed because of recent deposition of soil materials.

A Dark Grey Gleisolic Profile

Regosols occur on the drifting dune sand in which no genetic horizons have formed as well as on the shaley gravel near Kettle Point.

Soil Catena

The differences in soils that are due to differences in drainage are usually observable within field or farm boundaries. Because of the fact that well drained, imperfectly drained, and poorly drained soils often occur in close association, it is convenient to use the term “catena” to designate two or more soil series developed on similar parent material but differing in drainage.

Summary of the Classification of the Soils of Lambton County

	Acreage	% Total
A. Soils Developed from Till		
1. Medium textured calcareous till		
(a) Grey-Brown Podzolic Great Group		
(1) Well drained		
(a) Guelph loam	300	—
(b) Guelph loam—shallow phase	200	—
B. Soils Developed from Water-washed Till		
1. Fine textured calcareous till		
(a) Grey-Brown Podzolic Great Group		
(1) Well drained		
(a) Huron clay	13,900	2.0
(b) Huron clay—eroded phase	5,200	.8
(2) Imperfectly drained		
(a) Perth clay	131,300	18.2
(b) Perth clay—eroded phase	6,000	.9
(c) Perth clay loam	300	—
(b) Dark Grey Gleisolic		
(1) Poorly drained		
(a) Brookston clay	306,800	42.7
(b) Brookston clay—stony phase	1,500	.2
2. Fine textured calcareous till containing shale		
(a) Grey-Brown Podzolic Great Group		
(1) Imperfectly drained		
(a) Caistor clay	69,100	9.6
C. Soils Developed from Deltaic or Outwash Sands and Gravels		
1. Coarse textured outwash		
(a) Regosol Great Group		
(1) Excessively drained		
(a) Plainfield sand	15,900	2.2
(b) Eastport sand	2,400	.3
(b) Grey-Brown Podzolic Great Group		
(1) Well drained		
(a) Fox sandy loam	4,700	.6
(2) Imperfectly drained		
(a) Brady sand	10,700	1.5
(b) Brady sandy loam	7,800	1.0
(c) Dark Grey Gleisolic Great Group		
(3) Poorly drained		
(a) Granby sandy loam	1,800	.3
2. Gravelly, calcareous outwash		
(a) Grey-Brown Podzolic Great Group		
(1) Well drained		
(a) Burford loam	6,800	.9
(b) Burford loam, shallow phase	1,200	.2
(2) Imperfectly drained		
(a) Brisbane loam	13,100	1.8
(b) Brisbane loam—shallow phase	500	.1
(b) Dark Grey Gleisolic Great Group		
(1) Poorly drained		
(a) Gilford loam	100	—
3. Shaley gravels		
(a) Regosol Great Group		
(1) Well drained		
(a) Shashawandah loam	500	.1

4. Sandy outwash material underlain by lacustrine clay or clay till at three feet or less		
(a) Grey-Brown Podzolic Great Group		
(1) Imperfectly drained		
(a) Berrien sand	100	—
(b) Berrien sandy loam	7,100	1.0
D. Soils Developed from Lacustrine Materials		
1. Fine sandy loam		
(a) Dark Grey Gleisolic Great Group		
(1) Colwood fine sandy loam	15,300	2.2
2. Clay and silt		
(a) Dark Grey Gleisolic Great Group		
(1) Toledo clay loam	1,200	.2
(2) Toledo clay	300	—
(b) Wiesenboden Great Group		
(1) Clyde clay	1,900	.3
3. Silt loam and loam underlain by clay till at three feet or less		
(a) Grey-Brown Podzolic Great Group		
(1) Imperfectly drained		
(a) Lambton loam	600	.1
(b) Lambton silt loam	10,800	1.5
E. Soils Developed from Recent Alluvium		
1. Silt and clay, high in lime		
(a) Alluvial Great Group		
(1) Blackwell clay	8,600	1.2
2. Sand, silt, or clay of variable lime content in flood land along stream courses		
(a) Alluvial Great Group		
(1) Bottom land	35,900	5.0
F. Soils Developed from Organic Material		
1. Well decomposed		
(a) Organic Group		
(1) Muck	4,500	.6
(2) Marsh	16,500	2.3
2. Poorly decomposed		
(a) Organic Group		
(1) Peat	900	.1
G. Soil Complexes		
Perth clay and Berrien sandy loam	1,700	.2
Caistor clay loam and Berrien sandy loam	1,900	.3
Brookston clay and Berrien sandy loam	4,700	.6
Brady sandy loam and Brookston clay	4,800	.7

Description of Soils of Lambton County

The soils of Lambton County vary greatly in chemical and physical composition and hence in their capabilities to produce crops and in their response to management. These variations are reflected in the morphological characteristics which are used as the basis for separating the mapping units.

Most of the soils are poorly drained in their natural state owing to the nearly level relief and the dominance of soils of fine texture. The best soils for general farming are the clay soils but most of these, however, cannot be utilized until artificially drained. The sandy soils generally have better natural drainage and are most suitable for fruit crops and tobacco.

The soils of the County have been classified on the basis of the different soil parent materials, natural drainage, and kind of profile (i.e. Great Soil Group).

A. SOILS DEVELOPED FROM TILL

Glacial till in Lambton County is commonly found in the form of undulating plains and consists of sand and sharp edged stones in a clayey matrix. Because of the fact that much of Lambton County was submerged by glacial lakes, there is only a small acreage of soil developed from till that has not been modified by water.

1. MEDIUM TEXTURED CALCAREOUS TILL

The loamy till of the County was derived from a mixture of Onandaga limestone and smaller amounts of Huron shale. Only one soil series mapped in Lambton County has been developed from these parent materials.

GUELPH SERIES (500 ACRES)

The Guelph series represented by the Guelph loam has developed on loamy calcareous glacial till on undulating to rolling topography. The subsoil is permeable and internal and external drainage are good. The soils belong to the Grey-Brown Podzolic Great Soil Group.

A_1 —0-4 inches of dark grey-brown (10 YR 4/2) loam; medium granular structure; friable; some stones; pH 6.8.

A_{21}—4-12 inches of pale brown (10 YR 6/3) sandy loam; weak granular structure; friable; some stones; pH 6.7.

A_{22}—12-14 inches of grey (10 YR 6/1) sandy loam; weak granular structure; friable; few stones; pH 6.6.

B_2 —14-24 inches of brown (10 YR 5/3) loam; medium sub-angular blocky; moderately hard; several stones; pH 7.0.

C —Grey (10 YR 7/2) loamy calcareous till derived from dolomitic limestone and shale; pH 7.6.

The Guelph loam—shallow phase exhibits similar profile features except that the bedrock occurs at depths of one to two feet below the surface. Guelph soils occur only

on a ridge south of Thedford and in Plympton Township. The natural vegetation consisted of maple and beech.

Agriculture

The small acreage of Guelph loam in the County is used mainly for pasture because of its stony nature and shallowness. It tends to be droughty particularly where the bedrock is near the surface. The chief fertility deficiency is phosphorus and organic matter. .

B. SOILS DEVELOPED FROM WATER-WASHED TILL

Most of the till of Lambton County has been submerged by the glacial great lakes and hence it may contain fine material deposited from water.

1. Fine Textured Calcareous Till

The unweathered drift contains angular stones and occasional boulders mixed in a clayey matrix. The relief is undulating to level as a result of erosion and deposition by lake waters.

The Huron catena, of which the Huron series is the well drained member, the Perth series the imperfectly drained member, and the Brookston series the poorly drained member, occurs on these soil materials.

Huron Series (19,100 acres)

The Huron series is mapped, for the most part, along stream courses in Lambton County particularly along the Ausable River in the Arkona-Thedford area and along the Sydenham River near Alvinston. The topography is rolling to hilly, hence the external drainage is rapid although internal drainage is slow. The natural vegetation consisted of hard maple, beech, elm, and ash as well as walnut and oak.

The Huron soils belong to the Grey-Brown Podzolic Great Soil Group. Some slopes of up to 15 per cent along stream courses have been seriously eroded. Such areas have been mapped as Huron clay-eroded phase. The following is a description of a Huron clay near Arkona.

Huron clay (13,900 acres)

A_0—½-0 inches of partially decomposed litter from deciduous trees.

A_1—0-4 inches of dark grey (10 YR 3/1) clay; medium granular structure; friable; pH 6.5.

A_2—4-9 inches of pale brown (10 YR 6/3) clay; medium nuciform structure; friable; pH 6.8.

B_2—9-20 inches dark grey-brown (10 YR 4/2) clay; medium sub-angular blocky structure; hard; few stones; pH 7.0.

C —Light brownish grey (10 YR 6/2) clay till; high in lime but containing some shale; few stones; pH 7.6.

Chemical tests show that the levels of available calcium, magnesium and potassium are high. The organic matter content is medium but available phosphorus content is low.

Agriculture

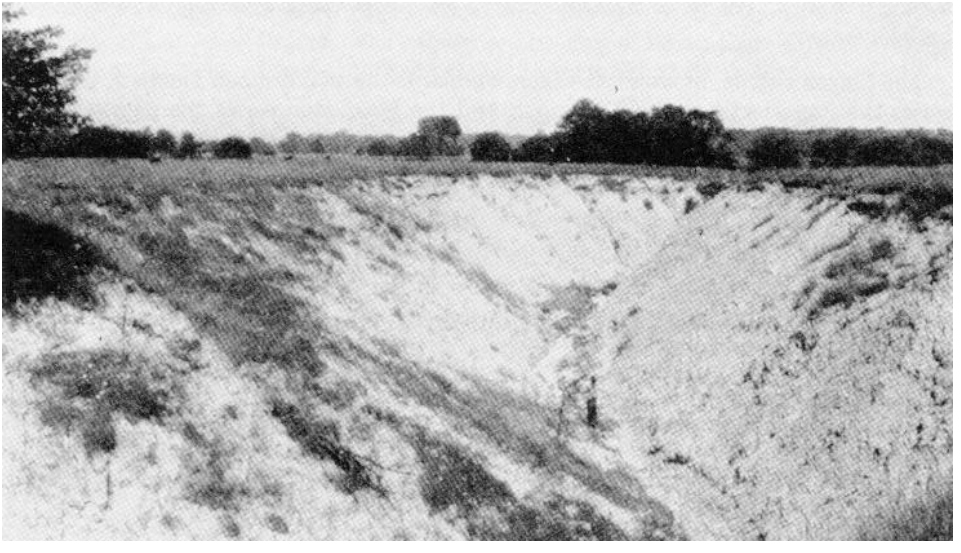
The Huron clay is well suited for the production of winter wheat, spring grains, alfalfa, clover, and corn. The soil is susceptible to erosion and so a cover should be maintained on the soil as much as possible.

In order to maintain the organic matter content and good soil structure, farmyard manure if available or green manure crops should be returned to the soil.

Clovers and alfalfa are good soil-building crops and should form part of the hay and pasture mixtures for Huron soils.

Complete fertilizers particularly high in phosphate are recommended for maximum yields. Additional nitrogen may be required for corn.

Huron clay-eroded phase (5,200 acres)



Gully Erosion on the Huron and Perth soils along stream courses. Reforestation or good permanent pasture can check such destruction

The eroded phase of the Huron clay occurs along the steep banks of the Ausable River and the shorecliff above Lake Huron. The area is strongly dissected by gullies and little if any topsoil is left in most instances. Reforestation or permanent pasture is recommended for these soils.

Perth Series (139,300 acres)

The imperfectly drained soils of the Huron catena are classified in the Perth series. The soil types in the series are Perth clay, and Perth clay loam. The soils are developed on undulating topography that is dissected along some of the stream courses. Elm, ash and soft maple with some hickory and oak were the natural vegetation.

The Perth soils belong to the Grey-Brown Podzolic Soil Group. A commonly occurring profile in a woodlot is described below.

Perth Clay (131,300 acres)

A_o—½-0 inches of partially decomposed litter from deciduous trees.

A_1—O-4 inches of very dark grey (10 YR 3/l) clay; medium granular structure; friable; pH 6.6.

A2—4-8 inches of pale brown (10 YR 6/3) clay; slightly mottled with yellow brown; medium sub-angular blocky structure; friable; pH 6.8.

B_2—8-14 inches of brown (10 YR 4/3) clay; mottled with yellow-brown; coarse blocky structure; hard; few stones; pH 7.0.

C—Light brownish grey (10 YR 6/2) clay till; high in carbonates; some Huron shale fragments; few to frequent stones; pH 7.8.

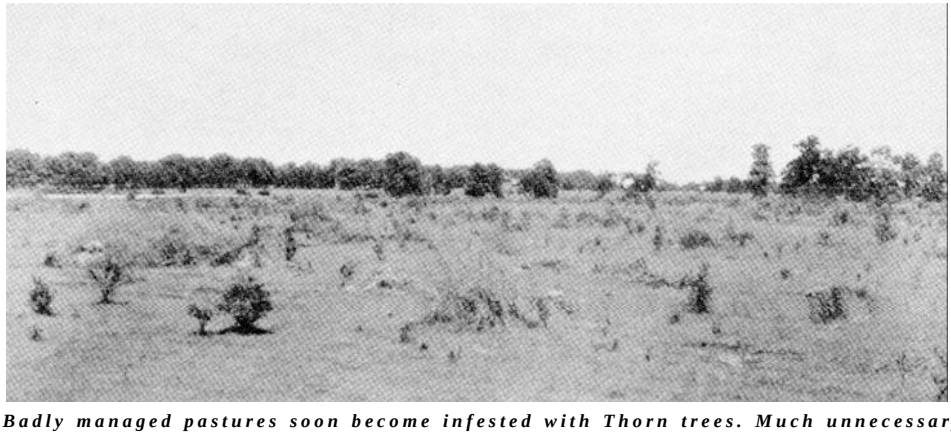
The profile development of the Perth soils has been affected by inadequate drainage and in some instances the A_2 and B horizons are very poorly defined.

The natural fertility is fair although phosphorus levels are low. A satisfactory physical condition of the surface soil can be maintained fairly easily by the management practices described for the Huron series.

Agriculture

Perth soils are well suited to the production of most crops grown in the County except the tree fruits and early vegetables.

During dry seasons, these soils usually produce good yields because of their large reserve supply of moisture. Some improvement in drainage is recommended for good yields of fall wheat and alfalfa. Corn, soybeans, and spring grains yield fairly well even without artificial drainage.



Badly managed pastures soon become infested with Thorn trees. Much unnecessary expense is involved in reclaiming such areas

If the maintenance of organic matter is neglected or if the soils are cultivated at improper moisture contents, they become difficult to work and less productive: A crop rotation that includes hay and pasture is commonly used on the Perth soils; hence organic matter depletion has not been serious to date.

Perth clay—eroded phase (6,000 acres)

Along the Lake Huron shorecliff and some of the stream courses, erosion has seriously reduced the productivity of the Perth soils. These areas are indicated as the eroded phase. Reforestation or the establishment of permanent pasture on these areas is recommended.

Perth clay loam (300 acres)

This soil type differs from the Perth clay only in the texture of the surface soil. The use and management of this soil is similar to that described for the clay type.

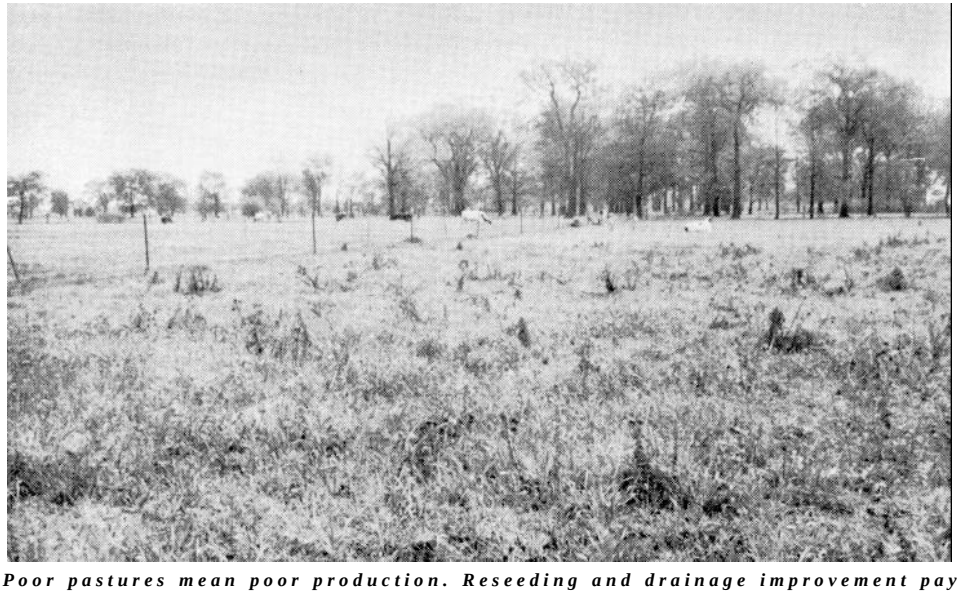
Brookston Series (313,000 acres)

The poorly drained soils of the Huron catena are classified in the Brookston series. The topography is level to slightly sloping and both the internal and external drainage are slow. Elm, ash, basswood with some hickory and sycamore formed the natural vegetation.

The Brookston soils belong to the Dark Grey Gleisolic Great Soil Group. The Brookston clay, the only Brookston soil mapped in the County is described below:

Brookston clay (306,800 acres)

A_0—1-0 inches of partially decomposed litter from deciduous trees.



Poor pastures mean poor production. Reseeding and drainage improvement pay dividends

A_1—O-8 inches of very dark brown (10 YR 2/2) clay; medium granular structure; friable; sticky when wet; a few surface pebbles; high in organic matter; pH 6.7.

G—8-20 inches of light brownish grey (10 YR 6/2) clay with some yellow-brown (10 YR 5/4) mottling; coarse blocky structure; very plastic; gritty; pH 7.0-7.2.

C—Grey-brown (10 YR 5/2) calcareous clay till; some Huron shale fragments; gritty; pH 7.8.

The Brookston clay occupies the largest acreage in the County. In parts of Moore, Sombra and Enniskillen townships the subsoil of the Brookston soils is heavy making drainage difficult. The soils in these areas also tend to be lower in organic matter than the Brookston soils elsewhere in Lambton County and in Essex County.

Agriculture

Without artificial drainage, the Brookston soils can produce pasture, hay and limited yields of cereal grains. When drainage is improved by installation of systematic tile systems, the soils produce good yields of fall wheat, and other cereal grains, alfalfa, corn, soybeans, or sugar beets.

The soils are inherently well supplied with all plant nutrients except phosphorus.

Clover and Alfalfa thrive on Brookston soils if drainage is improved

Unless adequate organic matter levels are maintained, the soils may become puddled when wet and baked during dry weather.

Fall plowing of these soils is recommended because frost action promotes good soil structure. Erosion is not a problem because of the level topography.

Brookston clay—stony phase (1,500 acres)

A small area of Brookston soils north-west of Sarnia has been mapped as stony phase. The land use is similar to the normal Brookston clay except for the additional hazard of stones that may interfere with cultivation.

2. FINE TEXTURED TILL CONTAINING SHALE

In the central and western portion of the County the soil materials consist of limestone till containing large fragments of Huron shale. The soils are fine textured due in part to the inundation of the area by glacial Lake Warren. Only one series, Caistor, has been developed in mappable areas on these soil parent materials.

Caistor Series (71,000 acres)

The Caistor series has developed on slightly undulating topography. The internal drainage is hindered by a compact subsoil and the external drainage is imperfect because of the numerous saucer-like depressions. The natural vegetation consisted of elm, ash and soft maple.

The Caistor series belongs to the Grey-Brown Podzolic Great Soil Group and includes the Caistor clay and clay loam types. The following profile is common in woodlots on Caistor clay.

A_0—½-0 inches of partially decomposed litter from deciduous trees.

A_1—0-3 inches dark grey (10 YR 4/1) clay loam; fine crumb structure; friable; pH 6.2.

A_2—3-6 inches of light grey (10 YR 7/2) clay; slightly mottled with yellow brown; fine platy structure; friable; pH 5.7.

B_1—6-9 inches of yellow-brown (10 YR 5/4) clay; somewhat mottled; medium blocky structure; hard; pH 5.8.

B_2—9-20 inches of brown (10 YR 5/3) clay; mottled with yellow-brown; coarse blocky structure; hard; pH 6.4.

C —Light grey-brown (10 YR 6/2) clay till; high in lime with some Huron shale; pH 7.6.

The B_2 horizon of the Caistor soils is frequently very fine textured and compact. Hence it tends to inhibit water percolation and root penetration. The knolls of Caistor are often eroded and the grey A_2 layer is exposed. In instances of extreme erosion, the hard B horizon, low in organic matter may be exposed. Such areas are very difficult to cultivate and have a low productivity.

Agriculture

The Caistor soils are best adapted to livestock type of farming and rotations that include few row crops. Because these soils are inherently low in organic matter, all crop residues should be returned to the soil and if possible green manure crops should be turned under regularly. All available farmyard manure should also be applied.

Since the soils are moderately acid, lime is required for good growth of alfalfa and clovers and complete fertilizer high in phosphorus is required for all crops.

The production of legumes is recommended on Caistor soils because they improve

Caistor soils have compact, fine textured sub-soil. Grey sub-surface layer is low in lime

the structure of the topsoil and their deep roots penetrate the "tight" subsoil and open it up. This promotes better aeration and drainage. If the subsoil is extremely tight, deep tillage may be profitable although no experimental results of such practices have been obtained.

C. SOILS DEVELOPED FROM DELTAIC OR OUTWASH SANDS AND GRAVELS

The parent materials of this group of soils were deposited by slowly moving water in the post-glacial lakes that covered Lambton County. The materials occur in the form of sand bars, outwash plain and shorelines.

1. COARSE TEXTURED OUTWASH

The soils developed from the sandy materials are members of the Fox catena of which the Plainfield is the excessively drained, the Fox the well drained, the Brady the imperfectly drained, and the Granby the poorly drained members.

Plainfield Series (15,900 acres)

The Plainfield series is developed from excessively drained dune sand that has been stabilized under a forest cover of oak and pine. Plainfield soils occur along the shore of Lake Huron between Point Edward and Bright's Grove and between Kettle Point and Grand Bend. The latter area is known as "The Pinery".

The coarse nature of the soil materials allows such rapid percolation of moisture that an A-C type of profile has developed. Occasionally a weakly developed B horizon may be evident. The Plainfield sand classified in the Regosol Great Soil Group is described below:

A_C—0-4 inches of yellow-grey sand; low in organic matter; single grain structure; stone-free; pH 6.0.

C —Light yellow sand grading into grey sand that may be calcareous; stonefree; pH of upper part is 6.0.

Agriculture

Very little of this soil is cultivated. It is droughty and subject to wind and water erosion. Hence much of this land is suitable only for trees. The inherent low fertility and organic matter content also limit the possibilities for agricultural crop production.

Fox Series (4,700 acres)

The Fox series occurs between Wyoming, Forest, and Thedford largely in the form of ridges that were the shorelines of glacial Lake Warren. The topography is smooth moderately sloping and the natural drainage is good. The natural vegetation consisted of hard maple and beech.

The Fox series consisting of the Fox sandy loam type, is classified in the Grey-Brown Podzolic Great Soil Group. The following is a description of the Fox sandy loam profile.

A_0 —¼-0 inches of partially decomposed litter of deciduous trees.

A_1 —0-5 inches of very dark grey (10 YR 3/1) sandy loam; fine granular to crumb structure; very friable; pH 6.6.

A_{21}—5-16 inches of yellow-brown (10 YR 5/6) sandy loam; single grain structure; very friable; pH 6.4.

A_{22}—16-22 inches of pale brown (10 YR 6/3) sandy loam; weak platy structure; very friable; pH 6.0.

B —22-30 inches dark brown (10 YR 4/3) loam or sandy clay loam; medium sub-angular blocky structure; sticky when wet; pH 6.8.

C —Light yellowish brown (10 YR 6/4) sand and fine gravel; stratified; some limestone and shale particles; pH 7.8.

Some gravel may be present in the Fox soil materials. The ridges mapped as Fox sandy loam, therefore, are good areas to prospect for gravel pits of commercial value.

Agriculture

Although the sand deposit is deepest near Thedford, most of the Fox soils are deep enough for successful cherry and peach orchards. Much of the Fox sandy loam in the County is used for tree fruit production. The soils are deficient in moisture in some seasons. The medium to low organic matter and fertility level require corrective measures.

Brady Series (23,300 acres)

The Brady series is the imperfectly drained member of the Fox catena and is found, for the most part, in Sarnia and Euphemia Townships. It occurs on level to undulating sand deposits south of the sand hills near the Lake Huron shore. The natural drainage is imperfect because of the presence of clay at depths of 4 to 10 feet. The natural vegetation was maple, ash, hickory, and elm.

The series, which includes the Brady sandy loam and the Brady sand, is classified in the Grey-Brown Podzolic Great Soil Group. The Brady sandy loam profile is described below.

Brady sandy loam (7,800 acres)

A_0—½-0 inches of partially decomposed litter from deciduous trees.

A_1—0-4 inches of very dark grey (10 YR 3/1) sandy loam; medium to fine crumb structure; very friable; pH 6.5.

A_2—4-12 inches of mottled yellow-brown (10 YR 5/6) sand; single grain structure; very friable; pH 5.9.

B —12-25 inches of brown (10 YR 4/3) sandy loam; mottled yellow-brown; coarse crumb structure; friable; pH 6.4.

C —Light yellowish brown (10 YR 6/4) sand; calcareous; pH 7.5.

D —Grey calcareous clay at depths varying from 4 to 6 feet.

The cultivated surface soil is very dark grey sandy loam approximately five inches thick. The natural fertility is medium to low and the surface reaction is usually slightly acid.

Agriculture

Most of the Brady soils are close to Sarnia and in Euphemia Township are devoted to the production of small fruits and vegetables. In recent years the development of housing projects near Sarnia has reduced the acreage that can be cultivated.

Truck crops yield very well on these soils provided relatively large amounts of commercial fertilizers are used. Provision must be made also for maintaining the organic matter content. In a general farming program this can be done by including clovers and alfalfa in the rotation.

Brady sand (10,700 acres)

The Brady sand is similar in management requirements to the sandy loam except that the fertility is lower as a result of the coarser texture of the surface soil.

Granby Series (1,800 acres)

The Granby series is the poorly drained member of the Fox catena developed on sand deposits in level to depressional areas. Like the Brady soils, the Granby soils are poorly drained because clay at 4 to 10 feet restricts water movement. Granby soils occur in association with the Fox soils on the Lake Warren beach and with the Plainfield soils near Point Edward. The natural vegetation consisted of elm with some soft maple and white cedar.

The Granby sandy loam is the only type in the series and is representative of the Dark Grey Gleisolic Great Soil Group. A cultivated profile is described below.

A_C —0-8 inches of (10 YR 2/1) black sandy loam; fine crumb structure; very friable; pH 7.0.

G —8-22 inches grey-brown (10 YR 5/2) sandy loam with some low contrast mottles; single grain structure; friable; pH 7.0.

C —Light yellow-brown (10 YR 6/4) sand; calcareous; pH 7.8.

D —Grey calcareous clay at depth varying from 4 to 10 feet.

Agriculture

Some of the Granby sandy loam is cleared and cultivated but most of it is in permanent pasture or woodlot. In most instances the cost of drainage improvement is justified only for the production of high cash value crops. After drainage improvement is effected, the organic matter is readily depleted. The natural fertility is low.

2. GRAVELLY, CALCAREOUS, OUTWASH

Gravelly, calcareous water-laid materials occur as beaches or outwash plains along the main drainage channels of the County. The gravel consists mainly of dolomitic limestone with small amounts of shaley and siliceous material. The gravel is overlain by one or two feet of medium textured material in which most of the profile is formed. The Burford catena, consisting of the well drained Burford series, the imperfectly drained Brisbane series, and the poorly drained Gilford series, has developed on these materials.

In some locations the gravel deposits are underlain by clay till at depths of three to six feet. In such instances the soils are mapped as the shallow phase of the appropriate series.

Burford Series (8,000 acres)

The Burford series occurs in small areas near Ravenswood and at Alvinston. The topography is undulating and the open subsoil provides good natural drainage. The natural vegetation was chiefly sugar maple and beech.

The Burford loam, the only member of the series, is classified as a Grey-Brown Podzolic soil. The profile is described below.

A_0 —½-0 inches of partially decomposed litter of deciduous trees.

A_1 —0-4 inches of dark brown (10 YR 4/3) loam; fine crumb structure; very friable; a few gravelly pebbles; pH 6.5.

A_{21}—4-14 inches of yellowish brown (10 YR 5/6) loam; fine crumb structure; very friable ;pH 6.5.

A_{22}—14-16 inches of light yellowish brown (10 YR 6/4) loam; weak platy structure; friable; pH 6.3.

B_2 —16-26 inches of brown (10 YR 5/3) clay loam; medium sub-angular blocky structure; friable; pH 7.0.

C —Very pale brown (10 YR 7/3) stratified gravel and sand; numerous dolomitic limestone fragments with some Huron shale; pH 7.8.

In some instances, the surface soil contains a large number of stones while elsewhere a layer of relatively stonefree loam may cover the underlying gravel.

The organic matter content of the cultivated soil is medium but the levels of phosphorus and potash are low.

Agriculture

The Burford series is usually intensively cultivated. It is an early soil and supports good orchards of peaches, cherries and apples. The soil can produce good yields of general farm crops such as wheat, corn, spring grains and clover. It tends to be droughty.

Burford loam—shallow phase (1,200 acres)

The shallow phase of the Burford loam is similar in management requirements but is less well adapted to orchards because the clay inhibits the root development of trees.

Brisbane Series (13,600 acres)

The Brisbane series, the imperfectly drained member of the Burford catena, is found only in small areas except for the relatively large tract east of Port Lambton. It occurs on level to slightly undulating topography. The main natural forest species on these soils were elm, ash, oak, and maple.

The only type in the series, Brisbane loam, is a Grey-Brown Podzolic soil and a representative profile is described below.

A_0—½-0 inches of partially decomposed litter from deciduous trees.

A_1—0-5 inches of very dark grey (10 YR 3/1) loam; medium crumb structure; gritty; very friable; pH 7.0.

A_2—5-14 inches of light yellow-brown (10 YR 6/4) loam or fine sandy loam; mottled; very weak platy structure; friable; pH 6.8.

B —14-21 inches of yellow-brown (10 YR 5/4) loam; mottled; weak sub-angular blocky structure; friable; pH 7.2.

C —Very pale brown (10 YR 7/3) calcareous gravel and sand; pH 7.4.

In some instances clay till occurs at 4 to 6 feet below the surface. Such areas are indicated as Brisbane loam—shallow phase.

The cultivated surface soil is medium to low in organic matter and available nutrients.

Agriculture

In the Port Lambton area, large acreages of tomatoes and beans are grown on the Brisbane soil. It is a highly valued soil in this area and few farms are devoted solely to general farm crops. Elsewhere in the County, Brisbane loam produces fair yields of wheat, corn, and cereal grains.

The natural drainage is unsatisfactory for alfalfa. The soil responds well to applications of complete fertilizer even without improved drainage.

Brisbane loam—shallow phase (500 acres)

The shallow phase of the Brisbane loam has an additional problem due to the presence of clay till at 4 to 6 feet below the surface. This tends to inhibit development of deep rooted crops.

Gilford Series (100 acres)

The Gilford series, the poorly drained member of the Burford catena, is mapped in small areas associated with the glacial beaches. The topography is depressional. The natural vegetation consisted chiefly of elm.

The only type in the series, Gilford loam, is classified in the Dark Grey Gleisolic Great Soil Group. A representative profile is described below.

A_0—½-0 inches of partially decomposed litter from deciduous trees.

A_1—0-7 inches of very dark brown (10 YR 2/2) loam; medium granular structure; very friable; pH 7.0.

G —7-27 inches of light yellowish brown (10 YR 6/4) loam; mottled with yellow-brown; fine sub-angular blocky structure; friable; pH 7.0.

C —Very pale brown (10 YR 7/3) stratified gravel and sand; calcareous; pH 7.8.

The cultivated surface soil is high in organic matter and moderately well supplied with available nutrients. The main problem is the lack of drainage.

Agriculture

When drainage is improved the Gilford loam will produce fair yields of most general farm crops.

It is especially well adapted to forage crop production. Without drainage, however, the soil produces only low quality pasture.

3. SHALEY GRAVEL

Along the present shoreline of Lake Huron south of Kettle Point, there is an area of shaley gravel that apparently has been deposited by wave action. The well drained soil developed from this material exhibits a poorly defined profile. Only one series, Shashawandah, has been mapped on these materials.

Shashawandah Series (500 acres)

The Shashawandah series in Lambton County has developed on undulating topography from shaley gravel. The natural vegetation consists of maple and beech with some pine. The natural drainage is good.

The Shashawandah loam is classified as a Regosol and exhibits a profile as described below.

A_0—½-0 inches of partially decomposed litter from deciduous and coniferous trees.

Shashawandah loam developed from shaley gravel

A_1—0-3 inches of dark brown (10 YR 4/3) stony loam; fine crumb structure; very friable; pH 5.2.

A_2—3-10 inches of dark grey-brown (10 YR 4/2) stony loam; fine crumb structure; friable; pH 4.6.

B_2—10-15 inches of reddish brown (5 YR 4/4) shaley, gravelly loam; weak crumb structure; pH 4.8.

C —Black shale; unconsolidated, flat rounded fragments.

Agriculture

There is no agricultural development on this soil and it is doubtful that it should be used for anything other than tree production. The excessive stoniness, low soil reaction and low fertility practically eliminate it as a potential agricultural soil.

4. SANDY OUTWASH MATERIAL UNDERLAIN BY LACUSTRINE CLAY OR CLAY TILL AT THREE FEET OR LESS

The shallow sand deposits over clay till in Lambton County are a result of wave action in the post glacial lakes which left sand bars of one to three feet in depth. On the relatively level topography of the area, the clay substratum hinders internal drainage to such an extent that no well drained profiles occur in the sandy materials. Areas of imperfectly drained soils do occur and they are mapped as Berrien series.

Berrien Series (7,200 acres)

The Berrien Series which includes sand and sandy loam types has developed on undulating topography. The natural vegetation consisted predominantly of beech, maple and elm.

The Berrien soils belong to the Grey-Brown Podzolic Soil Group and exhibit profiles like the one described below.

A_0—½-0 inches of partially decomposed litter of deciduous trees.

A_1—0-4 inches of dark grey-brown (10 YR 4/2) sandy loam; medium crumb structure; friable; pH 6.6.

A_2—4-10 inches of light brownish grey (10 YR 6/2) sandy loam; single grain structure; very friable; pH 6.6.

B_2—10-19 inches of brown (10 YR 5/3) sandy loam; single grain structure; friable; pH 7.0.

C —19-32 inches of grey-brown (10 YR 5/2) mottled with yellow-brown sand; may be calcareous in lower part; pH 7.4.

D —Grey (10 YR 5/1) clay till; calcareous; pH 7.8.

The clay till usually occurs at depths of three feet or less. The cultivated surface soil is moderately well supplied with organic matter but the levels of available nutrients are low.

Agriculture

Because of the low fertility and coarse texture and resultant low water-holding capacity, the Berrien soils are not used intensively for agriculture.

The chief grain crop grown on these soils is rye which gives only fair yields. With relatively high rates of fertilization fairly good yields of spring grains and corn can be obtained.

When left without cover, the soils are susceptible to wind during dry periods. The Berrien sandy loam is usually more suitable for agriculture than the sand type.

D. SOILS DEVELOPED FROM LACUSTRINE MATERIALS

Lacustrine materials have been deposited in deep, still or slowly moving water. Hence, they are found in the beds of the glacial lakes and consist of silt, clay or very fine sand which may be varved. In Lambton County the lacustrine soils have relatively level topography.

1. FINE SANDY LOAMS AND SILT DEPOSITED BY WATER.

The fine sandy loams and silts of Lambton County were deposited by the St. Clair River as it entered Lake St. Clair. The natural drainage is poor and so only one series, Colwood, has been mapped on these materials.

Colwood Series (15,300 acres)

The Colwood series is developed from very fine sand and silt on level topography. The native vegetation consisted of soft maple, poplar and willow but in the very poorly drained areas reeds and sedge grasses predominated.

The Colwood fine sandy loam, the only type in the series belongs to the Dark Grey Gleisolic Great Soil Group. A representative profile is described below.

A_C—0-6 inches of very dark grey (10 YR 3/1) fine sandy loam; fine crumb structure; friable; pH 7.0.

G_1—6-14 inches of grey (10 YR 5/1) fine sand with light yellow-brown mottles; weak sub-angular blocky structure; friable; pH 7.2.

G_2—14-27 inches of grey (10 YR 5/1) fine sandy loam with large yellow-brown mottles; weak sub-angular blocky structure; friable; pH 7.4.

C —Grey (10 YR 5/1) stratified sand and silt; calcareous; pH 7.6.

Agriculture

When the Colwood soil is artificially drained, it is well suited to the production of vegetables, canning crops, corn and sugar beets. Without improved drainage it remains largely as hay and pasture land or as woodland.

On the Island of St. Anne, a large area of Colwood soils has been dyked and drained and is now under intensive cultivation producing corn, wheat, beans, sugar beets, and

tomatoes. The soils require heavy fertilization with phosphorus and usually respond to potash fertilizer as well.

2. CLAY AND SILT DEPOSITED BY WATER.

The lacustrine clays and silts occur for the most part in the northern part of the County near the Thedford Marsh. The only series mapped on these materials in the Thedford area is the Toledo. In a small area south of Sarnia and another west of Alvinston, soils on similar materials have developed under a grass type of vegetation. These soils are classified in the Clyde series.

Toledo Series (1,500 acres)

The Toledo series is the poorly drained member of the Brantford catena. The topography is level. The natural vegetation consisted of elm, aspen and basswood.

The series includes two types, Toledo clay and Toledo clay loam, and is classified in the Dark Grey Gleisolic Great Soil Group. The clay loam profile is described below.

A_0—½-0 inches of partially decomposed litter from deciduous trees.

A_1—0-7 inches of very dark grey-brown (10 YR 3/2) clay loam; fine granular structure; very friable; pH 7.0.

G —7-18 inches of grey-brown (10 YR 5/2) clay loam; medium sub-angular blocky structure; mottling increases with depth; friable consistency; pH 7.4.

C —Pale brown (10 YR 6/3) mottled clay; some shells present; calcareous; pH 7.8.

Agriculture

The Toledo soils are suitable for the production of alsike, timothy, oats, barley, and buckwheat. If drainage is improved, a wider variety of crops can be grown.

Drainage improvement increases the adaptability of these soils. If they are intensively cropped, however, the organic matter may be depleted rapidly and a poor physical condition may result. Maintenance of organic matter content by frequent applications of farmyard or green manure is necessary. Drainage improvement, however, is the prime requirement of these soils.

Toledo clay (300 acres)

This type is similar in morphology and land use requirements to the clay loam type.

Clyde Series (1,900 acres)

The Clyde soils developed under wet conditions on level topography. The native vegetation consisted of grass, reeds and cattails.

The Clyde clay is the only type mapped in the County. It has the profile characteristic of the Wiesenboden soils.

A_1—8-12 inches of very dark grey (10 YR 3/1) or black clay (10 YR 2/1); medium granular structure; high in organic matter; stonefree; pH 7.0-7.2.

G_1—12-18 inches of grey clay; (10 YR 5/1) coarse granular structure; sticky when wet; pH 7.2.

G_2—18-20 inches of grey clay (10 YR 5/1) coarse blocky structure; stonefree; pH 7.2.

C —At 30-36 inches grey calcareous clay till; medium blocky structure; pH 7.4-7.6.

In an area of south Brooke Township there is sometimes a layer of shallow muck on the surface and thin bands of shaley gravel occur within the profile.

Agriculture

With adequate drainage by means of tile the Clyde soils are quite productive. They respond well to phosphorus and potassium fertilization. In an area south of Sarnia, they are used mostly for natural pasture but in Brooke township they produce good sugar beets, wheat, beans, and corn as well as other general farm crops.

3. SILT LOAM AND LOAM UNDERLAIN BY CLAY TILL AT THREE FEET OR LESS

Calcareous silt loam and loam materials have been deposited over clay till in the area between Watford and Alvinston and in a small area west of Warwick village. The agency of deposition may have been water but there is some possibility that the materials were deposited by wind. Only one series, Lambton, has been mapped on these materials.

Lambton Series (11,400 acres)

The Lambton series has developed on strongly undulating topography under conditions of imperfect drainage. The internal drainage is restricted by the underlying impermeable clay till. The natural vegetation consisted of hard maple and beech with some elm, basswood, and ash.

The series includes the silt loam and loam types and is classified in the Grey-Brown Podzolic Great Soil Group. The Lambton silt loam profile is described below.

Lambton silt loam (10,800 acres)

A_0—¼-0 inches of partially decomposed litter from deciduous trees.

A_1—0-5 inches of dark grey-brown (10 YR 4/2) silt loam; fine crumb structure; very friable; pH 6.2.

A_2—5-12 inches of light brownish grey (10 YR 6/2) silt loam; single grain structure; sometimes weakly platy; slightly to strongly mottled with yellow-brown; friable; pH 6.0.

B_2—12-22 inches of (10 YR 5/3) brown clay or silty clay loam; mottled yellow-brown; medium blocky structure; hard; pH 6.6.

C —Grey brown (10 YR 5/2) clay or stratified silt over clay; calcareous; pH 7.6.

D —Grey (10 YR 5/1) calcareous clay till; pH 7.6.

The overburden of silty materials varies from 12 to 20 inches in thickness but tends to be thinner along stream courses presumably as a result of erosion. The cultivated soil is moderately well supplied with nutrients, medium to low in organic matter and is moderately acid.

Agriculture

Most of the soil has been cleared and is devoted to general farming. It is well adapted to wheat, corn, and spring grains and, with application of lime, to alfalfa and clovers. The soil is quite versatile however, and can produce good yields of cash crops such as peas, white beans, and tomatoes.

Lambton loam (600 acres)

Near the village of Warwick the surface is loamy in texture and tends to be slightly better drained than the silt loam soils. The profile however is quite similar to that described above and the use and management requirements of the Lambton loam are similar to those described for the silt loam.

E. SOILS DEVELOPED FROM RECENT ALLUVIUM

Certain areas in the County are flooded periodically or have been flooded in relatively recent times. The flood waters invariably carry sand, silt and clay as well as organic materials which have been deposited in the flooded area. Such deposits are called Alluvial Deposits. There are two kinds of Alluvium in Lambton County. In the Blackwell and Thedford marsh areas alluvial materials were deposited in relatively shallow ponds behind the sand hills along the Lake Huron shore. With the excavation of "The Cut" the areas were drained and are used now for vegetable crops. In long narrow bodies along stream courses alluvial materials have been deposited by water on low lying areas during spring floods. The soils developed from the former materials are classified in the Blackwell series and the latter have been mapped as Bottom Land.

Blackwell Series (8,600 acres)

The Blackwell series has developed on level topography from alluvial materials deposited in relatively recent times in shallow pondings that were connected to Lake Huron through the sandy area to the north. The natural vegetation was reeds, marsh grasses and cattails. The natural drainage is poor.

The series is classified in the Alluvial Great Soil Group. The profile described below is representative of the Blackwell clay.

A_1—0-8 inches of black (10 YR 2/1) clay or silty clay; medium crumb structure; very friable; high in organic matter; calcareous; pH 7.4.

G —8-25 inches of grey (10 YR 5/1) calcareous clay containing numerous shells; massive structure; plastic; partially decomposed wood and other plant material may be present; pH 7.4.

C —Grey (10 YR 5/1) silt and clay with many shells; calcareous; pH 7.6.

The thickness of the A_1 horizon is quite variable and in some instances extends to depths of 24 inches. Below the A_1 horizon there may be strata of sand and even gravel in the silty clay subsoil. Such variability is to be expected, however, in view of the mode of deposition of the materials.

Agriculture

The Blackwell soils are intensively cultivated. The main crops grown are sugar beets, potatoes, onions, garden beets, carrots, and beans. By the use of large open ditches the area has been drained. This lowers the watertable enough that the land can be readily cultivated. In recent years, some tile drains have been laid. This may be an indication that there has been a deterioration of structure which slowed down the natural percolation of water through the soil.

The Blackwell soils are low in phosphorus as are most Ontario soils. Because of wet conditions, they will usually respond to potash as well.

Bottom Land (35,900 acres)

Soils adjacent to stream courses and subject to flooding during part of the year are mapped as Bottom Land. The soil materials have been deposited recently and indeed deposition may still take place during floods. The tree cover consists of elm, ash and willows. The soil consists of layers of silt, sand and clay intermixed with layers of organic matter. Usually there is a gradation in colour from very dark grey to grey from the surface downward.

Agriculture

Bottom Land is moist at all times and the abundant growth of grass provides good grazing. Good yields of farm crops can be obtained if serious flooding does not occur during the normal growing season of the crop.

F. SOILS DEVELOPED FROM ORGANIC MATERIALS

Organic deposits in Lambton County are formed mainly by the decomposition of grasses, sedges and wood. They occur where drainage is very slow or where the water becomes impounded.

Muck (4,500 acres)

The organic material comprising muck is well decomposed. Muck soils are classified in the Organic Great Soil Group.

1—Very dark grey (10 YR 2/1); well decomposed sedges, leaves and wood; greater than 12 inches thick.

2—Less well decomposed woody material.

3—Calcareous clay or marl or sand.

Agriculture

Muck soils occur for the most part in the Blackwell area and on the western part of the Thedford Marsh.

The Muck soils in Lambton County are being intensively cultivated. They produce

Muck is underlain by clay, sand or, in some places, by marl. When cleared and drained this soil produced excellent vegetable crops

good crops of celery, carrots, beets, potatoes, and other market garden produce. Recently mint has become an important crop.

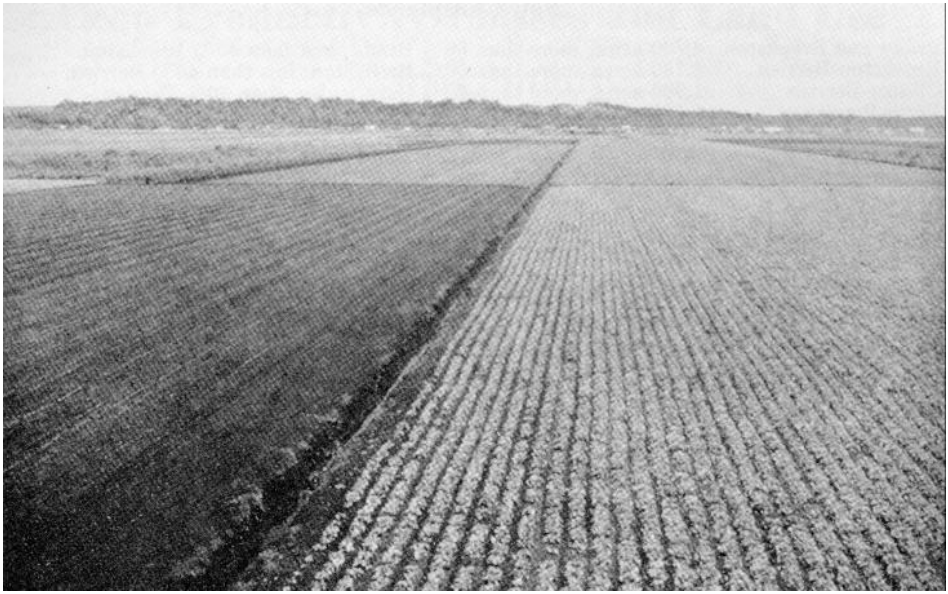
There is some tendency for these soils to be eroded by the wind when exposed. The level of potassium and phosphorus is usually low and good results are obtained from the application of large quantities of these elements in fertilizer mixtures.

Marsh (16,500 acres)

The Marsh land of Lambton County is underwater for all or part of the season. It occurs along the Lake Huron shore south of Kettle Point and supports a vegetation of sedges, rushes and cattails.

Agriculture

The marsh lands are not being used for agriculture at present. Large engineering works for water control are required to permit agricultural use of these areas. Some of them may provide pasture during the dry season but for the most they are used for recreational purposes such as duck hunting and trapping and for wildlife habitat.



The Thedford Marsh is productive of high value crops such as celery, carrots, onions

Because of their low topographic position they are covered with water for much or all of the season. Thus dykes and pumping would he necessary to bring these lands into cultivation.

Peat (900 acres)

Peat is an organic soil developed from the remains of reeds and sedges. Peat soils occur in the Thedford Marsh in Lambton County. The peat is often slightly acid but in some places it is covered by silty material that contains free carbonates. This silty covering was deposited by flood waters. The construction of drainage canals has allowed cultivation of the peat area. In its original state the area was probably covered with water most of the year. The soil belongs to the Organic Great Soil Group.

The native vegetation is reeds and sedges with poplars encroaching on the border areas.

l—0-20 inches of brown poorly decomposed plant remains; pH 6.1-6.2.

2—20-40 inches of brown fibrous organic material; slightly decomposed; pH 6.1-6.2.

3—At 40-60 inches grey clay containing numerous aquatic shells; calcareous.

Agriculture

Most of the area has yet to be reclaimed for agriculture. In recent years some land has been cleared and is used for the growing of celery, carrots, and other market garden crops. Like most organic soils, the peat is low in potassium and phosphorus. Other trace elements are often in short supply on such soils.

Soil Complexes

Brady and Brookston	4,800 acres, more than 60% Brady; less than 40% Brookston.
Brookston-Berrien	4,700 acres, more than 60% Brookston; less than 40% Berrien.
Caistor-Berrien	1,900 acres, more than 70% Caistor; less than 30% Berrien.
Perth-Berrien	1,700 acres, more than 70% Perth; less than 30% Berrien.

In some areas in the County, small spots of sand from 10 to 100 feet in diameter occur on the clay till materials. The profile developed in the sandy spots is similar to the Berrien or Brady soils whereas the profile developed in the clay till between the sand spots is similar to the Huron, Perth or Brookston soils.

Because the areas of sand and clay are too small to delineate separately on the map they have been mapped as a complex. The soil series whose name appears first in the name of the complex is present in largest acreage in that particular area.

Agriculture

The use and management problems of the areas mapped as complexes include those described previously for each of the series making up the complex.

An additional problem arises from the fact that the fertility levels, management requirements and crop adaptability of the two series in a complex may be quite different. Yet because the two series are so closely associated in small areas it is impractical to manage them or fertilize them differently.

Eastport Series (2,400 acres)

Drifting dune and beach sand along the Lake Huron shore has been classified in the Eastport series. The soils belong to the Regosol Great Soil Group.

Agriculture

The best use for these soils is the production of trees or as recreation land.

Crop Productivity Classes and Land Use Management

Of the various factors that affect soil productivity, climate is one that cannot be altered. Fortunately, the climate of Lambton County is suitable for the production of a wide range of crops. The successful production of any crop depends also on the suitability of the soils to produce that crop. The simplest method of soil conservation and good land use management is the selection of crops that produce most efficiently and profitably on the soil types available.

The potentialities and limitations of the soil types for crop production have been discussed previously. The comparative adaptability of the soil types and phases for selected crops grown in Lambton County, shown in Table 11, is a sound basis on which to formulate a better soil management programme.

The limitations of such crop adaptability ratings, however, must be realized in the beginning. In making these ratings the inherent characteristics of the soil were weighed against the requirements of specific crops. The ratings do not carry an implication of mathematical precision. They are made for crops commonly grown in the area under prevailing systems of management. The rating may change with the introduction of new varieties, new crops, etc., or other unforseen factors. A knowledge of the soil characteristics was supplemented with observation of the crops being grown. Thus the expression of these ratings depends upon the judgement of those responsible for preparing them.

On the basis of the best information available from soil workers, agronomists, and farmers, as well as from observations made during the survey, the soils have been grouped into six productivity classes and rated for eleven crops commonly grown in the County.

Management Requirements of Crop Productivity Classes

In general, the soils rated as good cropland have the highest agricultural potential while the poor cropland has the lowest potential. In other words, for each unit of time and money invested in good soils the returns per acre are likely to be higher than the returns from poor soils.

Good Cropland

Soil Type	Acreage	% Total Acreage of County
Huron clay	13,900	2.0
Guelph loam	300	—
Total	14,200	

With simple management practices that maintain an adequate soil organic matter content and satisfactory fertility levels, the Huron and Guelph soils produce moderate to high yields of general farm crops. The Huron clay may require special management to maintain satisfactory physical condition and to control erosion.

Good to Fair Cropland

Soil Type	Acreage	% Total Acreage of County	Natural Limitations
Lambton silt loam	10,800	1.5	drainage, erosion
Lambton loam	600	.1	" "
Perth clay loam	300	—	" "
Perth clay	131,300	18.2	" "
Burford loam	6,800	.9	fertility, droughtiness
Burford loam—shallow phase	1,200	.2	fertility
Total	151,000		

When the drainage is improved, the Lambton and Perth soils become good cropland. Erosion is a problem in certain instances but good soil management practices usually are sufficient to control erosion.

The Burford soils are well suited to the production of specialized crops such as tree fruits, raspberries and vegetables. The greatest limitation to production is the low fertility. Fertilizer and manure must be applied for maximum production. Although the coarse open subsoil permits early spring cultivation it does lead to droughtiness later in the season.

Fair Cropland

Soil Type	Acreage	% Total Acreage of County	Natural Limitations
Fox sandy loam	4,700	.6	fertility
Caistor clay	69,100	9.6	drainage, fertility, compacted subsoil
Brookston clay	306,800	42.7	drainage
Toledo clay loam	1,200	.2	drainage
Toledo clay	300	—	drainage
Clyde clay	1,900	.3	drainage
Blackwell	8,600	1.2	drainage
Colwood fine sandy loam	15,300	2.2	drainage, fertility
Total	407,900		

The productive capacity of the Fox sandy loam is limited only by the low fertility. Applications of fertilizer and manure are essential for successful crop production. The other soils of the group require artificial drainage. When the drainage is improved by means of tile drains and open ditches the Brookston, Toledo and Clyde soils become good cropland particularly for corn, soybeans, hay and pasture. The Blackwell and Colwood soils are very poorly drained naturally and the cost of drainage improvement is generally higher.

Fair to Poor Cropland

Soil Type	Acreage	% Total Acreage of County	Natural Limitations
Perth and Berrien	1,700	.2	drainage, fertility
Brookston and Berrien	4,700	.6	drainage, fertility
Caistor and Berrien	1,900	.3	fertility, drainage
Brady and Brookston	4,800	.7	fertility, drainage
Brisbane loam	13,600	1.9	drainage, fertility
Berrien sandy loam	7,100	1.0	fertility, drainage, erosion
Brady sandy loam	7,800	1.0	fertility, drainage, erosion
Berrien sand	100	—	fertility, drainage, erosion
Brady sand	10,700	1.5	fertility, drainage, erosion
Total	52,400		

The soil complexes are classed as fair to poor cropland because, in addition to the limitations of the constituent soil types, the variability in drainage and fertility over short distances makes it almost impossible to manage and use each of the soils most effectively. The remaining soils in the group require drainage and fertility improvement before satisfactory production can be attained. The coarse textured soils are also susceptible to wind erosion when they are cultivated.

Poor Cropland

Soil Type	Acreage	% Total Acreage of County	Natural Limitations
Gilford loam	100	—	drainage
Granby sandy loam	1,800	.3	drainage, fertility
Brookston clay—stony phase	1,500	.2	stoniness, drainage
Guelph loam—shallow phase	200	—	shallowness, droughtiness
Huron clay—eroded phase	5,200	.8	erosion
Perth clay—eroded phase	6,000	.9	erosion
Total	14,800		

Fortunately, there is only a small acreage of poor cropland in Lambton County and each unit area of such land is small and in association with better land. Wherever such soils occur, however, they present a problem in land use.

Submarginal Cropland

Soil Type	Acreage	% Total Acreage of County	Natural Limitations
Shashawandah loam	500	.1	fertility, lack of lime, stoniness
Muck	4,500	.6	drainage
Bottom Land	35,900	5.0	drainage, flooding
Plainfield sand	15,900	2.2	fertility, droughtiness
Peat	900	.1	drainage
Eastport sand	2,400	.3	fertility, wind erosion
Marsh	16,500	2.3	drainage
Total	81,100		

The Bottom Land is subject to flooding and therefore is suitable for grazing land only. Lack of fertility and low moisture holding capacity are serious limitations of the Shashawandah, Plainfield and Eastport soils. The muck and peat require artificial drainage. The cost of drainage improvement is justified only for the production of high value vegetable crops.

TABLE 11

CROP ADAPTABILITY RATINGS FOR SOILS OF LAMBTON COUNTY

	Wheat	Oats and Barley	Husking Corn	Soy-beans	Alfalfa and Red Clover	Alsike Timothy	Sugar Beets	Tree Fruits	Veg. Crops	Canning Tom-atoes	Pasture
Good Cropland											
Huron clay	G	G	G-F	G-F	G	G	G-F	F	F	F	G
Guelph loam	G	G	G-F	G-F	G	G	G-F	G-F	G-F	F	G
Good to Fair Cropland											
Lambton silt loam	G	G-F	G-F	G-F	G	G	G-F	F	F	F	G
Lambton loam	G	G-F	G-F	G-F	G-F	G	G-F	F	F	F	G
Perth clay	F	G-F	F	F	F	G-F	F	F	F	F	G
Perth clay loam	F	G-F	F	F	F	G-F	F	F	F	F	G
Burford loam	G-F	G-F	G-F	G-F	F	F	F	G-F	G-F	G-F	G-F
Burford loam—shallow phase	G-F	G-F	G-F	G-F	G-F	G-F	F	F	F	G-F	G-F
Fair Cropland											
Fox sandy loam	F	F	F	F	F	G-F	F	G-F	G-F	F	F
Caistor clay	F	G-F	F-P	F-P	P	F	F-P	F-P	F-P	F-P	F
Brookston clay	P	F	F-P	F-P	P	F	F	F	F	P	G-F
Toledo clay loam	P	F	F-P	F-P	P	F	F	F	F	P	G-F
Toledo clay	P	F	F-P	F-P	P	F	F	F	F	P	G-F
Clyde clay	P	F-P	F-P	P	P	F-P	P	P	P	P	F
Blackwell clay	P	F-P	F-P	P	P	F-P	P	P	P	P	F
Colwood fine sandy loam	P	P	F-P	F-P	P	F	P	P	P	P	F
Fair to Poor Cropland											
Perth and Berrien	F-P	F-P	F	F	F-P	F	F-P	P	P	F-P	F
Brookston and Berrien	P	P	F	F-P	F-P	F-P	F-P	P	P	F-P	F-P
Caistor and Berrien	P	P	F-P	F-P	P	P	F-P	P	P	F-P	F-P
Brady and Brookston	P	P	F-P	F-P	P	P	P	P	P	F-P	P

TABLE 11 (Cont'd.)

	Wheat	Oats and Barley	Husking Corn	Soy-beans	Alfalfa and Red Clover	Alsike Timothy	Sugar Beets	Tree Fruits	Veg. Crops	Canning Tom-atoes	Pasture
Brisbane loam	P	F-P	P	P	P	F-P	P	P	P	P	F
Berrien sandy loam	P	F-P	P	P	P	F-P	P	P	F	F	F-P
Brady sandy loam	P	F-P	P	P	P	F-P	P	P	F	F	F-P
Berrien sand	P	P	P	P	P						
Brady sand	P	P	P	P	P	F-P	P	P	F	F	F-P
Poor Cropland											
Gilford loam	P	P	P	P	P	P	P	P	P	P	F-P
Granby sandy loam	P	P	P	P	P	P	P	P	P	P	P
Brookston clay—stony phase	P	P	P	P	P	P	P	P	P	P	F-P
Perth clay—eroded phase	P	P	P	P	F-P	F-P	P	P	P	P	F-P
Guelph loam—shallow phase	P	F-P	P	P	P	F-P	P	P	P	P	F-P
Huron clay—eroded phase	P	P	P	P	F-P	F-P	P	P	P	P	F-P
Submarginal Cropland											
Shashawandah loam	P	P	P	P	P	P	P	P	P	P	P
Muck									P	P	P
Bottom Land											
Plainfield sand											
Peat									P	P	P
Eastport sand											
Marsh											

APPENDIX

TABLE I

CHEMICAL AND PHYSICAL COMPOSITION OF SURFACE SOIL FROM LAMBTON COUNTY, ONTARIO (1)

Soil Type	Sample No.	Location			Sand	Silt	Clay	Reaction pH Glass Electrode	Phosphorus Readily Soluble (2) Lb. P/acre	Potassium Replaceable (3) Lb. Ca/ac.	Calcium Replaceable (3) Lb. Ca/ac.	Magnesium Replaceable (3) Lb. Mg/ac.	Organic Matter (4) % C x1.724
					Bouyoucos Hydrometer								
		Township	Lot	Conc.	Per Cent 1 to .05mm	Per Cent .05 to .002mm	Per Cent > .002mm						
Berrien sand loam	49	Euphemia	25	5	71.6	18.0	10.4	6.33	49	154	3760	378	3.81
	50	Euphemia	20	4	76.6	16.8	6.6	6.47	31	63	4450	300	5.45
	51	Euphemia	16	6	80.0	14.0	6.0	5.36	19	89	1620	116	6.26
	52	Euphemia	16	8	82.2	12.2	5.6	5.48	35	80	1110	96	2.78
	53	Euphemia	28	8	70.8	20.6	8.6	5.30	48	122	1680	164	6.43
	60	Sombra	5	6	78.0	12.4	9.6	5.86	28	68	4430	388	5.39
	69	Bosanquet	24	6	74.0	13.2	12.8	6.40	54	64	3730	324	4.16
	78	Euphemia	23	7	78.0	12.7	9.3	6.66	62	72	5560	368	5.41
	79	Euphemia	20	4	80.0	13.7	6.3	6.14	38	72	3980	290	5.66
Blackwell marly clay.....	21	Sarnia	40	Lake	16.8	46.4	36.8	7.44	16	176	14730	568	10.66
	22	Sarnia	11	8	28.4	49.0	22.6	7.39	79	142	16730	752	12.44
	23	Sarnia	7	8	34.4	47.4	18.2	7.53	229	151	14340	734	5.41
Brady sand.....	72	Bosanquet	7	Marsh	81.9	7.9	10.2	6.19	27	80	3900	522	3.84
Brisbane loam ...	32	Plympton	21	7	69.2	21.0	9.8	7.20	78	97	12520	434	9.74
	64	Sombra	A	6	68.1	18.3	13.6	6.26	21	104	6330	588	5.99
	77	Brooke	16	9	44.4	35.8	19.8	5.84	26	146	4400	338	4.22
	82	Warwick	12	1 NER	62.8	17.6	19.6	6.31	56	140	5220	418	5.46
Brookston clay...	1	Moore	1	10	28.4	31.4	40.2	6.54	180	431	11700	1552	10.49
	3	Enniskillen	17	11	15.6	33.2	51.2	5.92	179	472	4980	472	6.75
	4	Enniskillen	24	11	22.2	26.2	51.6	6.48	290	453	15580	940	10.09
	8	Enniskillen	13	6	16.6	27.6	55.8	5.76	191	447	9140	1004	6.34
	9	Enniskillen	24	6	18.2	35.2	46.6	6.68	255	540	15280	816	11.11
	25	Plympton	5	10	38.8	30.2	31.0	6.70	208	345	9540	1096	6.34
	27	Plympton	16	11	33.4	34.2	32.4	6.85	178	328	8700	1580	6.23
	41	Brooke	4	6	15.0	36.2	48.8	6.02	193	377	9440	744	7.04
	45	Brooke	13	8	25.4	38.0	36.6	6.13	115	392	13060	714	10.58

Soil Type	Sample	Township	Lot	Conc.	Sand	Silt	Clay	pH	P	K	Ca	Mg	O.M.
Burford loam....	43	Brooke	21	5	49.8	38.0	12.2	6.91	143	84	5930	344	3.92
	48	Euphemia	25	1	38.8	38.2	23.0	5.01	13	194	1740	354	2.72
	67	Bosanquet		18	70.4	17.6	12.0	7.32	37	142	5880	444	2.94
Caistor clay.....	14	Dawn	20	13	38.6	31.4	30.0	5.16	17	187	3000	492	4.32
	17	Dawn	11	8	36.0	38.0	26.0	4.99	24	202	2360	509	4.96
	19	Moore	12	12	44.0	29.6	26.4	6.01	60	265	5160	855	5.76
	20	Moore	10	6	18.4	38.8	42.8	5.94	38	400	5000	1042	4.80
	33	Moore	20	6	29.0	36.4	34.6	6.39	45	205	5790	1230	6.17
	36	Moore	21	8	33.2	34.6	32.2	5.80	35	256	4850	896	6.30
	37	Moore	22	4	31.2	28.8	40.0	6.09	73	350	5580	1052	5.67
	38	Moore	15	3	15.6	37.6	46.8	6.01	82	392	6930	1196	7.80
	39	Moore	23	1	22.0	32.0	46.0	5.94	80	411	8180	1446	9.00
	40	Moore	4	10	29.8	35.8	34.4	6.16	46	252	5020	1052	4.85
Clyde clay.....	42	Brooke	12	6	33.4	42.4	24.2	7.38	480	201	22560	970	22.28
	65	Sarnia	25	2	13.8	36.6	49.6	7.01	455	468	14720	1588	11.23
Colwood fine sandy loam....	61	Walpole Is.			75.3	16.1	8.6	7.13	52	82	5300	598	3.82
	62	Walpole Is.			64.4	21.4	14.2	7.44	65	92	5900	783	3.98
	63	Walpole Is.			47.8	31.0	21.2	7.40	97	124	9400	955	5.23
	86	St. Anne's Island			70.8	21.4	7.8	7.77	105	55	9200	810	3.49
Fox sandy loam..	31	Plympton	23	8	76.0	15.6	8.4	6.04	17	155	2620	338	3.40
	66	Plympton	24	9	79.3	11.0	9.7	6.21	49	74	3180	270	3.86
	70	Bosanquet	24	2	74.0	15.6	10.4	6.99	30	108	3040	228	2.31
Huron clay.....	54	Brooke	25	6	12.8	42.0	45.2	5.74	34	305	7150	968	6.39
	58	Bosanquet	4	1	35.1	30.1	34.8	6.52	45	226	6090	964	5.21
	74	Warwick	30	5 NER	21.2	41.2	37.6	5.56	28	266	4260	492	4.10
Brookston clay...	6	Enniskillen	4	4	19.6	29.2	51.2	6.10	189	525	11020	1106	10.40
	7	Enniskillen	8	4	16.8	29.6	53.6	5.63	177	574	10350	1228	9.66
	10	Enniskillen	31	4	17.2	35.8	47.0	5.80	164	405	8760	714	8.02
	11	Enniskillen	27	3	18.0	37.0	45.0	5.95	132	473	8780	888	7.71
	12	Dawn	31	8	13.8	33.4	52.8	5.62	171	488	8880	954	9.21
	13	Dawn	25	11	19.6	41.4	39.0	5.96	82	285	9620	906	9.52
	15	Dawn	14	4	25.2	36.8	38.0	6.18	13	307	11960	886	10.60
	16	Dawn	15	6	17.8	34.2	48.0	4.79	28	389	3340	1036	5.15
	18	Dawn	18	8	20.0	38.4	41.6	6.12	97	350	8930	908	7.56
	34	Moore	26	6	21.6	31.6	46.8	6.15	128	372	8010	1354	7.01
	35	Moore	22	8	30.4	32.0	37.6	6.16	105	332	6160	1292	5.65

TABLE I (Cont'd.)

Soil Type	Sample	Township	Lot	Conc.	Sand	Silt	Clay	pH	P	K	Ca	Mg	O.M.
Lambton.....	44	Brooke	19	8	26.4	47.2	26.4	6.14	28	194	6080	688	5.86
	46	Brooke	12	10	31.8	48.4	19.8	5.95	22	172	4210	432	4.20
	55	Brooke	24	11	64.9	14.7	20.4	6.11	55	150	5960	560	6.75
	56	Warwick	24	6 SER	22.4	61.2	16.4	5.98	50	143	3900	468	6.24
	76	Brooke	18	7	22.2	56.4	21.4	5.97	56	162	7200	548	7.95
	80	Brooke	12	1	36.6	31.8	31.6	5.61	79	190	4280	502	4.50
	81	Warwick	7	2 SER	40.8	34.8	24.4	7.06	96	157	8280	944	5.34
Muck.....	83	Bosanquet			—	—	—	6.90	1360	417	45600	2480	
Peat.....	84	Bosanquet			—	—	—	5.83	27	242	24000	1180	
Perth clay.....	2	Enniskillen	4	8	28.6	33.8	37.6	6.35	71	583	5880	964	4.99
	5	Plympton	20	3	36.0	31.4	32.6	5.85	27	225	4400	888	5.49
	26	Plympton	8	11	38.4	31.2	30.4	6.68	160	381	7880	1022	6.44
	28	Warwick	1	5 NER	34.0	32.4	33.6	5.91	43	331	6100	1212	7.53
	29	Warwick	1	5 NER	32.0	34.8	33.2	6.09	109	378	5950	1388	6.27
	30	Warwick	7	1 NER	34.6	32.6	32.8	5.87	36	236	5120	912	4.94
	47	Warwick	14	6 SER	19.4	45.2	35.4	5.80	40	206	4320	672	4.35
	57	Warwick	19	3 SER	23.0	39.0	38.0	5.55	13	263	5530	690	6.11
	59	Bosanquet	11	6	32.0	35.4	32.6	6.54	42	262	6170	1100	5.78
Plainfield sand...	24				93.8	3.0	3.2	7.31	56	52	4590	252	1.08
	85				92.8	3.4	3.8	5.73	31	57	980	132	1.55
Toledo clay.....	71	Bosanquet	7	Marsh	23.0	30.2	46.8	7.16	345	358	27130	1364	22.55
	73	Bosanquet	11	Ausable	9.4	23.8	66.8	7.29	435	376	16410	1408	7.22

1. Samples taken in permanent pasture fields.
2. Lohse and Ruhnke Method—Soil Science 35: 6, 1933.
3. Neutral normal ammonium acetate extraction.
4. Allison Method—Soil Science, October, 1935.