SOIL SURVEY

of

Pictou County
Nova Scotia

by

D. B. CANN and R. E. WICKLUND

CANADA DEPARTMENT OF AGRICULTURE

EXPERIMENTAL FARMS SERVICE

REPORT No. 4—NOVA SCOTIA SOIL SURVEY

TRURO, NOVA SCOTIA — MARCH, 1950

EXPERIMENTAL FARMS SERVICE
Canada Department of Agriculture

IN CO-OPERATION WITH THE AGRICULTURAL COLLEGE,
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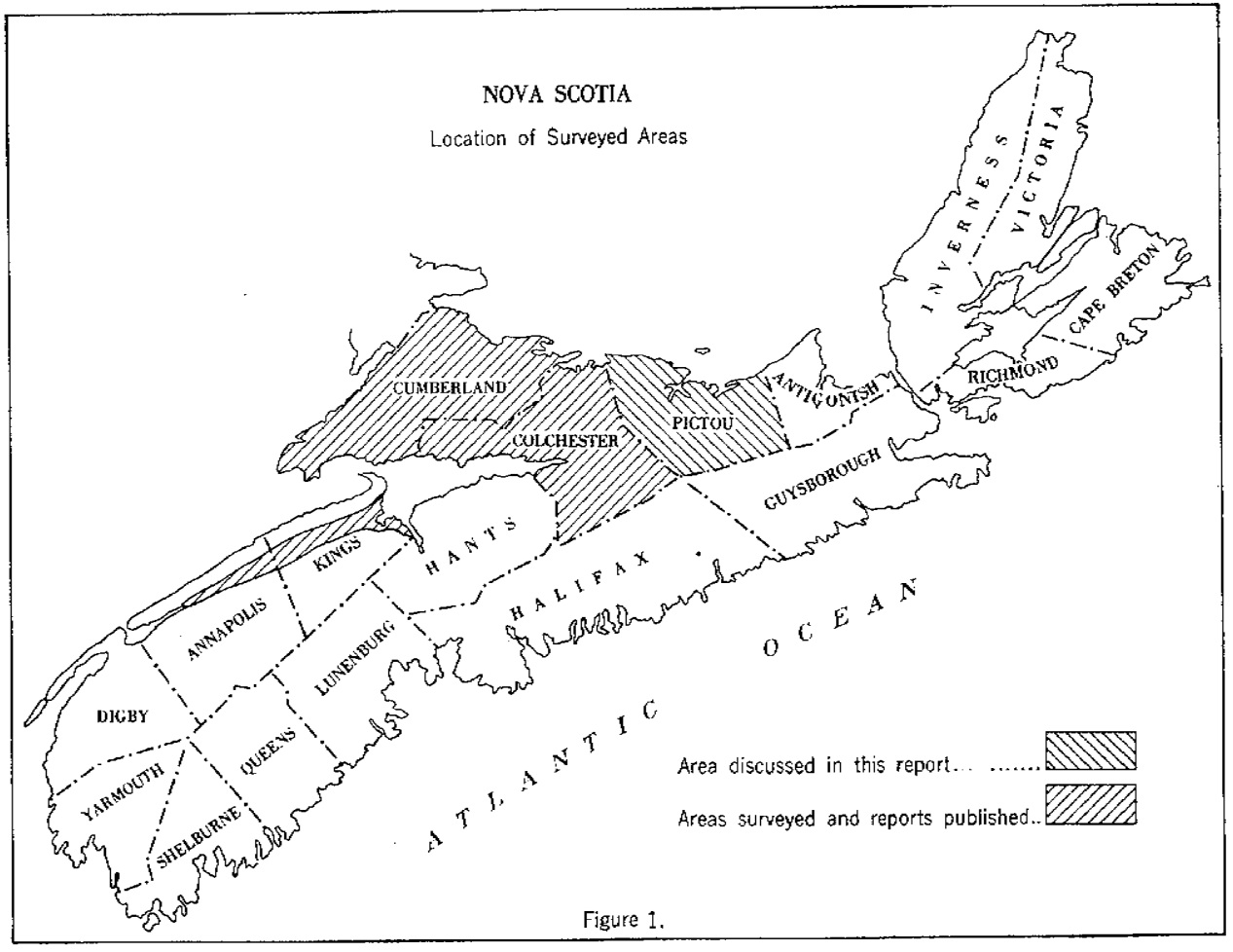
NOVA SCOTIA
Location of Surveyed Areas
INVERNESS
VICTORIA
CAPE BRETON
RICHMOND
ANTIGONISH
CUMBERLAND
PICTOU
COLCHESTER
GUYSBOROUGH
HANTS
KINGS
HALIFAX
ANNAPOLIS
LUNENBURG
DIGBY
QUEENS
YARMOUTH
SHELBURNE
ATLANTIC OCEAN
Area discussed in this report.....
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Figure 1.

INTRODUCTION

This report deals with the soils of Pictou county and is the fourth in a series of reports on the soils of Nova Scotia. It covers an area of approximately 1,118 square miles. The primary purpose of the report is to describe the various soils found in the county, the factors governing their formation and development and their relative suitability for agricultural purposes.

One of the most important parts of a soil survey report is the soil map which accompanies it. This map shows the location and extent of the various soils and their relation to one another. The scale of the map used does not permit very detailed separations and consequently it does not show small variations in the soils on any individual farm. Such variations are described in the report.

The first part of the report deals with a general description of the area—its location, population, transportation facilities and industries. This is followed by a section on the factors which affect the formation of the soils and their development.

The main body of the report is devoted to the classification and description of the various soils and their suitability for agriculture. Finally, the agriculture of the area and its relation to the various soils is discussed. An attempt is made to rate the soils according to their ability to produce crops economically. This is necessarily a general rating, since sufficient accurate information on crop yields is difficult to obtain. It is subject to revision as knowledge of the soils grows. The influence of soil erosion on crop production and management of the various soils is discussed. This is an important factor, too often neglected or not recognized by the farmer.

The information in this report has a wide variety of uses and applications. Its first object is to supply the farmer with information about his soil. Research workers and soil specialists will be interested in the aspects of soil analysis and soil classification. Other workers such as those interested in soil conservation, land-use planning, recreational facilities, highway construction, forestry, wildlife conservation and real estate, or students and teachers of soil science will find useful information throughout the report.

GENERAL DESCRIPTION OF THE AREA

Location and Extent

Pictou county occupies a central position in the north shore area of Nova Scotia. Geographically it lies between 45°15′ and 45°45′ north latitude and between 62°00′ and 63°15′ west longitude. Northumberland Strait forms its northern boundary and it lies between Colchester county on the west and Antigonish county on the east. Guysborough county forms the southern boundary. The greatest distance from east to west is approximately 48 miles and from north to south, 34 miles.

The total area of the county is given as 1,124 square miles or 719,360 acres. This includes lakes, harbors and rivers, so that the total land area is 1,117·9 square miles or 715,456 acres.

Pictou, the county seat, is situated on Pictou Harbor on Northumberland Strait. It has a population of 3,069 and is the site of an old Indian village, with an interesting and historical background. New Glasgow, with a population of 9,210 is the largest town and is the centre of a thriving industrial, mining and farming area. New Glasgow is approximately 40 miles from Truro and 100

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miles from Halifax. Other towns include Trenton, Westville and Stellarton. Several villages such as Salt Springs, River John, Scotsburn, Eureka, Sunnybrae, Thorburn, Merigomish, Bailey Brook and Lismore are the centres of farming areas.

Population and Racial Origin

The population of Pictou county as given by the 1941 Census of Canada is 40,789 persons. Of these 16,345 or 40·1 per cent live in rural areas and 24,444 or 59·9 per cent are urban dwellers. It is interesting to note that those classed as urban make up the population of the five towns—New Glasgow (9,210), Pictou (3,069), Stellarton (5,351), Westville (4,115), and Trenton (2,699). The population has increased from 32,114 in 1871 to 40,789 in 1941. The origin of the population is chiefly from British Isles races, the Scottish being predominant. The distribution of racial classes is shown below as given by the Census of Canada 1941.

TABLE I.—RACIAL ORIGIN OF PICTOU COUNTY POPULATION—1941

British Isles Races.	English	7,627		
	Irish	3,746		
	Scottish	24,256		
	Other B.I. races	280		
			35,909	88%
	French	2,315		
	German	260		
	Netherlands	544		
	All others	1,761		
			4,880	12%
	Total		40,789	

Transportation and Markets

Pictou county has an adequate system of roads and railways for getting farm produce to market. A paved highway (No. 4) from Truro, crosses the county from west to east passing through Salt Springs, West River, New Glasgow, Barneys River and Marshy Hope. This highway continues to Antigonish and Sydney farther east. Route 6, known as the Sunrise Trail, runs along the shore of Northumberland Strait through River John, Toney River and Pictou, connecting with the paved highway at Alma, six miles west of New Glasgow. A good gravel road along the eastern shore connects the villages of Knoydart, Lismore and Merigomish with the No. 4 highway at Sutherlands River. Good secondary roads run up the river valleys and join the paved highway at various points and the valleys are connected with each other by a network of roads.

The main line of the Canadian National railway from Truro to Sydney crosses the county, passing through West River Station, Lansdowne, Lorne, Eureka, Stellarton, New Glasgow, Woodbourne, Merigomish, Avondale and Marshy Hope. Branch lines are maintained from Stellarton to Pictou through Westville and from New Glasgow to Pictou Landing through Trenton and from Pictou to Oxford. From Eureka a branch line runs up the valley of the East River to Sunnybrae and Kerrowgare. The long coastline of Pictou county contains several good harbors, such as Pictou harbor and Merigomish harbor, which facilitate shipping. A ferry from Caribou connects Nova Scotia with Prince Edward Island.

The towns of New Glasgow, Stellarton, Trenton and Westville lie in the coal basin and are closely associated. The population of this coal basin, approximately 31,000, affords a good market for agricultural products. Several large creameries in the county provide an outlet for dairy products. There are also several summer resorts, which provide a seasonal market for the farmer.

Non-Agricultural Industries

Coal mining is the principal non-agricultural industry in Pictou county. The coal areas occur in detached sections, covering a total area of about 11 miles long and 3 miles wide. The Westville area has four seams, the Stellarton area five seams and the Thorburn area five seams. The Pictou field is one of the earliest developed in Nova Scotia. Its total production up to the present is about 40 million tons of coal. The Thorburn mine has recently been completely mechanized.

New Glasgow has iron and steel foundries, machine shops and clay works. Among the products produced are brick, clay pipe and tile, car wheels, beds, springs, hardwood flooring and canned foods. Trenton is the site of a large steel plant. Railway cars and heavy machinery are manufactured here.

Along the shore the fishing industry flourishes. Pictou is a ship-building centre and has an excellent harbor. It is one of the largest lobster producing ports in the province and considerable lumber is shipped from there.

The census of 1941 shows that there were 42 wholesale establishments in Pictou county with sales totalling $5,961,600 and 163 retail establishments with receipts totalling $556,800.

Several resorts along the shore attract summer tourists and the scenery throughout the county is very attractive.

Numerous beaches and bodies of water afford recreational facilities for the local population and visitors.

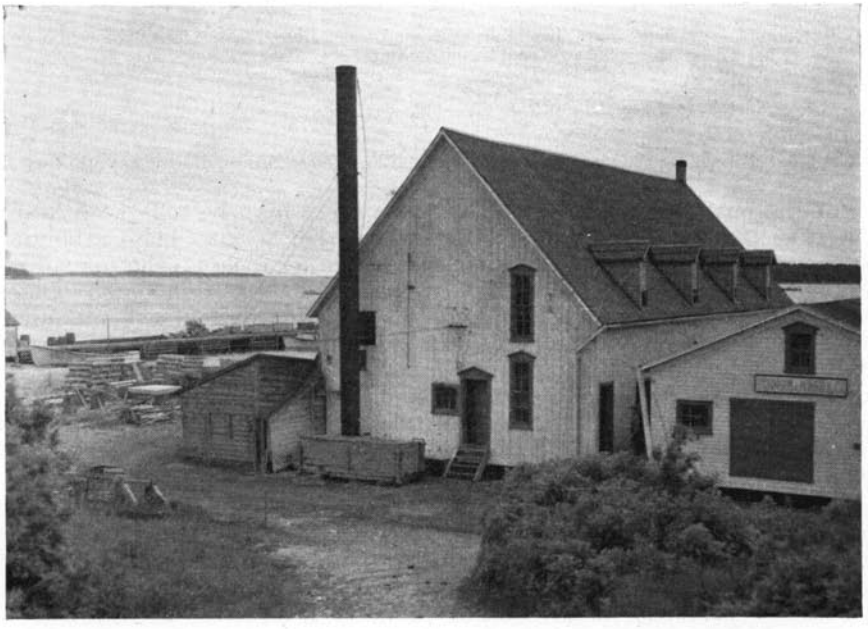

FIG. 2—A lobster factory at Lismore on Northumberland Strait. In this area farming and fishing are combined occupations.

FACTORS AFFECTING SOIL FORMATION IN PICTOU COUNTY

The weathering of rocks results in the formation of unconsolidated deposits or accumulations which, if allowed to develop under existing environmental conditions, produce the natural body which we call soil. These environmental conditions include climate, drainage, vegetation, relief, erosion and time. In northern latitudes the unconsolidated deposits were not allowed to develop in their original location, but were transported, mixed and redeposited by the great ice sheet which covered the northern part of the continent many years ago.

Consequently, the parent materials of the present day soils are derived from not one, but several kinds of rock. A knowledge of the underlying rock formations of an area and their relative position and attitude provides information regarding the source of the soil parent materials. It explains, to some extent, the nature of the relief and drainage of an area.

Geological Materials from which the Pictou County Soils Have Been Formed

The bedrock formations forming the surface of Pictou county belong to four major periods and their distribution is shown on the accompanying sketch map.

1. *Carboniferous*
   (*a*) *Pennsylvanian*—red, reddish brown, brown and grey sandstones, shales and conglomerate. Grey and black shales of the Coal Measures.
   (*b*) *Mississippian*
   Windsor—reddish brown, brown and grey sandstone, shale and limestone, gypsum.
   Horton —brown and grey sandstones and shales.
2. *Devonian*
   Brown and grey shale, slate, limestone and sandstone, altered sediments consisting of grey or purplish sandstones, quartzites and shales; granite.
3. *Silurian*
   Grey sandstone, slate and limestone.
4. *Pre-Cambrian*
   Altered sediments consisting of slates and quartzites, syenite, felsite, diorite, granite.

For the purpose of this discussion these rocks may be separated into two divisions on the basis of the topography which they form. The Carboniferous rocks are confined to the *lowland* plain and the other rocks to the *upland* plain, locally known as the Cobequid Mountains and the Pictou Highlands. The rock formations are covered with a mantle of glacial drift, consisting of till, outwash deposits and recent alluvium. This drift is derived principally from the underlying rocks and varies in texture and composition depending on the type of rock from which it was derived and on its mode of deposition. The depth of the till varies from three to fifteen feet, but in certain places a depth of nearly eighty feet has been reached by drilling. The depth and composition of the water-deposited materials is variable.

The lowland plain occupies about two thirds of the area of the county. It has a general slope toward the coast of Northumberland Strait and an average elevation of about two hundred feet. Along the shore from the vicinity of River John to Knoydart and extending inland for a distance of roughly seven miles at its widest part, the plain consists of fairly level areas interspersed with numerous drumlin-like ridges giving it an undulating appearance. In this area, the glaciation of the underlying Pennsylvanian rocks has resulted in a complexity in the texture and composition of the till. The till derived from shales is a clay to clay loam in texture and varies from a red through reddish brown to purplish red in colour. This till may be further differentiated according to other characteristics such as its content of mica, difference in texture or difference in type of shale. The areas developed from shale are usually level to very gently undulating in relief.

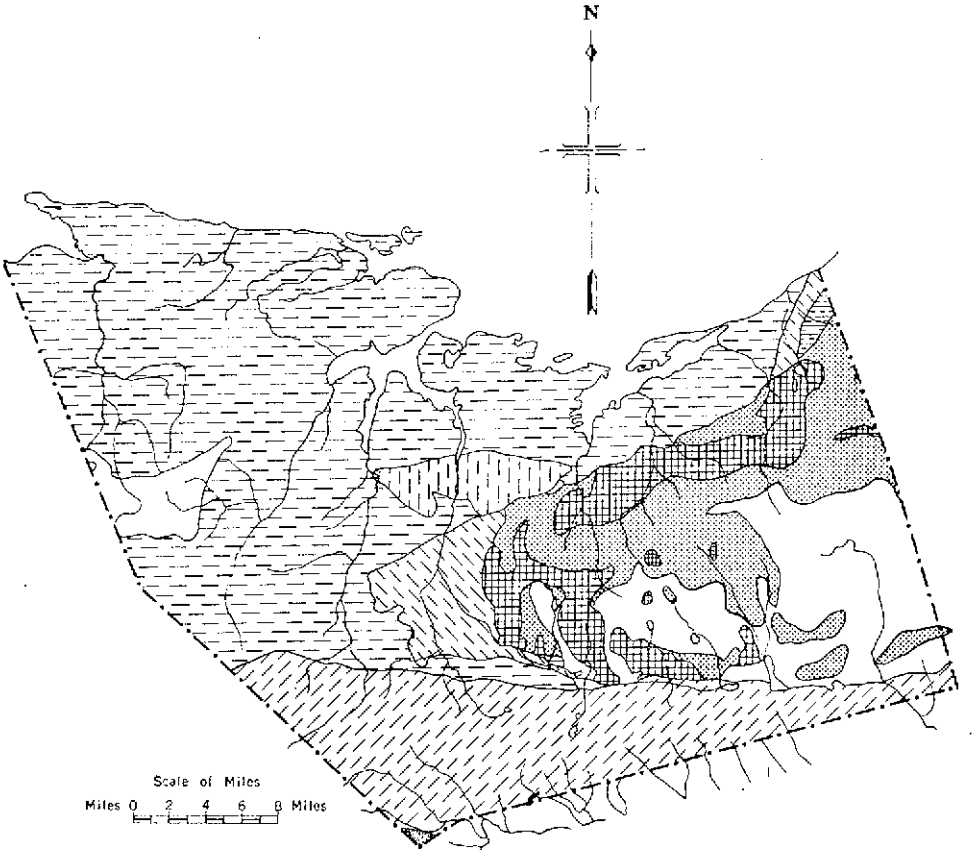

Figure 3. Geological Formations in Pictou County

CARBONIFEROUS
Pennsylvanian
Sandstone, shale conglomerate — Coal Measures
Windsor
Limestone, gypsum, shale, sandstone
Horton
Sandstone, shale, conglomerate
DEVONIAN
Granite — Altered Paleozoic sediments.
Limestone, slate, shale, sandstone
SILURIAN
Limestone, slate, sandstone
PRE-CAMBRIAN
Igneous rocks and altered sediments.

The till derived from sandstones varies from a sandy loam to a gravelly sandy loam in texture and varies greatly in depth. These areas form the major relief features of the plain. Red and reddish brown sandstones give rise to light textured till which varies in its fineness and porosity, depending on the texture and hardness of the sandstone. The grey sandstones are more resistant to weathering than the other sandstones and form the higher ridges in the plain. The till developed from these sandstones is usually shallow, coarse textured and very stony. Around New Glasgow, the grey and black shales of the Coal Measures give rise to a heavy textured till in which drainage is slow.

Farther inland, along the northern slope of the Cobequid Mountains and in several ridges which rise above the general level of the plain, deposits of a purplish red conglomerate are overlain by a gravelly, porous till developed from the underlying rock. Around Mt. Thom a greyish sandstone breccia gives rise to a till that is loose, porous and stony.

South of New Glasgow and in the gap in the upland plain between the eastern end of the Cobequids and the western end of the Pictou Highlands, the more rolling topography underlain by the rocks of the Windsor series blends with the higher and irregular hills underlain by Horton strata. Despite the stronger relief, these hills must be regarded as part of the lowland plain, for they are several hundred feet lower than the general level of the upland plain.

The till derived from the Windsor rocks has a loam to clay loam texture. The calcareous sandstones and scattered deposits of limestone have resulted in a rather stony and, in some places shallow till, especially on the tops of the higher hills. Mixtures of shale and sandstone give the till an intermediate texture such as sandy clay loam and gravelly clay loam. The colour of the underlying rock is usually imparted to the till.

The rocks of the Horton series are hard sandstones and shales, giving rise to a shallow, stony till and in many places there are outcrops that form barrens similar to those developed on the Pre-Cambrian quartzite and slate areas to the south.

The outwash deposits found on the lowland plain vary in depth, composition and form. They are chiefly composed of sand and gravel derived from the harder igneous and metamorphic rocks of the upland plain. They exist in the form of kames, eskers and outwash plains. Along the stream courses and valley floors, the more recent alluvial deposits are sandy loams to clay loams in texture and vary in composition depending on their origin. They form the flood plains and intervals in the valleys.

The upland plain forms a triangular shaped area whose base occupies the eastern county boundary and whose apex extends westward to the East River, about five miles south of New Glasgow. Here the rocks dip beneath the Carboniferous rocks of the lowland plain and reappear about ten miles farther west to form the eastern extremity of the Cobequid Mountains.

Viewed from the lowland, the surface of this upland looks rough and irregular, but seen from its own level it appears as a dissected plain. Its average elevation is about eight hundred feet, but hills of over nine hundred feet occur in the plain. During the glacial period the ice sheet moved over the surface of this plain first eastward and then southward, but without making much change in its surface. Streams have eroded deep gorges and valleys in the surface, through which they descend to the lowland.

The till deposits on this plain are not generally as deep as those on the lowland. The rocks are exposed in many places, especially on the tops of the higher hills. The Silurian rocks are mainly shales and have produced a greyish brown loam to clay loam till containing considerable shale. In a few places these Silurian shales and sandstones were found to be calcareous, and in many

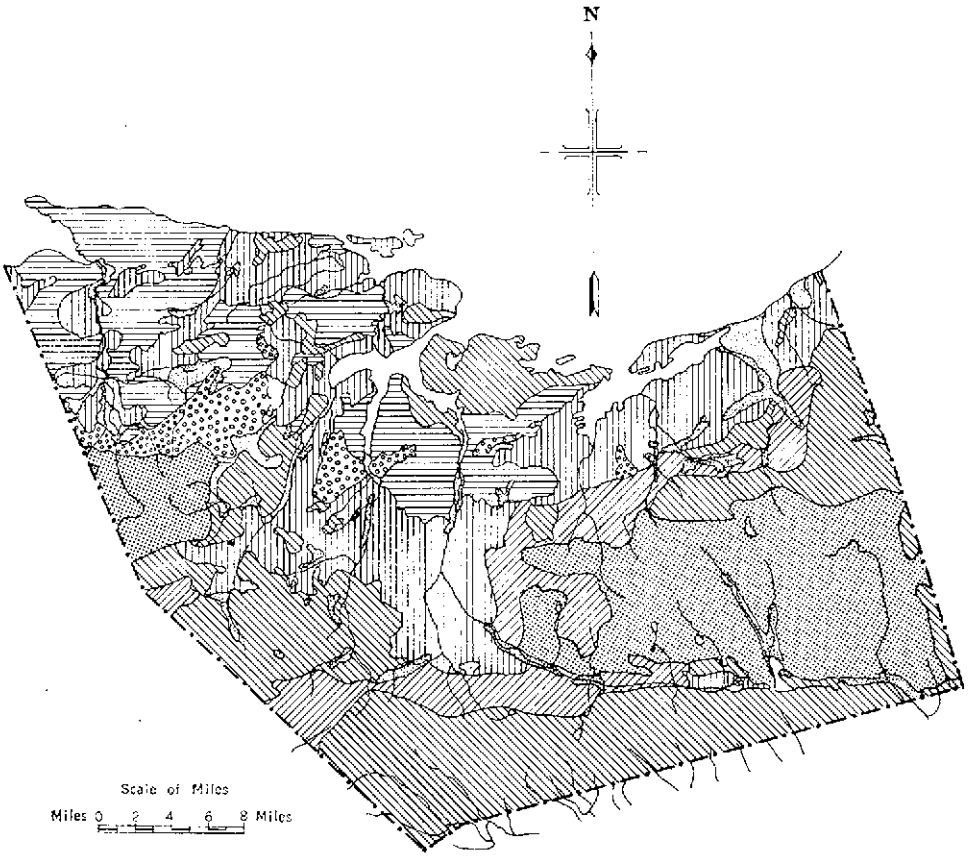

Figure 4. Distribution of the Drift in Pictou County.

Dark reddish brown or grey clay to clay loam till derived from Carboniferous sedimentary rocks.

Reddish brown sandy clay loam till, derived from Carboniferous sedimentary rocks.

Greyish brown shaly sandy loam to clay loam till, derived from Carboniferous and Silurian sedimentary rocks.

Greyish brown sandy loam till, derived from Carboniferous sedimentary rocks.

Greyish brown sandy loam till, derived from igneous and metamorphic rocks.

Reddish brown sandy loam till, derived from Carboniferous conglomerate.

Water deposited materials.

places fossils are well developed and abundant. The till derived from Devonian and Pre-Cambrian rocks is stony and usually comparatively shallow. It varies from a sandy loam to loam in texture and is fine but porous. The area underlain by Silurian rocks varies from rolling to hilly, while that comprised of Devonian and Pre-Cambrian rocks is hilly, with steep slopes.

Some gravelly outwash deposits are found in the upland plain, chiefly in the form of kames and eskers. Along the lower courses of the rivers, small deposits of more recent alluvium occur, but the streams in this upland plain are usually swift running and have steep gradients and numerous waterfalls.

In the southwestern corner of the county a small area of granite rocks is covered with a coarse textured, gravelly and stony till of shallow depth.

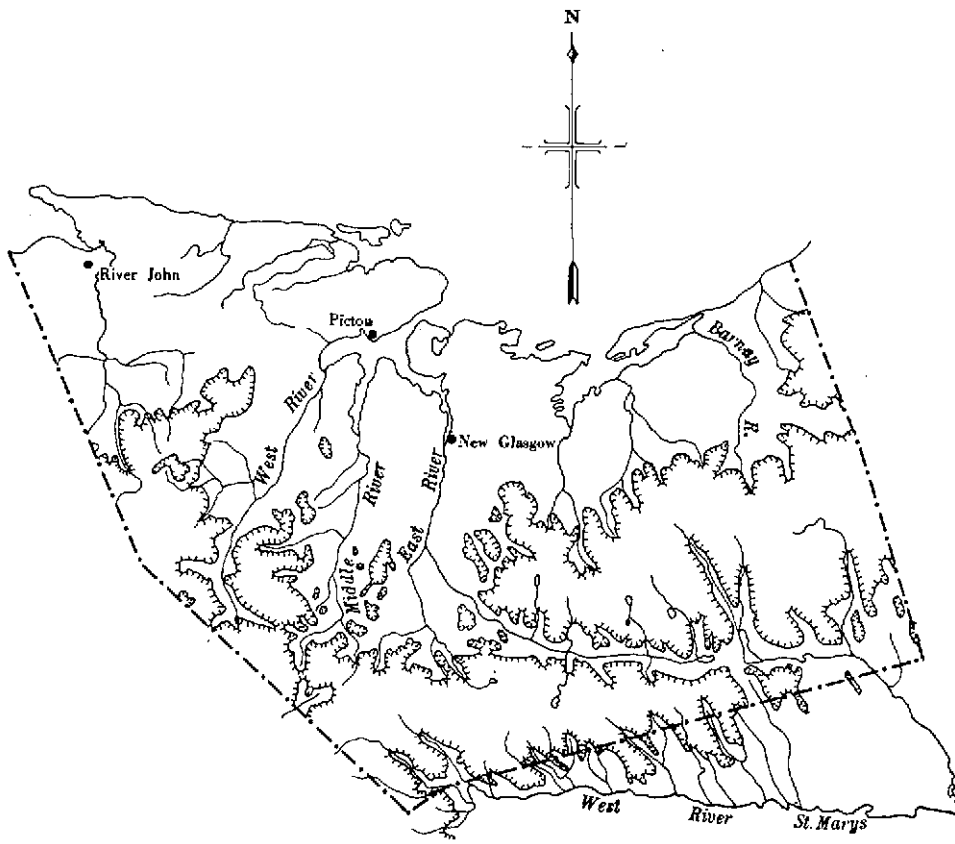

Figure 5. Relief and Drainage of Pictou County

Scale of Miles
Miles 0 2 4 6 8 Miles

....500 ft. contour

Relief and Drainage[1]

The general relief of the county has been partly described in the previous section. The Cumberland-Pictou lowland plain extends eastward across the northern part of the county without change of character. It is about ten miles wide where it enters the county on the west and narrows to about one mile wide where it leaves the county at its eastern boundary. Its southern boundary is usually well defined by the sharply rising borders of the upland plain.

The topography consists of long, flattish ridges and smooth drumlinoid hills which are more or less parallel with the broad, open folds in the underlying rock structure. In some places these hills seem to be wholly composed of glacial drift. The average elevation of this lowland plain is about 200 feet, varying from sea-level to 400-500 feet in the interior. Several hills underlain by more resistant rock rise above the general level of the plain. In a gap in the upland south of New Glasgow, the lowland rises to higher and more irregular hills which form the main drainage divide in southern Pictou county. This area, however, is still below the level of the upland plain. In many places along the shore, the lowland is quite flat and the valleys are cut sharply beneath it, showing that some uplift has taken place.

The Cobequid Mountains and the Pictou Highland form the upland plain. It has an average elevation of 800 feet, but a number of hills have elevations over 900 feet. The topography of this plain is hilly. It is highly dissected and streams have cut deep valleys and gorges in its surface. Most of the streams of Pictou county have their origin in this upland plain.

The drainage pattern of the northern half of Pictou county is similar to that found in regions of broadly folded strata and most of the streams have dendritic patterns. All of the large streams are graded and near the coast they meander in their flood plains. The majority of the streams rise in lakes and boggy areas of the upland and flow into Northumberland Strait. The largest river in the county is the East River. Other principal rivers are River John, Toney, Caribou, West, Middle, French, Sutherland and Barney rivers. These rivers and their tributaries provide adequate surface drainage for the northern part of the county.

On the south side of the upland plain, many short streams with fairly steep gradients flow into the west branch of the St. Mary River. Moose River flows into Eden Lake, which is drained by the east branch of the St. Mary River. These streams eventually flow into the Atlantic ocean. Eden Lake is the largest in the county and several smaller lakes in the southern part of the county provide fishing and recreational facilities. Surface drainage of the county is adequate, but percolation of water through the soil and the storage of underground water depend on the nature of the drift, vegetation and slope of individual areas.

Climate

The climate of Pictou county and the surrounding area is humid temperate. Under these conditions the average annual precipitation is about 40 inches and the mean annual temperature about 40° Fahrenheit. Local variations in precipitation and rainfall take place throughout the county. The first light snow usually falls toward the end of October and intermittent and heavier falls continue well into March. The spring season has very changeable weather. Mild, warm days in April and May may be followed by sudden changes in temperature resembling winter conditions and snow may fall. The summers are comparatively cool with an average mean temperature of about 63°F. and a range from 50°F. to 75°F. Occasional short spells of unusually hot weather

[1] Goldthwait, J. W. Physiography of Nova Scotia. Memoir 140, Geol. Survey of Canada 1924.

sometimes occur bringing thunderstorms or heavy rains. The fall season brings the nicest days of the year. Bright clear days with warm midday temperature and crisp nights are common. This is also a season of some of the gloomiest weather—dark heavily clouded skies and cold, raw winds.

The climatic data for Pictou and several stations in the surrounding area are given in the tables below. The data are compiled from reports of the Meteorological Division, Dept. of Transport, Canada, and represent averages over a period of years. The Upper Stewiacke station is located near the southeast corner of the county. Pictou and Antigonish stations are on the coast.

The daily mean temperature is about the same at all stations. At Pictou, the maximum temperatures tend to be lower and the minimum temperatures higher than at the other stations. That is, there is a smaller range of temperature. The Pictou station records slightly more precipitation than the other stations, except Collegeville, and approximately 37 per cent of the precipitation falls during the growing season. About 53-55 per cent of the precipitation falls from September to March and 25 per cent of this is snow. The Pictou station also records the heaviest annual snowfall. A large part of the precipitation from October until April is lost as run-off. Along the shore the spring season is usually late and this delays planting operations.

The growing season ranges from 180 to 190 days and the frost-free period from 100 to 120 days. No accurate data are available on the number of hours of sunshine in the area, but from nearby stations it may be estimated to be between 1750 and 1820 hours, the sunniest months being June, July and August with a monthly average of 200 to 235 hours per month.

TABLE II.—TEMPERATURE RECORDED AT VARIOUS STATIONS

	Pictou (30 yrs.)			Upper Stewiacke (23 yrs.)			Antigonish (28 yrs.)			Collegeville (23 yrs.)		
	Daily Mean	Daily Maximum	Daily Minimum	Daily Mean	Daily Maximum	Daily Minimum	Daily Mean	Daily Maximum	Daily Minimum	Daily Mean	Daily Maximum	Daily Minimum
December	27	34	20	25	34	16	27	35	18	26	34	18
January	20	27	12	20	31	8	20	31	10	20	30	10
February	20	28	12	18	30	6	18	28	7	18	29	7
Winter	23	.....	.....	21	.....	.....	21	.....	.....	21	.....	.....
March	28	36	21	29	39	19	28	37	18	28	38	18
April	38	45	30	39	49	29	37	46	28	38	47	28
May	49	58	40	49	61	37	48	59	36	48	59	36
Spring	38	.....	.....	39	.....	.....	37	.....	.....	38	.....	.....
June	59	68	50	59	71	46	57	68	45	58	69	46
July	66	75	57	65	77	53	65	76	54	64	76	53
August	65	73	57	64	77	52	64	75	52	64	76	53
Summer	63	.....	.....	62	.....	.....	62	.....	.....	62	.....	.....
September	58	66	50	57	69	44	56	67	46	57	68	46
October	48	54	41	47	59	36	48	58	38	48	58	38
November	38	44	32	36	46	27	38	46	30	37	46	29
Fall	48	.....	.....	46	.....	.....	47	.....	.....	47	.....	.....
Year	43	51	35	42	53	31	42	52	32	42	52	32

TABLE III.—MEAN MONTHLY PRECIPITATION AT VARIOUS STATIONS

Month	Pictou (30 yrs.)	Upper Stewiacke (23 yrs.)	Antigonish (28 yrs.)	Collegeville (23 yrs.)
December	3·37 (13·8)*	4·07 (13·4)	3·75 (14·6)	4·71 (15·2)
January	4·46 (19·4)	4·89 (23·0)	3·12 (13·9)	4·36 (15·3)
February	3·44 (19·6)	3·46 (17·3)	2·68 (16·2)	3·24 (16·1)
Winter	11·27	12·42	9·55	12·31
March	3·72 (15·0)	2·06 (10·6)	2·46 (9·3)	3·18 (11·5)
April	3·16 (8·2)	2·97 (4·5)	2·81 (4·3)	3·04 (4·0)
May	3·04 (1·2)	2·65 (0·2)	3·43	3·31 (0·3)
Spring	9·92	7·68	8·70	9·53
June	2·68	2·63	2·56	2·96
July	2·38	3·16	2·82	3·05
August	4·36	3·59	2·87	4·04
Summer	9·42	9·38	8·25	10·05
September	3·26	3·67	4·08	3·69
October	4·05 (0·1)	4·10 (0·1)	3·77 (0·6)	4·65 (0·1)
November	4·11 (3·6)	3·85 (3·4)	4·25 (3·5)	4·30 (3·2)
Fall	11·42	11·62	12·10	12·64
Year	42·03 (80·9)	41·10 (72·5)	38·60 (62·4)	44·53 (65·7)
Growing Season	15·72	15·70	15·76	17·05

*Figures in brackets—Inches of Snowfall. Ten inches of snow equals one inch of rain.

Vegetation

Originally the forest growth of Pictou county consisted of mixed conifers and deciduous trees, the distribution of which was largely determined by the character of the soil, drainage and elevation. The lowland plain along the coast was covered mainly with coniferous trees and produced valuable timber. The district between Toney River and Caribou River was noted for its white pine and large pitch pine. History records that every grown tree for many miles would produce a timber fourteen inches square. Sawmills were established at Toney River and quantities of lumber were shipped to England. Today most of this lowland area is farm land. The principal vegetation consists of second-growth red spruce, white spruce, white birch, red maple and fir on the better drained positions. The depressions are usually covered with a mixture of black spruce, tamarack, poplar and alder. The very sandy outwash deposits support a growth of white pine, red pine and occasional jack pine together with wire birch.

The lower slopes of Cobequid Mountain and the Pictou upland are covered with a growth of mixed hardwoods and red spruce, fir and hemlock. On the higher slopes the hardwoods predominate and yellow birch, beech and maple are the principal trees and constitute about 60 per cent of the cover. The forest on the Carboniferous area lying south of the upland is covered with hardwoods on higher points, while the bases of the slopes and depressions support a mixed stand in which conifers are dominant. The area between the Pictou Highland and the southern boundary of the county contains many barrens and semi-barrens interspersed with boggy areas and low ridges covered with birch and

beech. At the present time about 75 per cent of Pictou county is covered with trees. A wide variety of shrubs and grasses exist on the cleared areas of the county. The spiraea or hardhack *(Spiraea tomentosa)* is common over most of the county.

Timothy *(Phleum pratense)* is by far the most important grass grown for hay, together with some clover and a little alfalfa. On the better pastures, brown top *(Agrostis Tenuis)* is the major grass and is accompanied by red fescue *(Festuca rubra)*, sweet vernal grass *(Anthoxanthum odoratum)*, Kentucky blue grass *(Poa pratensis)*, and couch grass *(Agropyron repens)*. Sweet vernal grass used to be seeded with hay mixtures but this practice has been discontinued because of its unpalatability. Pasture lands which have been allowed to run out contain a large proportion of poverty grass *(Danthonia spicata)* which is readily replaced by the better grasses when pasture improvement takes place. The boggy areas and wet meadows contain manna grass *(Glyceria canadensis)*. Along the coast small areas of salt marsh support a vegetation of salt marsh grass and broad leaf *(Spartina* spp.) with foxtail barley *(Hordeum jubatum)* and manna grass along the edges. The salt marsh grasses are effective in preventing erosion of the shore and hold the mud and silt deposited by the overflowing tides.

Age

Many of the facts concerning the movement and recession of the glacial ice in Nova Scotia are obscure. The movement of the ice and its effects on the topography are well recorded in present day features, but how long the ice remained is still a matter of speculation. From data gathered by geologists in other parts of the New England region it may be estimated that Nova Scotia has been free from glacial ice for 15,000 to 20,000 years. The soil materials have been weathered for that length of time, rivers have cut their valleys deeper and wider and there has been a slight uplift in parts of the coastline.

Erosion

In Pictou county erosion has not been a significant factor in soil formation, until recent years. The county was heavily wooded and the lowlands were the first to be cleared, leaving the wooded uplands to control the rate of run-off. With increasing settlement, many of the high hills were cleared and erosion began. Today some of these hills have very shallow soils, the bedrock being exposed in some places. Sheet erosion is the most common type on these slopes. On the lowland the heavier types of soil show a certain amount of sheet erosion, where clean cultivation takes place on slopes of 4 to 7 per cent or more. Gullying and rill erosion is not so common unless slopes are left bare for some time. Excessive erosion has been prevented to a large extent by the fact that nearly 70 per cent of the improved farmland is in hay and often remains so for several years. The increased run-off caused by the cutting of timber on the higher slopes is reflected in the excessive volume of water carried by the rivers after heavy rains. In the spring many of these rivers overflow their banks and cause considerable damage.

CLASSIFICATION AND DESCRIPTION OF THE SOILS

Soil Development

Practically all of the soils of Pictou county are developed from materials previously deposited by glacial action in the form of till and outwash deposits. After the retreat of the ice the existing climate of the region favoured the development of a mixed forest vegetation on these inorganic materials. The effect of this vegetation on soil development is very important. New organic substances are added to the mineral material which affect the resulting colour, structure, consistency, permeability and aeration of the resulting soil. The development of microbiological flora and fauna is favoured and mineral decomposition is enhanced.

Under forest vegetation organic matter such as leaves, needles, twigs, etc., tends to accumulate on the surface of the soil rather than in the soil as is the case with grass vegetation. The climate of the Pictou county area is such that considerable water percolates through the soil during part of each year. The long winters, during which the ground is frozen and microbiological activity is at a minimum, are favourable for the accumulation of quantities of organic matter on the surface of the soil. During the warmer months of the year, this organic material, which is low in bases, is broken down and the resulting acid condition of the percolating water attacks the soil minerals. It leaches out the bases and brings the compounds of iron and aluminum into solution. These compounds, often protected by organic colloidal material are washed farther down in the soil where they reach conditions suitable for their precipitation.

Silica, being more resistant to attack remains behind. This removal of the iron compounds and organic matter, which form the colouring material of soils, gives rise to a greyish, leached layer, high in silica, under the surface with darker coloured layers of deposition below it. This process of leaching and deposition is called podzolization and the soils are known as Podzols.

Pictou county lies in the broad climatic zone which favours the development of podzolic soils. These are the mature zonal soils. In some cases the nature of the parent material, drainage or relief has retarded the podzolization process and the soils do not exhibit the profile characteristics of the zonal soils. These are known as the intrazonal soils. Along the stream courses and intervals, the more recently deposited material has not had time to develop zonal soil characteristics. These deposits are classed as azonal soils.

A normal mature profile of a podzol soil under forest cover in Pictou county is represented by the Tormentine soil described below. The various layers or horizons in the profile are characterized as A, B, or C and these may be subdivided according to their presence or absence.

A_0 0 - 2 inches —Dark brown semi-decomposed organic material; leaves twigs, etc., felty; numerous roots.
A_2 2 - 6 inches—pinkish-grey sandy loam; loose; structureless; porous. pH 3·87.
B_1 6 - 11 inches—yellowish red sandy loam; medium granular structure, friable, porous, pH 4·79.
B_2 11 - 20 inches—dark red sandy loam; firm; porous; contains soft sandstone fragments and gravel; pH 5·02.
C below 20 inches–dark red sandy loam till; medium blocky structure; firm but porous; contains sandstone fragments and some gravel. pH 4·73.

The Tormentine represents one of the lighter textured soils developed from till derived from Carboniferous rocks of the lowland plain. Podzol development takes place more readily in these light textured soils than in the heavier textured ones, but in Pictou county both types show the effects of the podzolization process.

On the lowlands the soils developed from till are derived from sedimentary rocks of various textures. The Queens, Nappan, Londonderry and Joggins soils are derived from shales. Differences in the type of shale and the nature of profile

development differentiate these soils. The finer grained sandstones have produced a till of sandy loam to sandy clay loam texture from which the Tormentine, Pugwash, Woodbourne, Millbrook and Merigomish soils are developed. Woodbourne soils are derived from a calcareous sandstone and the Millbrook soils from a mixture of shale and sandstone. The coarser textured sandstones have produced shallow stony till from which the Shulie and Hansford soils are derived. Westbrook soils are derived from conglomerate. Most of the soils of the lowland derive their colour from the parent rock.

The upland soils are derived from both igneous and sedimentary rocks. The Barney and Kirkhill soils are derived from shales, the Thom soils from sandstone breccia, the Halifax soils from quartzite and slate and the Gibraltar, Kirkmount and Cobequid soils from metamorphic and igneous materials. All of these soils develop a leached layer under the forest cover and are acid throughout their profiles. In the depressions and poorly drained areas the soils have a mucky surface and the profile is mottled and has a high water-table, but retains some of the characteristics of the normal soil profile.

The soils developed from water-deposited materials are derived from various kinds of rock. The outwash soils such as the Hebert contain a major proportion of igneous material. They are heavily leached and excessively drained. The Stewiacke soils are heavy textured and are derived chiefly from sediments washed out of the Carboniferous till. The Cumberland soils are light textured and of fairly recent origin. Cumberland and Stewiacke soils show little or no profile development and occur on river terraces and flood plains.

There are many areas of poor drainage where the nature of the topography or the underlying rock restricts the movement of water and the soil is permanently saturated. Such areas were called swamp. The soil has a thick layer of poorly decomposed organic matter underlain by mottled greyish mineral material.

Small areas of marshland exist in Pictou county which are usually flooded by intermittent tides.

Soil Survey Methods

The methods used to map the soils of Pictou county were those in common use among soil surveyors throughout Canada. All roads and suitable trails were traversed by car and an examination made of the soils in many locations. Test pits were dug and road cuts and exposures were examined. In many places scarcity of roads made traverses on foot necessary, especially in the heavily wooded areas. Frequent notes were taken on the relief, drainage and general characteristics of the soils and on the nature of the crops grown on them and detailed descriptions of the soil profiles were taken. Boundaries between the different soil areas were ascertained by measurement on the car speedometer or by pacing.

The soil boundaries were plotted on base maps supplied by the Department of Mines and Technical Surveys on a scale of one inch to one mile. The accuracy of these lines is coincident with the scale of the map. The survey of Pictou county is of the detailed reconnaissance type and the soil boundaries plotted on the map are not sufficiently detailed to show small variations in the soils on any individual farm. The boundary between two soil areas is rarely sharply defined, but of a transitional nature and the lines must be drawn with some regard to the agricultural significance of the soil.

When the mapping was completed representative samples of the various soils were taken for analysis. Only undisturbed profiles were selected, so as to gain some knowledge of the original potential value of the soil. Detailed descriptions of the soils and their suitability for use are discussed further in this report.

Soil Classification

In order to map the soils of an area, some method of orderly and systematic arrangement of the soils on the basis of their characteristics must be established. The individual units thus mapped may then be grouped into higher categories and the scheme of classification built up.

The unit used to map the soils of Pictou county is the Association. A soil association includes all soils developed from similar parent materials. In the individual soils the colour, texture, consistency and origin of the parent materials is the same. Where such parent material varies widely in texture, altering the profile characteristics or agricultural value of the soil, a new association must be established. The soil association is usually named after some town or geographical unit near which it is first mapped.

Within an association, variations in drainage may alter the profile characteristics of the soil. Such soils are known as associates and designated as the well drained, imperfectly drained or poorly drained associate. In Pictou county the poorly drained associate was separated within the association.

In detailed mapping, variations in surface textures, depth or stoniness may be used to separate a phase of a soil associate. In naming individual soils, the surface soil texture or soil class name is added to the association name, e.g. Tormentine sandy loam. This represents a soil having a sandy loam surface texture and developed from parent materials common to the Tormentine association of soils.

Soil Key

The soil associations of Pictou county are grouped in the following table, first according to the nature of the parent material and secondly on the general colour of the profile which develops on these materials. The Carboniferous rocks exert a strong influence on the colour of the soils which are derived from them. In many cases this colour alone is sufficient to identify the soil, when one is familiar with the characteristics of the soil association. However, a variation in moisture conditions will appreciably alter the colour of some soils and more reliable characteristics must be examined when the soils are being mapped.

KEY TO THE SOILS OF PICTOU COUNTY

	Acreage	Map Symbol
PODZOL ZONE		
A. *Soils Developed from Till*		
1. *Clay to clay loam parent material*		
(*a*) Soils with reddish brown subsoils		
(1) *Queens Association*—dark reddish brown clay loam derived from reddish brown shale	53,273·6	Q.
(2) *Nappan Association*—dark red clay loam derived from red micaceous shale and sandstone	17,798·8	N.
(3) *Londonderry Association*—purplish red clay loam to silt loam derived from dark red shale	3,900·8	L.
(4) *Woodbourne Association*—reddish brown clay loam derived from reddish brown shales and fine grained calcareous sandstone.	61,049·6	Wo.
(*b*) Soils with yellowish brown subsoils		
(1) *Joggins Association*—greyish brown clay to clay loam derived from dark grey to black shales	10,995·2	J.
2. *Sandy clay loam to clay loam parent materials*		
(*a*) Soils with reddish brown subsoils		
(1) *Pugwash Association*—purplish red to dark red sandy clay loam derived from reddish brown sandstone	50,828·8	Pu.
(*b*) Soils with yellowish brown profiles		
(1) *Merigomish Association*—reddish brown loam to sandy clay loam derived from grey and brown sandstones	18,323·2	Me.
(2) *Millbrook Association*—reddish brown clay loam derived from brown sandstone and grey shale	22,822·4	Mi.

KEY TO THE SOILS OF PICTOU COUNTY—*Concluded*

PODZOL ZONE—*Concluded*

	Acreage	Map Symbol
A. *Soils Developed from Till*—Concluded		
3. *Shaly sandy loam to shaly clay loam parent material*		
(*a*) Soils with yellowish brown subsoils		
(1) *Barney Association*—greyish brown shaly clay loam derived from grey shales	41,593·6	B.
(2) *Kirkhill Association*—Greyish brown shaly sandy loam derived from grey shales and slates	25,305·6	K.
4. *Sandy loam to gravelly sandy loam parent materials*		
(*a*) Soils with reddish brown subsoils		
(1) *Tormentine Association*—dark red sandy loam derived from fine-grained red sandstone	2,489·6	T.
(*b*) Soils with yellowish brown subsoils		
(1) *Hansford Association*—Purplish grey to brown sandy loam to loam derived from brown and grey sandstone	21,427·2	Hd.
(2) *Shulie Association*—light brown sandy loam derived from grey sandstone	30,182·4	S.
(3) *Kirkmount Association*—greyish brown gravelly sandy loam derived from metamorphosed shale and sandstone	36,377·6	Kt
(4) *Thom Association*—light yellowish brown sandy loam derived from sandstone breccia	73,132·8	Tm.
(5) *Halifax Association*—greyish brown gravelly sandy loam derived from slates and quartzites	83,193·6	H.
(6) *Gibraltar Association*—greyish brown gravelly sandy loam derived from biotite granite	544·0	G.
(*c*) Soils with dark brown subsoils		
(1) *Cobequid Association*—light brown gravelly sandy loam derived from igneous and metamorphic rocks	97,766·4	Cd.
(2) *Westbrook Association*—purplish red gravelly loam derived from conglomerate	24,915·2	W.
B. *Soils Developed from Water-Deposited Materials*		
1. *Sandy loam to gravelly sandy loam parent material*		
(*a*) Soils with yellowish brown subsoils		
(1) *Hebert Association*—light brown sandy loam derived from igneous and metamorphic material in outwash plains, kames and eskers	22,758·4	Hg, Hs.
2. *Silty clay loam to clay loam parent materials*		
(*a*) Soils without profile development		
(1) *Stewiacke Association*—reddish brown clay loam derived from fine textured sediments	2,054·4	Sc.
3. *Sandy loam to fine sandy loam parent materials*		
(*a*) Soils without profile development		
(1) *Cumberland Association*—reddish brown sandy loam derived from various sources	7,737·6	Cs, Cg.
C. *Miscellaneous Soils*		
1. Swamp	4,492·8	Sp.
2. Salt Marsh	492·8	S.M.

Discussion of Soils

A. SOILS DEVELOPED FROM TILL

The soils developed from till in Pictou county occupy 677,920 acres or 94·7 per cent of the county. The variable character of the underlying rocks has produced till with considerable variation in colour and texture. The reddish brown Carboniferous rocks are the most easily weathered and produce a till which is fairly deep and quite free from stone. The soil profiles are red to reddish brown in colour and are generally the best agricultural soils. The yellow and grey Carboniferous rocks are coarser textured and more resistant, giving rise to shallow stony till and soils with yellowish brown profiles. These soils are not so suitable for agriculture and are mostly covered with forest. The Carboniferous till covers the lowland area of the county.

On the upland plain the soils are developed from harder shales, igneous and metamorphic material and the till is fairly shallow and quite stony. All of these soils develop yellowish brown profiles and while certain areas may be suitable for agriculture, the major proportion of these soils have their agricultural value limited by stoniness and relief. The soils developed from till are discussed in detail in the following pages. In the detailed description of the soils the technical designation of the colour as given by the Munsell colour chart is included. Thus the notation 10 YR 4/3 is the Munsell notation for the colour described as brown and 5 YR 4/3 as reddish brown and so on.

FIG. 6—A general view of the lowland looking north from the Cobequid Mountains.

A 1. Clay to clay loam parent material

QUEENS ASSOCIATION

The soils of the Queens Association occupy the largest area of heavy textured soils in Pictou county. The principal areas of these soils are found along the north western boundary of the county, south and west of River John, along the River John, along the highway from River John through Poplar Hill to Pictou, and north of Alma around Westville and Stellarton and around Woodbourne. Smaller areas are scattered throughout the lowland plain. The total area occupied by these soils is 53,273 acres or 7·4 per cent of the county. Of this area 53,068 acres have good to imperfect drainage and 205 acres are poorly drained.

The Queens soils are developed from till derived from a reddish brown Carboniferous shale or sandstone. It has formerly been reported that these soils were derived from grey and brown sandstones, and this holds true in some places, especially in New Brusuwick, but in Nova Scotia further investigation has revealed the presence of very soft shale or mudstone fragments in the till. Although sandstone fragments are present, a till derived from these sandstones would not be so heavy as that from which the Queens soils are developed and it is therefore concluded that the heavy texture of these soils may be ascribed to their origin from shales and mudstones. Further work may reveal a different source. The texture of the till varies from a clay loam to a clay.

The topography of the Queens soils varies from gently undulating to gently rolling. The smoother type of topography occurs in the north shore area. Surface run-off is usually slow and internal drainage is somewhat impeded by the

heavy nature of the subsoil, so that most of these soils are imperfectly drained. On the more level areas, the water will stand for some time after a rain and poor drainage is common. On the long slopes, drainage may be quite good at the top of the slope, but seepage spots occur farther down the slope because of the water running along the tight substratum. The Queens soils have a variable content of stone, but rarely contain enough stone to interfere with cultivation.

The greater part of the Queens soils in Pictou county is covered with forest vegetation consisting of spruce, fir, hemlock, poplar and birch trees. Under these conditions the undisturbed soil has a surface layer composed of semi-decomposed leaf litter, needles and moss about 1½ inches in depth. This layer is felty, contains many fibrous roots and is very acid in reaction. Under this surface, the A_2 horizon is a light reddish brown or light grey loam to clay loam, with a coarse platy structure and is slightly plastic. It may also show slight mottling from impeded drainage. When the soil is cultivated these two upper layers are mixed to form a light brown loam to clay loam which tends to bake when dry and puddle when wet unless the soil is managed properly. The upper B horizon, which is 5 to 10 inches thick, consists of a light brown loam to clay loam. It usually shows some yellowish mottled streaks and tends to become quite firm when dry. The lower part of the B horizon which extends to a depth of 16 to 20 inches below the surface is reddish brown in colour and has a clay loam texture. It is fairly plastic when wet and becomes firm when dry. Mottled streaks are common. It breaks in the hands to thick plates which may be crushed to a fine blocklike structure. The unaltered parent material, which occurs at a depth of 16 to 20 inches, is a dark reddish brown clay loam till. When dry it is extremely firm. It is almost impervious to water. It contains numerous fragments of grey and brown sandstone and shows black, carbonaceous streaks derived from the carboniferous material.

In the poorly drained areas the surface has a thicker layer of organic matter and the A_2 horizon is deeper, but the total depth of the profile is less than that of the better drained soils. Surface textures of the Queens soils include loam, silt loam and clay loam. A detailed description of a representative profile of the Queens soils is given below:

Horizon	*Depth*	*Description*
A_0	0 – 1 inch	Leaf litter, moss, semi-decomposed organic matter; felty; porous; numerous fibrous roots; fibrous mor.
A_2	1 – 5 inches	Light reddish brown (5YR 6/3) loam to silt loam; coarse platy structure; slightly plastic; friable when dry; some light brown mottling; some roots; pH 4·1
B_1	5 – 10 inches	Light brown (7·5 YR 6/4) loam to silt loam; thick platy structure; cohesive; firm; some yellow and orange mottling; some roots; pH 4·2
B_2	10 – 19 inches	Reddish brown (5 YR 4/3) clay loam; thick platy structure; crushes to fine blocky structure; cohesive; firm, but not impervious; mottled; some roots and sandstone fragments; pH 4·4
C	Below 19 inches	Dusky red (2·5 YR 3/2) clay loam till; breaks to coarse blocky structure; extremely firm; moderately impervious; black carbonaceous streaks; mottled; fragments of grey and brown sandstone; pH 4·5

Along the shore west of River John the Queens soils are somewhat lighter in texture and more friable, where they border on the Nappan and Pugwash soils.

Utilization of Soils

The major problem connected with the utilization of Queens soils is drainage. The heavy texture of the soil requires that it be worked at its optimum moisture content or it will puddle and bake. The installation of tile drains in this soil is costly, since the drains must be fairly closely spaced as the lateral movement of water is slow. Shallow ditches ploughed in the fields and dead furrows will provide surface drainage of a temporary nature. The fertility of the Queens soils

is not very high and the supply of available nutrients, especially phosphorus and potash, is low. The soils are very acid and show a lime requirement of 3 to 5 tons per acre. The organic-matter content is also low and this has a bad effect on the physical condition of the soil.

Where the Queens soils are cultivated, hay and grain are the principal crops. Usually a long-term rotation is practised and the fields are in hay for many years and yields become very low. However, Queens soils will give good response to management. Rotations should be shortened to four or five years. The application of lime at the rate of two tons per acre applied to the ploughed land and harrowed in may be repeated at lengthening intervals. Organic matter added in the form of barnyard manure and green manuring crops will improve the physical condition of the soil. Commercial fertilizers are recommended for these soils as follows: for grain, 300 to 500 pounds of 2-12-6 per acre; for roots, 400 to 600 pounds of 2-12-6 per acre and for garden crops and potatoes, 1,200 to 2,000 pounds per acre of a 4-8-10 fertilizer. Pastures require periodic top-dressings of lime and a mixed fertilizer. The heavy texture and imperfect drainage of these soils makes them suitable for hay and grain crops, but unsatisfactory for the commercial production of potatoes or vegetable crops. Erosion is not usually a serious factor on these soils except where clean cultivation is practised on the steeper slopes.

Nappan Association

The Nappan soils are somewhat similar to the Queens soils in general appearance, but differ in several characteristics. They are found chiefly on the Cape John peninsula and around the River John area, where they are extensively cultivated. Nappan soils are developed from a till of clay loam texture derived from red and brown shales and micaceous fine grained sandstone. The red colour imparted to the till by these rocks is very characteristic and this factor together with difference in structure and consistency distinguish the Nappan from the Queens soils. The total area occupied by Nappan soils is 17,798 acres or about 2·5 per cent of the county area. The topography of these soils varies from gently undulating with some areas nearly level in relief. Drainage generally tends to be imperfect, but is slightly better on the average than the Queens soils.

Internal drainage is slow. The soils are practically stone free and easy to cultivate. A large proportion of the Nappan soils is cleared, but where they are covered with trees, the vegetation consists of second growth spruce, poplar, fir, birch and some maple.

Under the forest surface cover of semi-decomposed leaves and needles, the A_2 horizon is a pinkish grey sandy loam to loam to a depth of 5 to 7 inches. It is usually slightly mottled and quite firm, containing soft sandstone fragments. The mixing of these two layers by cultivation results in a light brown or greyish brown surface soil, which is loose and friable when dry, but tends to be sticky and run together when wet, especially if the organic-matter content is low. The B horizon is reddish brown silty loam to clay loam which tends to break into small block-like fragments. It becomes plastic when wet and is slightly impervious. The lower part of the B horizon has a dark red colour and is somewhat more plastic than the upper part. It has a cheese-like consistency and small particles of mica may be seen in it. It may show darker or lighter streaks of mottling resulting from slow internal drainage. Some crop roots are able to reach into this layer but they are not often seen, although tree roots are common. The parent material is found at a depth of 20 to 26 inches. It consists of a dark red clay loam till. It is firm but not impervious and very plastic, having a silky feeling when rubbed between the fingers. It usually contains considerable mica and fragments of soft micaceous sandstone. Where the soil is poorly drained the A_2 horizon has a greater thickness, the profile is highly mottled with

red and yellow streaks and the parent material is closer to the surface. Surface textures in Nappan soils vary from loam to clay loam or clay. The poorly drained soils usually have the heavier textures. Clay loam is the most predominant surface texture. The detailed description of a representative Nappan profile is given below.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Leaf litter, moss, semi-decomposed organic matter; felty, numerous fibrous roots.
A_2	2 – 7 inches	Pinkish grey (5 YR 6/2) sandy loam; weakly developed platy structure; crushes to a granular mass; moderately cohesive; firm; mottled; contains some fragments of red sandstone; pH 4·1
B_1	7 – 13 inches	Reddish brown (5 YR 4/3) silt loam; medium platy structure; breaks to medium blocky structure; plastic when wet; firm, but not impervious; small fragments of red micaceous sandstone; pH 4·3
B_2	13 – 23 inches	Dusky red (10 R 3/4) silty clay loam; coarse blocky, breaking to medium blocky structure; firm; very plastic; contains flakes of mica and sandstone fragments; pH 4·4
C	Below 23 inches	Dusky red (10R 3/4) clay loam till; coarse blocky structure; very plastic; firm, but not impervious; fragments of red sandstone. pH 4·5

Utilization of Soils

The Nappan soils present about the same problems as the Queens soils. Drainage is a limiting factor in the use of these soils, but this may be corrected by the use of ditches and tile drains as in the case of the Queens soils.

The soils are usually late in drying out in the spring but in dry seasons, they appear well drained and retain enough moisture to permit favourable crop growth.

About 75 per cent of the Nappan soils in Pictou county is cleared and is principally in hay crops with some grain. The lack of stone in Nappan soils and their somewhat higher natural fertility and better physical conditions make them more desirable than the Queens soils. They are the best heavy textured soils in the county. In common with the Queens soils, the Nappan soils require careful management for best results. They are acid throughout and the use of lime is necessary. Organic matter needs to be increased in most cases and results in greatly improved physical condition of the soil. The application of lime and fertilizer on hay and pasture fields will increase yields and carrying capacity. At the present time most of this land is not producing anywhere near its capacity. Hay produces about 1 to $1\frac{1}{2}$ tons per acre. Pasture fields are often run out and carrying capacity is diminished, the chief grasses being brown top and poverty grass along with species of weeds.

A shorter crop rotation would do much to improve these soils. A four- or five-year rotation in which lime and fertilizers are used would greatly increase crop production and improve the soil. It is recommended that not more than two tons per acre of lime be used, applied preferably to the land ploughed for grain and harrowed in. This may be repeated in each rotation until the acidity of the soil is reduced to an optimum level. Where the organic matter is low the use of barnyard manure or green manuring crops greatly improves the physical condition of the soil. The Maritime Fertilizer Council recommends the application of 300 to 500 pounds per acre of a 2-12-6 for grain. For late spring pastures an application of 500 to 700 pounds of 2-12-6 applied in the late summer or early fall is recommended.

Nappan soils are not quite so responsive to fertilizers as are the Queens soils, since their natural fertility is somewhat higher. The soils respond well to good management practices, but in general they are not suitable for intensive cultivation of crops such as potatoes or market garden crops. Hay and grain are the natural crops for these soils.

The Nappan soils seem to be more easily eroded than the Queens soils and more care must be taken when intertilled crops are grown. Sheet washing and gullying are the chief forms of erosion on these soils.

Londonderry Association

The soils of the Londonderry Association are limited in extent. They occur in a small area between West Branch, River John and Plainfield along the base of the Cobequid Mountains and occupy a total area of 5,900 acres or about 0·8 per cent of the county. Londonderry soils are heavy textured and are developed from till derived from dark red or purplish red shales. In texture and general appearance, they resemble the Queens soils, but are generally darker in colour and contain shale fragments. The topography varies from undulating to long slopes and while surface drainage may be fairly good, internal drainage is slow, but is inclined to be somewhat better than on the Queens soils. The soils are generally quite free from stones, except for small shale fragments and occasional pieces of sandstone. The shallower areas tend to be more stony than where the till is deeper.

Most of the Londonderry soils are covered with forest vegetation and only small areas are cleared. The forest cover consists of a mixed stand of fir, spruce, hemlock, birch, poplar and maple trees. Under this cover the normally developed profile has a 2-inch layer of moss, twigs, leaf litter and semi-decomposed organic material which is underlain by a 3- to 5-inch pinkish grey A_2 horizon. This horizon has a silty loam texture and is quite friable and porous. The mixing of these two layers as a result of cultivation gives rise to a greyish brown silt loam or clay loam surface soil which is very acid and which tends to puddle when wet. The underlying B horizon is a greyish brown to reddish brown clay loam which shows a fairly well developed structure and is often mottled along the cleavage faces. The parent material, which occurs at a depth of about 18 to 20 inches, is a purplish grey or purplish brown clay, silt loam or clay loam till. This material is often quite impervious and slows internal drainage. Considerable shale is often found in this layer, especially where the soil is shallow. In the poorly drained depressions, the organic surface layer is quite thick, the A_2 layer is deeper than usual and mottling is prominent throughout the profile.

A detailed description of a representative Londonderry profile is given below.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Leaf litter, moss and black semi-decomposed organic matter; felty; held together by numerous fibrous roots.
A_2	2 – 5 inches	Pinkish grey (5YR 6/2) silt loam; thick platy structure; friable; vesicular; porous; some roots; pH 3·7
B_1	5 – 11 inches	Reddish brown (5YR 4/3) silty clay loam; medium blocky structure; plastic; mottled with orange and red streaks; good root distribution; some shale fragments; pH 4·0
B_2	11 – 19 inches	Reddish brown (5YR 4/3) silty clay loam; coarse blocky structure; very plastic; slightly impervious; mottling along cleavage faces; contains pieces of dark brown sandstone and shale. pH 4·4
C	Below 19 inches	Weak red (2·5 YR 4/2) silt loam till; very firm; moderately impervious; mottling; plastic; contains shale fragments and brown sandstone. pH 4·5

Utilization of Soils

The cleared areas of the Londonderry soils are mostly in hay or pasture. In common with the other heavy textured soils of the county, imperfect drainage is the main field problem which must be overcome. The practices common on the Queens and Nappan soils will also apply to the Londonderry soils. In Pictou county these soils are adjacent to areas of the better drained Pugwash soils which are more suitable for general agricultural purposes, so that the cleared areas of the Londonderry soils are usually left in hay. Where drainage is fairly good, the production of hay and grain is equal to or better than on the Queens soils. Londonderry soils are very acid, a condition that can be improved by liming. The natural fertility of these soils is not very high, so that for best results drainage, liming, the use of fertilizer and the building up of the organic matter is necessary. The rates of fertilizer application and the crop rotations practised on the Nappan and Queens soils apply to the Londonderry soils.

Joggins Association

The soils of the Joggins Association are confined to a single area about eight miles long and two miles wide running from Westville through New Glasgow to Thorburn. In all they cover an area of 10,995 acres or 1·5 per cent of the county area. Joggins soils are developed from a heavy textured till derived from the soft shales of the Pennsylvanian Coal Measures and throughout the province these soils are associated with the coal basins. The relief varies from undulating to gently rolling and in places the Joggins soils are dissected by streams. Surface drainage is variable. In most of the area around New Glasgow there is sufficient slope to provide adequate surface drainage and even to present erosion problems.

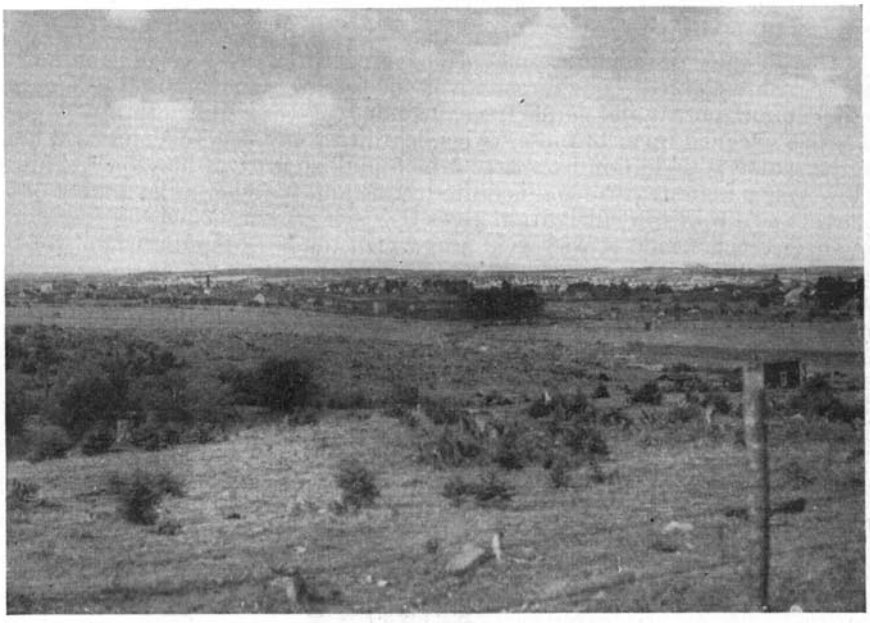

Fig. 7—The towns of New Glasgow and Stellarton are situated in a basin formed by rocks of the Carboniferous Coal Measures. Joggins soils in foreground; Woodbourne and Millbrook soils on the higher hills in the background.

The internal drainage of these soils is usually very slow. Some areas in the vicinity of Thorburn are developed from sandy shales and are lighter in texture with somewhat better drainage conditions. The Joggins soils are quite free from stone, except in a few places where the bedrock is close to the surface. Vegetation consists chiefly of wire-birch, poplar, red maple, spruce and larch.

The soil in undisturbed condition has a thin layer of organic material formed from leaves, needles and semi-decomposed forest litter on the surface. This is underlain by a grey loam, the A_2 horizon, varying in thickness on the average, from 2 to 5 inches. It is usually slightly mottled and develops its maximum thickness in the more poorly drained areas. The B horizon is a dark yellow or yellowish brown clay or clay loam, which shows definite mottling resulting from poor drainage. The structure of the upper part of this horizon becomes coarser with depth and develops a blocky structure in which the cleavage faces are coated with colloidal silica. In the area southwest of Thorburn, this horizon is lighter in texture and contains some very sandy shale or soft grey sandstone, but shows mottling.

The parent material, which is usually found at a depth of 15 to 25 inches, is a greyish brown to light brown clay or clay loam till. In some places the till is reddish brown, but this seems to be in pockets. It has a coarse blocky structure and is plastic, often stiff and impervious and may contain considerable fine grey shale fragments. In the poorly drained depressions the A_2 horizon may be 10 to 12 inches thick and the profile is extremely mottled with orange and yellowish streaks of reduced iron compounds.

A detailed description of a Joggins profile is given below.

Horizon	*Depth*	*Description*
A_0	0 – 1 inches	Black, semi-decomposed leaf litter; numerous fibrous roots; matted mor.
A_2	1 – 3 inches	Light grey (10 YR 7/1) loam; weak platy structure; friable; crushes to a fine crumb structure; cohesive; slightly mottled; porous; numerous roots; pH 4·2
B_1	3 – 15 inches	Yellowish brown (10 YR 5/6) clay loam; medium crumb structure; very friable; numerous roots; slightly mottled; some sandstone and shale fragments; pH 4·4
B_2	15 – 22 inches	Yellowish brown (10 YR 5/4) clay; medium blocky structure; cleavage faces coated with colloidal silica; very cohesive; slightly plastic; mottled with orange and grey streaks; drainage and root development along the cleavage faces; some shale and sandstone fragments; pH 4·5
C	Below 22 inches	Pale brown (10 YR 6/3) clay loam till; coarse blocky structure; firm; plastic; impervious; some black carbonaceous material and shale fragments; pH 5·1

West of New Glasgow some of the shaly till is mixed with the red Carboniferous till of the Queens soils, but the profiles are yellowish coloured and mottled, although drainage is slightly better on these areas.

Utilization of Soils

The soils of the Joggins Association are poor agricultural soils. Their general poor drainage is accompanied by a low natural fertility. Very little of the Joggins soils is under cultivation and where crops are grown the yields seem to be poor. The soil is cold and late in the spring. Drainage conditions could be improved and fertility built up by the same practices recommended for the Queens and Nappan soils but if better soils are available, it would be wise to leave these soils in forest or permanent pasture. On slopes such as are formed east of New Glasgow, soil erosion both by sheet washing and gullying, takes place readily on these soils, hence a forest or grass cover is the most suitable.

In a few places newly seeded stands of clover have given fair yields, but the crop seems to winter-kill and heave with the frost. Any future clearing of these soils for agricultural purposes is not advisable.

A. 2. Sandy clay loam to clay loam parent materials

PUGWASH ASSOCIATION

Pugwash soils are confined to the North Shore area of the county. They exist as scattered areas along the River John, Toney River, Caribou River and the valley of the West River, covering a total area of 50,828 acres or about 7·1 per cent of the area of the county. These soils are developed from a medium textured, sandy clay loam till derived principally from reddish brown carboniferous sandstone. They are usually associated with Nappan and Queens soils and have similarly coloured profiles but are lighter in texture and have better drainage. The texture of the till varies according to the texture of the original sandstone, in some places being a sandy loam. The topography of these soils varies from nearly level to undulating, the low, smoothly rounded ridges being interspersed in the more level topography. Drainage is usually well established, especially on the ridges, but a few areas with imperfect to poor drainage are found

on the more level areas. Stoniness on Pugwash soils is variable. They may be nearly stone free on the one hand, resembling a light textured Nappan soil, while on the other they may be very stony and grade into the Hansford soils. In general, most of the Pugwash soils present no difficulty in clearing and cultivating and most of the land is suitable for agricultural use. Where the Pugwash soils are forested, the cover consists of fir, red spruce, red maple, birch, hemlock and occasional pine.

The profile under forest cover has a 2 to 5 inch layer of leaf litter and partly decomposed organic matter on the surface. This is underlain by a 2 to 6 inch layer of grey or pinkish grey sandy loam, that is loose and porous. Under cultivation these two layers develop into a light brown sandy loam surface soil to plough depth. The subsoil or B horizon is a reddish brown sandy loam, which becomes heavier in texture with depth. It is usually quite porous and may contain considerable gravel and fragments of flat, fine grained sandstone. In imperfectly or poorly drained positions this horizon may be extremely firm or indurated. The change from the subsoil to parent material, which occurs at a depth of 15 to 20 inches, is gradual. The parent material is a dark reddish brown sandy clay loam till. In the very dry condition or in poorly drained areas, it may be extremely firm or indurated. It contains sandstone fragments and larger stones. Surface textures of Pugwash soils are usually sandy loam but may range through loam to sandy clay loam. A detailed description of a Pugwash profile under forest cover is given below.

Horizon	*Depth*	*Description*
A_0	0 – 5 inches	Black leaf litter, semi-decomposed organic material; F layer thick and laminated; H layer thin; matted; felty and fibrous; pH 3·8
A_2	5 – 9 inches	Pink (5 YR 8/3) sandy loam; weakly developed thick platy structure; friable, numerous roots; fragments of brown sandstone; pH 4·5
B_1	9 – 15 inches	Reddish brown to red (2·5 YR 4/5) sandy loam; medium granular structure; friable; some roots; fragments of flat, fine grained brown sandstone; pH 5·2
B_2	15 – 20 inches	Reddish brown (2·5 YR 4/4) sandy clay loam; medium granular structure; friable; slightly plastic; some roots; fragments of brown sandstone; pH 5·3
C	Below 20 inches	Weak red (10 R 4/3) sandy clay loam; coarse granular structure; firm; numerous fragments of red and brown sandstone; pH 5·5

Along the valley of the West River around Durham the profile is very sandy and contains some gravel. Around Abercrombie Point the till contains considerable silt and the soils are slightly heavier.

Utilization of Soils

The Pugwash soils are among the best agricultural soils of the county. The better drainage of these soils is the important factor which makes them superior to the heavy textured soils for general use. Mixed farming and dairying are the chief uses for the Pugwash soils. About 50 to 60 per cent of the Pugwash soils are cleared and a large part of this area is in hay and pasture. While they have a high potential agricultural value, these soils do not seem to be managed so as to obtain maximum production. Hay fields are left for long periods and the pastures become weedy and have low carrying capacity. Organic matter tends to be lost from this soil more rapidly than in the heavier textured soils and this must be kept up to an optimum level if maximum production is to be obtained. The profile is acid throughout and liming is necessary. The same practices recommended for the heavier soils will apply here also. Drainage is normally a minor factor, but a shortened crop rotation, the use of barnyard manure, lime and fertilizers are needed to give suitable yields. Some care must be taken not to work these soils when they are too wet. The fertilizers recommended for this type of soil include 300 to 500 pounds per acre of 2-12-6 or 3-15-6 for grain; 600 to 1,200 pounds per acre for roots when manure is used or the soil is well supplied with organic matter, the higher rate being used on

poorer soils; 1,200 to 2,000 pounds per acre of 4-8-10 for potatoes under average conditions or 800 to 1,200 pounds per acre of 4-12-6 when 10 to 15 tons of manure are used. The use of lime and fertilizers (500 to 700 pounds per acre of 4-12-6) on pastures will improve the grasses and increase carrying capacity. The Pugwash soils of Pictou county are capable of much greater production than is obtained at the present time. Proper soil management is needed, Some sheet erosion is taking place on these soils and, where they are exposed and dried out, wind erosion takes place. Maintenance of cover and increase of organic matter will prevent this. The soils are suitable for all crops grown in the area and may be used for potatoes or market garden crops.

Woodbourne Association

The soils of the Woodbourne Association occupy the fourth largest acreage of the soil associations of Pictou county. The largest single area of these soils lies south of Stellarton on both sides of the East River valley, an area about six miles wide extending southward to Elgin, Centredale and Bridgeville. Other areas occur east of New Glasgow, around Pine Tree and Woodbourne, along the Piedmont valley and in the vicinity of Baileys Brook and Knoydart. The total area occupied by the soils of this association is 61,050 acres or 8·5 per cent of the surveyed area. Woodbourne soils are developed from a till with a gravelly clay loam texture derived principally from brown and reddish brown shales and fine grained sandstones of the Carboniferous Windsor series. These rocks are slightly calcareous in places, but not enough to materially affect the acidity of the soil. The depth of the till varies from two to about eight feet with an average of three to four feet and in some places it is slightly lighter in texture.

The topography of the Woodbourne soils varies from undulating to rolling. Along the valley of the East River and around Hopewell and Bridgeville the soils occupy rolling hills and often have steep slopes, but in the vicinity of Pine Tree and Woodbourne the relief is undulating with gentle knolls and intervening small depressions. Drainage on the Woodbourne soils is generally good. On the steeper slopes, run-off may be excessive. Internal drainage is usually good unless the soil is shallow or in places where the texture of the parent material is somewhat heavier than normal. Seepage spots may occur on the long slopes. The stone content of these soils is variable. In the East River valley area the soils contain considerable stone in the form of flat, angular, flaggy pieces of sandstone, shale and shaly sandstone, but this seems to be no obstacle to cultivation. The deeper till is not so stony and in the Pine Tree-Woodbourne area the till is somewhat modified and more gravelly. The principal forest cover on the Woodbourne soils consists of fir, spruce, hemlock, poplar, birch and maple. On the higher hills the hardwoods predominate while fir, spruce, hemlock and poplar are found on the lower slopes and depressions. Pine is found in a few places.

The soil profile which develops under natural forest cover has a surface composed of 1½ to 2 inches of black, semi-decomposed leaf litter, held together by a thick root mat. This is underlain by a pinkish-grey to light reddish brown sandy loam A_2 horizon to a depth of 3 to 6 inches. In depressional areas this layer is deeper and usually slightly heavier in texture. Cultivation of these two layers develops a light brown sandy loam surface soil to plough depth. The B horizon is brown to reddish brown loam, becoming darker in colour and heavier in texture with depth. Usually the stone content increases with depth. This horizon is quite porous and plant roots are able to extend through it with ease. The parent material occurs at a depth of 15 to 20 inches and has a clay loam texture. It is often quite firm, but permeable and may contain variable quantities of gravel. Angular fragments of sandstone are nearly always present and the till has a purplish tinge imparted to it from the parent rock. Surface textures in the Woodbourne soils vary from a sandy loam to loam and clay loam.

A profile typical of the Woodbourne soils is described below:

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Black, semi-decomposed leaf litter, F layer, laminated; H layer granular and full of roots; pH 4·6
A_2	2 – 3½ inches	Light reddish brown (5 YR 6/3) silt loam; structureless; friable; contains numerous fragments of brown shale; pH 4·1
B_1	3½ – 9 inches	Reddish brown (2·5 YR 4/4) loam; very friable; medium granular structure; slightly plastic; numerous brown shale fargments; numerous roots; pH. 4·6
B_2	9 — 16 inches	Dark reddish brown (2·5 YR 3/4) clay loam; medium granular structure; slightly sticky; plastic; numerous rock fragments; some roots; pH. 4·7
C	Below 16 inches	Weak red (10 R 4/2) clay loam; medium blocky structure; firm when dry; slightly plastic; contains numerous fragments of brown sandstone and shale and occasional boulders, pH. 4·5

Utilization of Soils

About 50 to 60 per cent of the Woodbourne soils are cleared and used for agriculture and some of the best farms in the county are found on these soils. Topography, rather than stoniness, seems to be a limiting factor in the use of these soils. Drainage is often a problem, except on the steeper slopes where rapid run-off may cause erosion, or seepage may cause wet spots in a field. In the latter case, cross ditches might be used to drain off the excess water. Crops grown on these soils include hay, grain, potatoes, roots and truck crops. The East River valley area is more suited to the growing of hay and grain because of steeper slopes and consequent erosion difficulties. Some excellent crops of clover and alfalfa are seen in this area and the soil appears to be well suited to hay crops. On the smoother areas, some canning crops such as peas are grown, but at present the acreage of these crops is small. From field observations it appears that this soil requires building up of the organic matter to give best results. While the soil is acid, it is not so badly leached as some of the other soils of the county, but it will respond well to applications of lime and fertilizers. On the lighter textured areas, the need for these amendments is more apparent in the lower yields and poor pastures. Woodbourne soils are suitable for all crops grown in the area, but necessary precautions must be taken to prevent erosion and hence certain areas are limited to hay, grain or pasture. The steeper slopes should be left in pasture and there are many places where they should be allowed to revert to forest.

Merigomish Association

The soils of this association occur in a single area along the northeast coastline of the county. They extend from the vicinity of Merigomish to Lismore with a maximum width of about four miles. At lower Barney River the area is split by an area of outwash soils. The total area occupied by Merigomish soils is about 18,324 acres or 2·5 per cent of the county.

Merigomish soils are developed from a modified till derived principally from grey and brown sandstones. They are generally light textured soils, but texture varies considerable over small areas. In places the till, which has a general loam texture, contains lenses of sand, gravel or clay and may be roughly sorted. The topography is undulating with gentle knolls. In some cases these knolls have a drumlin-like form and on Merigomish Island they approach true drumlins in character. Drainage is generally good, but there are some depressional areas where the drainage is poor. In these places the subsoil is heavier than usual. The light texture of the Merigomish soils favours good internal drainage. Drainage of these soils is not a major problem. The character of the relief is often a disadvantage in that the depressions between the knolls are not so well drained and the continuity of cultivated fields is broken up into small areas. Stoniness is not a problem on the Merigomish soils, since they are quite

free from stone. They are easily cultivated, but are subject to erosion. Forest cover is confined to the areas away from the coast and consists principally of second-growth fir, spruce, birch, poplar and some pine.

Under this type of cover a surface layer consisting of 2 to 3 inches of leaf litter, moss and partly decayed organic matter develops, which is porous and held together with matted roots. It is very acid in reaction. This is underlain by a pinkish-grey A_2 horizon, usually 2 to 5 inches deep, of a sandy loam texture and loose and porous in character. In poorly drained areas this layer is thicker and may show some mottling. The B horizon is generally a light brown sandy loam to loam, quite friable, and porous. It becomes darker in colour and slightly heavier in texture with depth and often more firm. In some places gravel may be present in this horizon and in others a silty texture is prevalent. The parent material usually occurs at a depth of 16 to 20 inches. It is a brown to reddish brown loam, quite firm, but permeable and contains grey and brown sandstone fragments. In the poorly drained soils this horizon is often a compact gravelly clay loam till at 10 to 15 inches below the surface and is highly mottled. Surface textures on the Merigomish soils vary from sandy loam to loam and silt loam, the sandy loams being most common. In general, the cultivated surface is a light brown sandy loam to plough depth.

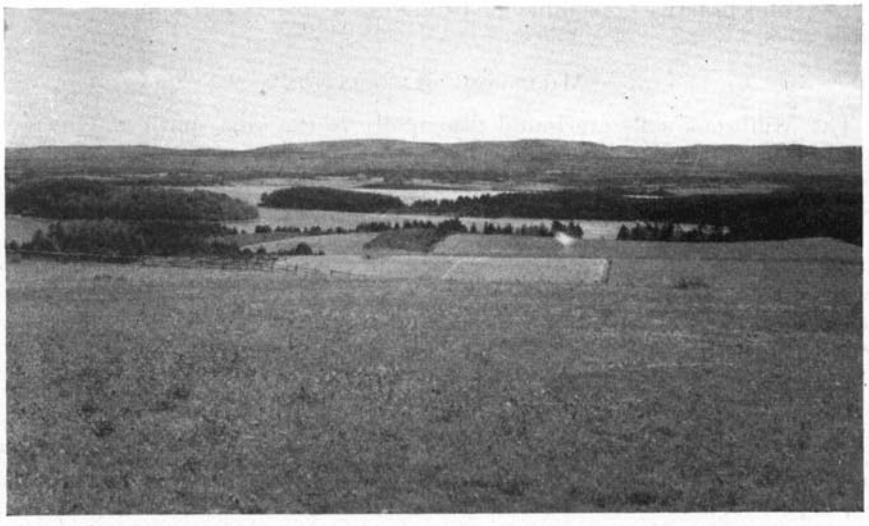

FIG. 8—Typical topography of the Merigomish soils. Local climate is modified by the Pictou Highlands seen in the background.

A description of a representative Merigomish profile is given below.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Moss, leaf litter, semi-decomposed organic matter held together with numerous roots; usually matted; fluffy and porous;
A_2	2 – 4 inches	Pinkish white (5 YR 8/2) sandy loam; weakly developed platy structure; loose; porous; some roots; pH 4·1
B_1	4 – 10 inches	Dark brown (10 YR 4/3) sandy loam; medium platy structure; crushes to a fine granular structure; friable; porous; good root development; no stones; pH 4·2
B_2	10 – 20 inches	Dark brown (10 YR 4/3) loam; thick platy structure; breaks into thin plate like fragments; friable; slightly mottled; occasional fragments of grey and brown sandstone; pH 4·4
C	Below 20 inches	Dark brown (7·5 YR 4/2) loam; firm; moderately cohesive; permeable; contains fragments of grey and brown sandstone; pH 4·6

Utilization of Soils

About 50 per cent of the Merigomish soils are under cultivation. Some areas which formerly were cleared have been allowed to revert to forest. The Merigomish soils are good agricultural soils, but their value is lessened by their topography in which well drained knolls are interspersed with imperfectly or poorly drained depressions and in the variability of textures over small areas. In many cases drainage may be improved through tile drainage or by the use of open ditches. The Merigomish soils are somewhat similar to the Pugwash soils and are suitable for all crops grown in the area. Considerable areas of potatoes, corn and hoed crops are grown on these soils, probably more than on any other soil association except the Tormentine soils. Hay and grain are also important crops. Crop rotations are generally shorter on these soils than on many of the soils in the area and a number of very good farms are seen. Some farmers derive part of their income from fishing and in this case the fields are left in hay for long periods and become run out.

As with the other soils of the area, the Merigomish soils require organic matter, lime and fertilizers for best results. Their response to fertilizer seem to be good and they are probably as well suited to the growing of market garden crops as any soil in the area. Proper precautions must be taken to prevent erosion, which may be severe where hoed crops are grown on knolls. The fertilizers and practices recommended for Pugwash soils will apply to the Merigomish soils.

Millbrook Association

The Millbrook soils are found principally in the area south of Green Hill, around Millbrook on the high land separating the valleys of the West and Middle rivers and in small scattered areas in the vicinity of Kerrowgare and Eden Lake. The total area is 22,822 acres or 3·2 per cent of the surveyed area.

Millbrook soils are medium textured and are developed from a clay loam till derived from a mixture of sandstone and shale. The till has the general reddish brown colour common to the Carboniferous soils and varies from a clay loam to a gravelly clay loam in texture. Over large areas of these soils drainage is imperfect. The slopes of the hills usually provide adequate surface drainage, but in many cases the tops of the hills are wet and internal drainage is slow. Some seepage spots occur on the longer slopes. In the eastern part of the area, the Millbrook soils are confined to the sides of the valleys, the till apparently having been carried in by glacial ice and mixed with local material. In larger areas the Millbrook soils have a rolling topography, with broad hilltops and fairly steep slopes. There is not a great deal of stone on the surface and in general, stone does not interfere with cultivation. Vegetation consists mainly of spruce, fir, hemlock, maple and birch in a mixed stand.

Under forest cover the A_0 or surface layer is black and consists of fairly well decomposed organic material. It is felty and permeated by roots and usually developed to a depth of 2 to 3 inches in the better drained places. The A_2 horizon is a pinkish grey or light reddish brown sandy clay loam to silt loam friable when dry, but somewhat plastic when wet. It usually contains fragments of shale and sandstone and is permeated by roots. The B horizon is usually found at a depth of 6 to 8 inches below the surface. It is a reddish brown clay loam or sandy clay loam with a medium granular structure. Clay content usually increases with depth, the structure becomes blocky and the consistency is firm and permeability is somewhat lessened. There is very little colour change with depth in this horizon. The parent material has a clay loam to gravelly clay loam texture and is blocky and firm and usually mottled. It occurs at a depth ranging from 16 to 24 inches and contains considerable shale and sandstone fragments. In a few places, as along the valley of the Moose River, the soil is well drained

and has a deep brown profile, the parent material occuring at a depth of 30 inches or more. The poorly drained areas have shallow profiles and a tight substratum which holds up the water.

Surface textures in the Millbrook soils vary from a loam to clay loam or sandy clay loam.

The profile described below is typical of the Millbrook soils.

Horizon	*Depth*	*Description*
A_0	0 – 2½ inches	Black, semi-decomposed organic matter; F layer, thin; H layer felty and finely granular; permeated by roots; pH 4·6
A_2	2½ – 5½ inches	Pinkish grey (5 YR 7/2) sandy clay loam; medium platy structure; friable; numerous roots; small fragments of shale and sandstone; pH 4·1
B_1	5½ – 12 inches	Yellowish red (5 YR 4/6) clay loam; medium crumb structure; friable; some roots; small stones; pH 4·8
B_2	12 – 23 inches	Reddish brown (5 YR 5/4) sandy clay loam; medium blocky structure; firm; porous; some roots; pH 4·8
C	Below 23 inches	Weak red (10 R 4/4) clay loam; medium blocky structure; very firm; slightly mottled; contains fragments of sandstone and shale; pH 4·9

Shallower profiles than this are more common and the parent material may have a dark reddish brown colour, but in the shallow profiles the general colour of the B horizon is darker than in the deeper profiles. In some cases the profile is quite yellowish as though superimposed on the reddish brown till.

Utilization of Soils

Although fairly large areas of the Millbrook soils are cleared, most of the cleared area is in hay and pasture. Unless these have been fertilized they usually give low yields, but because of the moisture-holding capacity of the soil, the yields in dry seasons may be better than on some other soils in the area. The land is usually late in the spring. Drainage is one of the major problems on these soils and in general makes them unsuitable for hoed crops. In some ways this is fortunate, since the cleared areas consist chiefly of long slopes subject to sheet washing and gully erosion. Drainage on these long slopes might be improved and erosion lessened by cross ditches. The soil seems to respond well to fertilization and good crops of grain have been grown when fertilizers were applied. It would appear that these soils would make good permanent pasture if properly managed, but the steeper slopes such as those over 10 per cent should be allowed to revert to forest.

A. 3. Shaly sandy loam to shaly clay loam parent material

BARNEY ASSOCIATION

The soils of the Barney Association occupy a total area of 41,593 acres or 5·8 per cent of Pictou county. The principal areas of these soils occur north and east of Springville, north of Kerrowgare, around McPherson's Mills and along the highway from Telford to Barneys River. Barney soils are developed from a shaly loam till derived from Silurian shales. The depth of the till varies from 2 to 15 feet, being very deep near McPherson's Mills, but around Wentworth Grant and Blanchard Road the bedrock is exposed over large areas. The topography of the Barney soils is usually rolling to hilly and they occur on the upland plain, but there are some areas that have undulating relief. Drainage on most of these soils is usually good. Steep slopes favour rapid run-off and the porous nature of the soil permits good internal drainage. In many places the parent material is quite compact or the bedrock is close to the surface and internal drainage is slowed. Some of the depressions collect water, because of the close proximity of the bedrock to the surface. Seepage spots on the slopes are caused either by the dip of the rock strata or the flowing of water over the tight substratum of the soil. Stoniness on the Barney soils is variable, but generally some

surface stone is present. This may vary from shale fragments to erratic boulders. Shallowness over bedrock, stoniness and topography are usually limiting factors on these soils. The forest cover is mixed spruce, fir, maple and birch, with the hardwoods predominating on the better drained areas.

The surface soil under virgin conditions consists of a 2 to 3 inch layer of semi-decomposed leaves and forest litter, permeated by matted roots. This is underlain by a grey or pinkish grey A_2 layer of sandy loam to silt loam texture. This layer is friable and porous and usually contains numerous shale fragments. Plant roots extend through this horizon. The B horizon is a yellowish brown loam, becoming darker in colour and heavier in texture with depth. The lower part usually contains considerable fine shale fragments and occasional cobbles of shaly rock. Roots of some plants reach this horizon. The thickness of the B horizon varies considerably. The C horizon or parent material occurs at a depth of 18 to 22 inches. It is a greyish brown shaly loam and may approach a clay loam in texture. It is generally quite firm, but permeable, the permeability varying with clay content. In shallow profiles there is considerable shale in this material.

Where it has been cultivated, the surface soil is a greyish brown sandy loam to loam.

FIG. 9—The East River Valley at Sunnybrae. The alluvial soils of the Cumberland Association occupy the valley floor. Hilly topography of the Barney soils in the background.

A description of a typical Barney profile is given below:

Horizon	*Depth*	*Description*
A_0	0– 3 inches	Black, partly decomposed organic matter; F layer, thin; H layer well developed, black and granular; numerous matted roots; pH 3·8
A_2	3 – 6 inches	Pinkish grey (5 YR 6/2) silt loam; weakly developed platy structure; friable; contains small fragments of shale; pH 4·4
B_1	6 – 13 inches	Strong brown (7·5 YR 5/8) loam; medium granular structure; very friable; shale fragments; pH 5·0
B_2	13 – 22 inches	Yellowish brown (10 YR 5/6) silt loam; fine granular structure; very friable; slightly plastic; numerous shale fragments and occasional sandstone cobbles; pH 5·2
C	Below 22 inches	Greyish brown (2·5 Y 5/2) shaly loam; friable; slightly plastic; contains considerable thin, flat shale fragments and occasional flaggy rock fragments; pH 5·3

Utilization of soils

Very little of the Barney soils is under cultivation. Most of the cleared areas are used for hay or pasture and many of these are now reverting to forest. In some places, abandoned farms may be seen on these soils, showing that their use for agricultural purposes has not been profitable. Over large areas Barney soils are too shallow and stony or have too steep slopes to make them suitable for agriculture. They are fairly low in natural fertility and when cleared and cultivated do not stand up very well. Barney soils are subject to erosion, especially on the steeper slopes.

With the possible exception of some of the smoother areas where the till is deeper, Barney soils are better suited to forest than to agriculture. Good stands of hardwood are found on these soils and the ease with which tree roots can penetrate the subsoil, makes the soils well adapted to forest growth.

Kirkhill Association

The area occupied by soils of the Kirkhill Association in Pictou is confined to the southern part of the county. The soils occupy an area extending from the county line south of Landsdowne and West River Station eastward to Sunnybrae with an average width of about two miles. They form a continuation of the Kirkhill soil area in Colchester county. The total area occupied by these soils is 25,306 acres or about 3·5 per cent of the county.

Kirkhill soils are developed from a medium textured shaly till derived from shales of the Pennsylvanian age. In some places these shales are thinly bedded and the till is deeper and heavier textured, while in others the shale is coarse textured and blocky and the resulting till is stony and shallow. Mixtures of the two types also occur. In general the topography of the Kirkhill soils is hilly, with an undulating or gently rolling microrelief. The character of the topography and the porous nature of the shale, which often has a nearly vertical dip, provides good internal and external drainage. On the steeper slopes of the hills, drainage may be excessive and considerable erosion results or seepage spots may occur on the slopes. There is usually considerable stone on the Kirkhill soils and rock outcrops are frequently observed. In many places there is sufficient stone to make clearing difficult and over large areas the soil is shallow and flaggy or stony. Where the soil is poorly drained it is often peaty to a depth of several inches. Large areas are covered with forest consisting of maple, birch, spruce, fir and hemlock, with a predominance of hardwoods on the higher slopes. Under this type of cover the soil profile has a surface layer consisting of partly decomposed moss and leaf litter. This layer is usually thin (1-1½ inches) and very acid. Underlying this, the A_2 horizon is a grey or greyish brown loam to clay loam full of shale fragments. It is quite cohesive, but porous and roots penetrate it easily. The A_2 horizon in these soils is well developed and usually varies from 2 to 7 inches in depth. In places it may be very patchy. When these two layers are cultivated they result in a greyish brown loam surface to plough depth. The B horizon extends to a depth of 12 to 20 inches and is a yellowish brown sandy loam to silt loam. It becomes heavier in texture with depth and has increasing quantities of shale fragments. It is quite porous and plant roots are able to get well down into this horizon. The parent material in most cases is a very shaly sandy loam till, especially where the till is shallow, and it often grades into the shaly bedrock. Where the till is deeper, the C horizon may have a clay loam texture, but these places are the exception. The depth to which the profile develops depends on the thickness of the till over bedrock.

The following is a description of a profile representative of the Kirkhill soils:

Horizon	*Depth*	*Description*
A_0	0 – 1 inch	Black, semi-decomposed moss, leaf litter, etc.; felty; porous.
A_2	1 – 4 inches	Greyish brown (10 YR 5/2) silt loam; weakly developed platy structure; firm; cohesive; porous; contains numerous shale fragments; pH 4·0
B_1	4 – 14 inches	Yellowish brown (10 YR 5/4) sandy loam to silt loam; medium crumb structure; slightly cohesive; very friable; porous; numerous roots; numerous shale fragments; pH 4·5
B_2	14 – 20 inches	Brown (10 YR 5/3) heavy sandy loam; firm; fine granular structure; very shaly; contains occasional flags of shale; pH 4·6
C	Below 20 inches	Dark greyish brown (10 YR 4/2) shaly sandy loam till; firm; porous; crushes to a shaly mass; contains large angular slabs and cobbles of shale; pH 4·8

Utilization of Soils

Practically none of the Kirkhill soils in Pictou county are being actively farmed at present, but many farms on this type of soil have been abandoned. The former cleared areas are used principally for grazing, but have a very low carrying capacity and are slowly reverting to forest. There are a few areas where the shale is finer textured and the till heavier, that might be cultivated, but results of past experience seem to indicate that this soil will not stand up under prolonged agricultural use. Organic matter disappears rapidly after clearing and steep slopes are easily eroded. The porous nature of the soil makes the use of fertilizer a doubtful expenditure, but there is a possibility that some of the more level areas on the tops of the hills might make permanent pasture, if a good sod were developed with the use of fertilizers.

Usually these soils occur near areas of soils that are more suitable for agricultural purposes and the Kirkhill soils are better left to forest. The hilly topography of the Kirkhill soils often furnishes a drainage divide for several river systems and by leaving these soils in forest, a control of erosion and run-off is maintained.

A. 4. Sandy loam parent material

TORMENTINE ASSOCIATION

The soils of the Tormentine Association are not very extensive in Pictou county and are confined to a single area along the coast between Pictou Harbor and Caribou Harbor. The soils occupy a total area of approximately 2,490 acres. Tormentine soils are developed from a sandy loam till derived from soft, fine-grained, red Carboniferous sandstones. The colour of the till is very characteristic of these soils and closely resembles the red Triassic soils of the Truro association in Colchester county. In a few places the till is slightly modified and may be very gravelly. The depth of the till varies from three to ten feet on the average.

The topography of the Tormentine soils is quite similar to that of the Pugwash soils and varies from gently undulating to undulating or gently rolling. Drainage is good over most of the area. The porous nature of the soil and the character of the relief provide adequate surface and internal drainage. On the more level areas, drainage is imperfect, the subsoil is compact enough to hold up the water and surface drainage is slow. Most of these areas are covered with trees consisting of spruce, fir and hemlock, while the better drained areas support a mixed stand of birch, spruce, maple and pine. The soils are free from stone of a size sufficient to interfere with cultivation, but sandstone fragments occur on and in the soil. The colour and development of the profile in Tormentine soils is quite striking when compared with other soils of the area.

Under forest vegetation a thin, 1 to 2 inch layer of leaves and semi-decomposed organic matter develops on the surface. This is underlain by a pinkish grey sandy loam A_2 horizon, that is loose, structureless and porous.

It is variable in depth, since these soils are readily leached, and varies from 2 to 10 inches. These two layers form a light brown surface soil when ploughed, often with a greyish cast. The upper part of the B layer is a yellowish brown sandy loam, becoming a characteristic dark red colour with depth. The lower subsoil is often quite firm in place, but permeable to water. A few roots reach the lower subsoil which grades into the dark red sandy loam parent material. This material is firm and shows some structural development and usually contains many fragments of micaceous sandstone. On the imperfectly to poorly drained areas, the A_2 horizon is thicker than in the well drained soils. The B layer is strongly mottled and may be slightly indurated. The colours are more dull and the horizons less distinct than in the well drained soils. Surface textures include sandy loam and loam.

A description of a representative Tormentine profile is given below.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Black, leaf litter and semi-decomposed organic material; felty; held together by numerous roots.
A_2	2 – 6 inches	Pinkish grey (5 YR 7/2) sandy loam; loose; structureless; porous; some roots; variable in depth; pH 3·8
B_1	6 – 11 inches	Yellowish red (5 YR 5/6) sandy loam; medium granular structure; friable; porous; contains some gravel; numerous roots and soft, micaceous sandstone fragments; pH 4·8
B_2	11 – 20 inches	Dark red (2·5 YR 3/6) sandy loam; medium blocky structure; firm; porous; few roots; red sandstone fragments and gravel. pH 5·0
C	Below 20 inches	Dark red (2·5 YR 3/6) sandy loam till; medium blocky structure; firm; porous; contains some flakes of mica and red sandstone fragments; occasional cobbles; pH 4·7

Utilization of soils

Tormentine soils are probably the best agricultural soils developed from till in Pictou county. They are equal to, and in many cases better than, the Pugwash soils, but in Pictou county only about one third of the soil area has been cleared. This may he because of the fishing-farming occupation of many of the land owners. Tormentine soils are usually well drained and easy to cultivate. They are suited to a wide variety of crops and canning crops do well on these soils. Within the area, peas are grown as a canning crop with considerable success, while other areas are devoted to dairying. Hay, grain and roots form the principal crops. Hay yields 1 to 1½ tons per acre and oats 30 to 35 bushels per acre, but these yields may be considerably increased by fertilization. The soils respond well to good management. The content of organic matter is generally low and it is necessary to keep this built up, if a good fertility level is to be obtained. This will ensure a good moisture-holding capacity and increase the microbiological activity on the soil. The application of barnyard manure where possible or ploughing down green manuring crops will help to maintain the organic matter. The Tormentine soils are very acid and require liming, especially if legumes are to be grown. The practices and fertilizers recommended for the Pugwash soils will apply to the Tormentine soils. Shorter rotations, liming and fertilization with a maintenance of organic matter are essential for profitable crop production. Poorly drained areas are usually fairly easy to drain and they may be used for pasture or in some cases may be brought under cultivation where drainage is greatly improved. Erosion is taking place on these soils, particularly in the form of sheet washing and some care must be taken in growing intertilled crops on the slopes. The maintenance of a fair level of organic matter will help to reduce soil losses.

Hansford Association

The Hansford soils occur in small scattered areas throughout the county. The largest single area occurs north of Trenton around Pictou Landing. Other areas occur near Meadowville, Scotch Hill, Scotsburn and north of Salt Springs.

The total area occupied by these soils is 21,427 acres or 3 per cent of the surveyed area. Hansford soils may be regarded as transitional in character between the Shulie soils and the Pugwash soils, having characteristics of both, but resembling a very stony Pugwash soil in profile.

The Hansford soils are developed from a coarse textured gritty till derived from coarse textured grey and brown sandstones. In some places the till is gravelly and not so stony as usual, while in others as around Pictou Landing and north of New Glasgow the till is heavier and does not contain much stone. The topography varies from gently undulating to rolling and the open nature of the soil allows free drainage. Where the soil is heavier internal drainage is restricted and the soils are generally wet or late in the spring. Stoniness is usually a limiting factor in the use of Hansford soils. In some cases the surface is littered with sandstone blocks and, with the exception of the heavier areas, the profile is nearly always stony. Vegetation consists of spruce, fir, maple, birch and poplar.

The uncultivated profile has a 1- to 2-inch layer of black, felty, semi-decomposed leaves and forest litter on the surface. This is underlain by a 6- to 8-inch layer of greyish sandy loam, which is porous and contains pieces of grey sandstone. In the depressions these layers are thicker and A_2 horizons 12 inches thick have been observed. The B horizon is yellowish brown loam, porous and friable. It becomes browner with depth and sometimes firmer and contains more stone. In the heavier textured areas the B horizon may vary from a loam to sandy clay loam in texture. The parent material is a greyish or reddish brown sandy loam to loam, usually firm, but permitting free drainage, except in the heavier areas. Considerable stone is often present.

A typical profile of the Hansford soil is described below:

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Moss, leaf litter and semi-decomposed organic matter; felty; numerous roots.
A_2	2 – 8 inches	Pinkish grey (5 YR 6/2) sandy loam; thick platy structure; vesicular; moderately cohesive, friable; porous; numerous roots and pieces of grey sandstone; pH 3·8
B_1	8 – 13 inches	Strong brown (7·5 YR 5/6) loam; fine crumb structure; very friable; porous; numerous roots; fragments of grey sandstone; pH 4·5
B_2	13 – 19 inches	Light brown (7·5 YR 6/4) sandy loam; firm; medium blocky structure; fragments of sandstone; some roots; pH 4·7
C	Below 19 inches	Dark reddish grey (5 YR 4/2) loam till; firm; pervious; contains a large amount of grey and brown sandstone pebbles, cobbles and boulders; pH 4·7

In the area North of New Glasgow toward Abercrombie Point and around Pictou Landing the soils contain less stone and the parent material is a sandy clay loam in texture. Drainage is imperfect in these soils, but they have less stone in the profile. In some cases they are mixed with small areas of the Shulie soils and much stone is present.

Utilization of Soils

The Hansford soils are not cultivated to any large extent, the principal cultivated areas being those around New Glasgow and Pictou Landing mentioned above. Some small areas are cleared north of Salt Springs, but these are used for hay or pasture. Except in the areas mentioned, Hansford soils are difficult to clear and are best suited to forest. Natural fertility is low and the soils tend to be droughty due to their open nature. Hay, grain and corn give low yields, but with proper treatment yields can be improved. On the presently cultivated areas some fields have been in hay for 10 to 15 years and are very weedy. Some farmers practise green manuring with good results and the benefits of manure on hay fields was observed in greatly increased yields and staying power of the crop. Under present conditions Hansford soils are marginal to submarginal agricultural soils.

Shulie Association

Shulie soils are not so extensive in Pictou county as they are in Cumberland and Colchester counties. The principal areas are along the western border of the county, where they are continuous with the areas in Colchester county, and between Trenton and Little Harbor. The total area of these soils in Pictou county is 30,182 acres.

Shulie soils are very stony and coarse textured, being developed from a till derived from hard grey and yellowish sandstones. The till is stony, often containing blocks and slabs of sandstone and is usually not very deep. The topography of these soils varies from undulating to rolling or hilly and the major proportion of the area has a pronounced relief. Drainage is usually good on the Shulie soils and in some areas it may be excessive, since the soil is very porous and allows water to percolate freely through it. In a few places drainage is restricted because of the nature of the relief, the shallowness of the soil over bedrock or a compact subsoil. The stone content of the soils is variable, but in nearly all cases there is enough stone to make cultivation difficult, or even impossible. Large areas are forested; the principal trees being beech, birch, maple, spruce and fir, with a major proportion of hardwoods. The normal profile developed under forest has a surface layer composed of leaves and tree litter mixed with semi-decomposed plant material about 1 to 2-inches deep. This is underlain by a grey leached layer of variable thickness and a sandy loam texture, which contains considerable sandstone fragments. The B horizon is light yellowish brown, orange brown or light brown sandy loam, showing little structure. It is granular and gritty and contains fragments and slabs of sandstone. Tree roots penetrate well down into the B layer. It grades with little change of character into the parent material at depths varying from 12 to 20 inches. This material is greyish brown or light brown in colour and has a gritty sandy loam texture. In some places it may be firm or compacted but always contains slabs and fragments of coarse grey sandstone. Where the soils have been cultivated, the surface soil is a light brown sandy loam or gravelly sandy loam, loose, structureless and low in organic matter. In the poorly drained depressions the profile is shallow, the leached layer is thicker and often mottled and the B horizon is usually also very firm and mottled.

A description of a typical uncultivated Shulie soil is given below:

Horizon	*Depth*	*Description*
A_0	0 - 1 inch	Dark brown to black leaf litter; semi-decomposed organic matter; F layer, thin, practically absent; H layer, fine, granular, and full of matted roots; porous.
A_2	1 - 4 inches	Pinkish grey (5 YR 6/2) sandy loam; slightly cohesive; friable; structureless; sandstone fragments; porous; numerous roots; pH 3·6
B_1	4 - 9 inches	Dark yellowish brown (10 YR 4/4) to yellowish red, (7·5 YR 5/6) sandy loam, structureless; loose; porous; grey sandstone fragments; good root development; pH 4·5
B_2	9 - 18 inches	Light yellowish brown (10 YR 6/4) sandy loam; structureless; loose; porous; some roots; numerous fragments of sandstone and some slabs; pH 4·7
C	Below 18 inches	Light brown (7·5 YR 6/4) sandy loam till; firm; porous; fragments and flags of grey sandstone; pH 4·8

Utilization of Soils

The largest area of cultivated Shulie soils occurs north of Salt Springs. The labour required to clear this land is evident from the stone walls and stone piles in the fields, and it is only through good management that the farms in this area are productive. In general, the stone content of these soils makes clearing impractical or, if cleared, the use of machinery is restricted. The soils have a low natural fertility due to their origin, but they are well suited to forest. Where they are cultivated, organic matter needs to be built up through the use of manure or green manuring crops. The soils are not suitable for crops other

than grain and hay, but through the use of lime and fertilizers their productivity may be kept at a fairly satisfactory level. The poorly drained areas are unsuitable for agricultural purposes. Some fire barrens occur in the area on the southwest boundary of the county.

Kirkmount Association

The soils of the Kirkmount Association are located in the southeastern part of the county. They occupy a large area in the vicinity of McLellans Mountain, Blue Mountain, McGraths Mountain and along the valley of the Moose River. Other small areas occur north of Sunnybrae and west of Eden Lake. The total area occupied by these soils is 36,377 acres or about 5 per cent of the county. The till from which the Kirkmount soils are developed is derived from metamorphosed sedimentary rocks and contains a large proportion of schist. The till has a sandy loam texture and is fairly stony, containing sharply angular blocks and fragments of very hard sandstone, slate or quartzite.

The topography is generally hilly, slopes are quite steep, usually 5 to 10 per cent or greater, and there are very few smooth areas. Drainage as a whole is fairly good. On exposed slopes run-off is rapid and erosion results, but the internal drainage of the soil varies from moderately slow to good. There are some depressional areas where the water is held up by the nature of the relief or the proximity of the bedrock to the surface. These areas are poorly drained and usually swampy. Kirkmount soils are usually stony and on the higher slopes they are shallow. Bedrock is exposed in many places. Along the valley of the Moose River, between Moose River and Eden Lake, the soft schist is practically free from other material and has been ground up by glacial action to give a deep till consisting almost entirely of soft schist fragments. Here the topography is undulating and consists of low knolls along the valley sides. The major proportion of the Kirkmount soils is forested, the principal trees being maple, birch and spruce.

In undisturbed wooded areas a thin layer of leaves and litter has accumulated. This is underlain by a thin layer of organic matter, held together by numerous roots. It is black, granular and porous. The leached A_2 horizon is grey colored and a loam in texture. It is usually thin, 2 to 3 inches, and very friable, loose and porous. The subsoil is a reddish brown sandy loam, friable and porous, which grades at a depth of 8 to 10 inches into a brown sandy loam to loam, which contains considerable schist and metamorphic rock fragments. This material overlies the greyish brown sandy loam till at a depth of 18 to 24 inches. The till is firm, often very firm, but quite permeable and contains a large amount of schist fragments and stones and cobbles of metamorphic materials.

The cultivated surface soil is a greyish brown to brown sandy loam to plough depth.

A typical profile of the Kirkmount soils is described in the following:

Horizon	*Depth*	*Description*
A_0	0 – 1 inch	Black leaf mold and leaf litter matted with roots.
A_1	1 – 3 inches	Black loam; fine granular structure; felty; porous; numerous roots.
A_2	3 – 4 inches	Pinkish grey (5 YR 6/2) loam; medium granular structure; very friable; soft; porous; numerous roots and fragments of schist. pH 4·0
B_1	4 – 8 inches	Reddish brown (5 YR 4/4) sandy loam; very friable; porous; some roots; fragments of schist and cobbles of metamorphic rocks; pH 4·5
B_2	8 – 24 inches	Dark brown (10 YR 4/3) sandy loam to loam; medium crumb structure; friable; porous; contains many cobbles and blocks of schist; pH 4·7
C	Below 24 inches	Dark greyish brown (2·5 Y 4/2) gravelly sandy loam; structureless; firm; pervious; numerous flaggy pieces of schist and cobbles of metamorphic material; pH 4·8

Utilization of Soils

Very little of the Kirkmount soils is being farmed at present. Where crops are grown on these soils hay, grain and pasture are the chief uses. Many formerly cleared areas are reverting to forest or are used for grazing. Stoniness and topography are factors which limit the use of Kirkmount soils. On the

smoother areas such as in the Moose River valley, the drainage is rapid to excessive and the soils tend to be droughty. This condition could be improved by the addition of organic matter and it is probable that in this area the soils would be fairly productive under proper management. The soil in its natural state under forest has a good supply of organic matter, but because of the nature of the topography this rapidly disappears after the tree cover is removed. Erosion quickly follows tree removal and these soils seem to erode very easily. Excellent stands of hardwood are seen on the Kirkmount soils, and in general, their use should be confined to forestry.

Thom Association

The soils of this association occupy the third largest acreage among the soils of the county. Areas of these soils are scattered throughout the county principally around Mt. Thom, north of Lansdowne and Glengarry Station, south of Barney River and along the eastern county line about Marshy Hope and southward. The Thom soils cover a total area of approximately 73,133 acres or 10 per cent of the county. They are developed from a coarse textured till derived principally from a sandstone breccia. Other rocks in the till include slightly metamorphosed shales and metamorphic erratics. The till varies in depth, but is usually quite shallow. In the eastern part of the county a larger proportion of metamorphic rocks is found in the till.

Topography on the Thom soils varies from rolling to hilly with an undulating microrelief. Drainage is usually good as the porous, open nature of the till readily permits the percolation of water. Run-off is rapid on some of the cleared steeper slopes and there are places where seepage spots occur on the hillsides, probably due to the attitude of the underlying rock strata. Poorly drained depressions occur where the nature of the topography or tightness of the subsoil restricts the movement of water. Stoniness is variable, but there appears to be more stone on the eastern areas than in the western part of the county. Although these soils are quite stony, they can usually be cleared with less labour than the Kirkhill, Shulie or Hansford soils. The principal tree cover consists of maple, birch, spruce, fir and hemlock.

On areas that have not been disturbed by cultivation for some time a layer of black leaf mold and semi-decomposed organic matter develops. This layer is usually thin and is underlain by a greyish loam leached layer 3 to 5 inches thick. Cultivation mixes these layers and develops a brown sandy loam surface soil to plough depth. The upper subsoil is a light yellowish or yellowish brown sandy loam, very friable and porous. It grades into a light yellowish brown friable sandy loam at a depth of 8 to 12 inches. The parent material occurs at a depth of 15 to 20 inches and is greyish brown or light brown loam, quite firm and contains numerous breccia fragments. The whole profile is acid throughout. In poorly drained depressions the surface accumulation of organic material is thicker and the soil seems to have a deeper leached layer which shows considerable mottling. Surface textures in the Thom soils vary from sandy loam to loam.

A profile representative of the Thom soils is described below:

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Black leaf litter and semi-decomposed organic matter; F layer, thin; H layer granular and full of roots; felty; porous; fluffy when dry.
A_2	2 – 5 inches	Pinkish grey (5 YR 6/2) loam; fine granular structure; very friable; contains considerable breccia-like fragments; some roots; pH 3·5
B_1	5 – 11 inches	Strong brown (7·5 YR 5/6) sandy loam; very friable; soft; porous; numerous fragments of sandstone breccia; pH 4·2
B_2	11 – 23 inches	Light yellowish brown (10 YR 6/4) sandy loam; medium granular structure; friable; porous; contains considerable stone; pH 4·4
C	Below 23 inches	Dark greyish brown (10 YR 4/2) loam; structureless; firm; porous; occasional roots; many angular stones and angular gravel fragments; pH 4·8

Utilization of Soils

The Thom soils are not cultivated extensively in Pictou county. In former years large areas have been cleared, but many of these have been abandoned and are reverting to forest. Cleared areas are used principally for hay or for grazing. The natural fertility of these soils is low and poor yields are obtained unless fertilizers are used. The porous nature of the soil and its topography result in too rapid drainage in dry years and crops fail from lack of moisture. Although Thom soils support a good forest growth, they quickly deteriorate under cultivation. Organic matter disappears rapidly and fertility is easily depleted. Under forest cover, the tree roots are able to reach well into the subsoil and moisture is held by the litter on the forest floor, so that in this respect the forest is self-supporting.

Areas under cultivation at present might be improved by building up the organic matter in the soil and through the use of lime and fertilizers, but if more suitable land is available for crop production the Thom soils are better suited to forest and should be used only for this purpose. Some severe erosion is taking place on the steeper slopes occupied by Thom soils. In some places complete removal of the soil has resulted. Even those areas now under grass cover are subject to considerable erosion on the steeper slopes. Reforestation will help to remedy this condition.

Halifax Association

The soils of the Halifax Association are widespread throughout the province, but in Pictou county they occupy a single area along the southern boundary of the county. The area is about seven miles wide on the western edge of the county and narrows to about one mile on the eastern boundary. The total area occupied by these soils in Pictou is 83,194 acres or about 11·6 per cent of the county.

The Halifax soils occupy the second largest acreage of the soils of Pictou county. They are developed from a stony till derived chiefly from Carboniferous rocks of the Horton series. In the southern part of Pictou county these rocks are somewhat metamorphosed and hard sandstones, quartzites and altered shales are the dominant rock material. The soils developed from these materials are similar to those developed from the slates and quartzites of the Southern Upland to the south.

The topography is hilly with an undulating microrelief. Drainage over large areas is variable. Short stony ridges are interspersed with swampy areas and drainage will usually vary with topography. Where there is sufficient slope for the water to drain away, the soils are well drained. The open porous nature of the soil facilitates good internal drainage. Halifax soils are generally shallow and very stony. In many places barrens may be seen in which the hard sandstone is exposed at the surface. On these barrens the principal vegetation is blueberries, wire birch and black spruce. Where heavier tree cover exists, spruce, fir, birch, maple and pine grow in mixed association.

Under forest cover a thin layer of leaf mould and semi-decomposed organic material collects on the surface. This is underlain by a 3 to 5 inch layer of greyish sandy loam, which is loose and porous. The B horizon is a light yellowish brown or orange brown sandy loam. It becomes slightly browner in colour, somewhat firmer and more stony with depth. This overlies the parent material at a depth of 15 to 20 inches. The parent material is a greyish brown sandy loam

till containing considerable stones and occasional boulders. In places it may be quite compact and possibly mottled, particularly in the poorer drained locations. In the poorly drained depressions the surface organic layer is very thick and peaty and usually approaches swampy conditions.

The profile described below is representative of a well drained Halifax soil under forest cover.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Dark brown to black semi-decomposed organic material; F layer, thick; H layer thin and matted with roots; often stony.
A_2	2 – 5 inches	Grey (10 YR 6/1) gravelly sandy loam; fine granular structure; very stony; porous; numerous roots; pH 3·5
B_1	5 – 9 inches	Strong brown (7·5 YR 5/8) gravelly sandy loam; structureless; loose; porous; stony; good root development; pH 4·2
B_2	9 – 18 inches	Dark brown (7·5 YR 4/4) gravelly sandy loam; fine blocky structure; friable; porous; some roots; very stony; pH 4·4
C	Below 18 inches	Dark greyish brown (2·5 Y 4/2) gravelly sandy loam; firm; pervious; crushes to a powdery mass; very stony; pH 4·8

Utilization of Soils

Practically none of the Halifax soils are under cultivation in Pictou county. Small cleared areas are used for hay or rough pasture, but yields are low and little effort is made to improve the land. The chief source of income from these soils is derived from lumbering. Halifax soils are not very well suited to agriculture. The stoniness of the soil and its variable drainage pattern precludes the clearing of any large well drained area, even though the stone might be removed. Fire barrens occur frequently in southern Pictou county and swampy areas are scattered throughout. The best use of these soils is for forestry. In Pictou county the Halifax soil area provides a drainage divide between rivers flowing north to the lowland plain and south into the valley of the St. Mary River. The use of these soils for forestry will control run-off and regulate the load carried by these rivers.

Gibraltar Association

Only a very small area is occupied by Gibraltar soils in Pictou county. This is located in the southwest corner of the county and adjoins the Gibraltar soil area of Colchester county.

Covering an area of 544 acres, Gibraltar soils are not very important in Pictou county, but they are widespread throughout the province. They are developed on a coarse gritty till derived from a biotite granite. The till is not usually very deep and is very stony. The topography is undulating to rolling and in some places, stony kame-like ridges interspersed with swampy areas occur. Drainage is variable between good and imperfect with numerous swampy depressions scattered throughout the area. Stones and boulders litter the surface and rock outcrops are frequent. All of the Gibraltar soil area in Pictou county is covered with forest consisting of maple, birch and beech on the better drained ridges and spruce, hemlock and poplar in the wetter positions.

The profile in undisturbed condition somewhat resembles that of the Halifax soils described above. Under a thin layer of leaf mold, the leached A_2 horizon varies in depth from 1 to 10 inches, being very patchy in places. It has no definite structure and is loose, fluffy and porous. The subsoil is yellowish brown or orange brown gritty sandy loam, the upper part often being thin and becoming lighter in colour and stonier with depth. This overlies the parent material at a depth of 18 to 25 inches. This material is sometimes firm or compact, very stony and a light yellowish brown or greyish colour. It may be somewhat finer in texture than the upper soil. The depth of the profile is extremely variable and may be only a few inches over bedrock.

A typical profile is described below.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Black, leaf mold, semi-decomposed organic matter; matted roots; stone fragments.
A_2	2 – 5 inches	Light grey (5 YR 7/1) sandy loam; structureless; loose; porous; variable in depth; numerous roots; pH 3·7
B_1	5 – 15 inches	Yellowish red (5 YR 5/8) gravelly sandy loam; granular structure; loose; porous; some roots; numerous stones and occasional boulders; pH 4·9
B_2	15 – 20 inches	Strong brown (7·5 YR 5/8) coarse sandy loam; slightly cohesive; very friable; porous; some roots; numerous stones of granite; pH 5·3
C	Below 20 inches	Pale brown (10 YR 6/3) sandy loam till; very firm, but pervious; contains granite stones, cobbles and boulders; pH 5·5

Utilization of Soils

Gibraltar soils in Pictou county, as in most parts of the province where they occur, are unfit for agricultural use. They support a good stand of timber but this is being rapidly cut off. The soils should be left in forest.

Cobequid Association

The Cobequid soils occupy the largest area of rough land in the upland plain, on the Cobequid Mountains in the west and on the Pictou Highland in the eastern part of the county. Their distribution may be seen on the soil map. They occupy 13·6 per cent of the county or an area of 97,766 acres. The largest single area occurs on the eastern side of the county. Cobequid soils are developed from till derived principally from igneous material such as granite, felsites, diorites and syenites, which produce a coarse textured, porous till.

The topography varies from rolling to hilly, the slopes of the hills usually are quite steep and long. Drainage of the Cobequid soils is good, both internally and externally, because of the nature of the topography and the porosity of the soil. There are very few poorly drained areas, although seepage spots may occur on the slopes or wet spots may occur where the bed rock is close to the surface on the tops of the hills. The Cobequid soils are very stony and resemble the Halifax and Gibraltar soils in this respect. Large areas are covered with forest consisting of maple, beech, yellow birch, wire birch, spruce, hemlock and occasional pine. The hardwoods are the dominant tree cover.

In places where the soil has been undisturbed a thin layer of leaf mould and organic matter collects on the surface. Under this layer a greyish sandy loam A_2 layer is developed. It is usually very thin and poorly developed and may be absent over large areas. The B horizon has a brown colour peculiar to the Cobequid soils, a loam texture and a fairly high content of organic matter. It grades downward, through a lighter brown sandy loam that becomes firmer and stonier, into the greyish brown to light brown parent material at a depth of 20 to 24 inches. The parent material is a gravelly sandy loam containing considerable stone and is quite firm, but allows easy penetration of water. In shallow profiles the soil material is often coarser and the rock content is increased. The poorly drained depressions have a deeper organic layer on the surface and the profile is shallow, compact and strongly mottled.

The profile of the Cobequid soil described below is quite typical of the Cobequid soils in general.

Horizon	*Depth*	*Description*
A_0	0 – 1 inch	Black leaf mold; F layer thin; H layer, fine granular structure; very friable; pH 4·8
A_2	1 – 3½ inches	Pinkish grey (5 YR 7/2) sandy loam; fine granular structure; very friable; porous; numerous roots; variable in depth; gravelly to cobbly.
B_1	3½ – 9 inches	Dark reddish brown (5 YR 3/4) loam; fine granular structure; friable; porous; numerous roots; stony; pH 5·0
B_2	9 – 26 inches	Reddish brown (5 YR 4/4) gravelly sandy loam; medium granular structure; firm; porous; some roots; stony.
C	Below 26 inches	Brown (7·5 YR 5/4) gravelly sandy loam; firm; porous; stony; pH 5·3

Utilization of Soils

Very little of the Cobequid soils in the surveyed area are cultivated at the present time. Some large areas have been cleared and the stone piles in the fields and fences give some idea of the excessive labour required to clear this land. Both stoniness and topography are deterrents to the agricultural use of the Cobequid soils. It is possible that a few of the areas now cleared might be developed for grazing with proper management, but generally the soil is thin and has been depleted of most of its fertility. The principal source of income on these soils is from lumbering and the exclusive use of the Cobequid soils for forestry will be a wise and profitable procedure.

Small areas being farmed at present are used for hay or pasture. In local areas where stone content is not serious careful management will produce fair hay crops. Maintenance of organic matter and the lowering of acidity through the use of lime is necessary for best results. The Cobequid soils erode easily and it is imperative that the steeper slopes be protected with trees. A sound forestry program should be encouraged on these soils.

Westbrook Association

The soils of the Westbrook Association occupy scattered areas throughout the county. The largest single area occurs around Rogers Hill and Campbell Hill in the Western part of the county. Other areas occur at Green Hill, east of Alma, Fraser mountain and north of Telford. In all, the Westbrook soils cover an area of 24,915 acres or 3·5 per cent of the county.

The soils are developed from a gravelly till derived from a reddish brown conglomerate. The conglomerate rock often has a distinct purplish colour which is quite characteristic. The topography varies from undulating or rolling to hilly, the rougher topography being found in the vicinity of Rogers and Campbell Hills. The nature of the relief and the open nature of the soil facilitate rapid drainage which may become a serious factor in erosion on the steeper slopes. In a few places the finer material in the till has become compact enough to restrict

Fig. 10—Looking west from Green Hill. Farms in foreground are on Westbrook soils. The high hills in the background are occupied by Cobequid soils and the intervening area by Shulie and Pugwash soils.

drainage and wet spots occur. Stones do not generally interfere with cultivation, but in many places the soils are very shallow or bedrock outcrops at the surface. Occasional boulders also occur on the surface. Tree cover consists principally of fir, maple, beech, hemlock and spruce. The cultivated soil has a light brown sandy loam to loam surface to plough depth. Under forest cover a layer of leaves, needles and partly decayed organic matter forms on the surface. This is underlain by a grey or pinkish grey A_2 layer to a depth of 3 to 6 inches. This layer has no structure and is loose and porous. It overlies the yellowish brown sandy loam subsoil which becomes darker in colour and slightly heavier in texture with depth.

The parent material occurs at a depth of 18 to 20 inches in most places. It has a reddish brown colour with a purplish cast and may vary in texture from a sandy loam to loam or in extreme cases a clay loam. Gravel is present throughout the profile. Roots are developed well down into the profile and in the natural state the soil seems to possess a fair content of organic matter.

A typical profile of the Westbrook soils is described below.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Black, semi-decomposed organic matter; matted roots; felty.
A_2	2 – 5 inches	Pinkish grey (5 YR 7/2) loam; coarse, granular structure; many roots and some gravel; porous; pH 4·3
B_1	5 – 11 inches	Yellowish red (5 YR 5/6) loam; fine crumb structure; friable; porous; good root development; some gravel; pH 4·6
B_2	11 – 17 inches	Reddish brown (2·5 YR 4/4) gravelly loam; granular structure; firm; porous; pH 4·7
C	Below 17 inches	Dark reddish brown (2·5 YR 3/4) gravelly loam; very firm; porous; contains considerable fine gravel; pH 5·3

Utilization of Soils

About 60 per cent of the Westbrook soils in Pictou county are cleared, but many areas have been abandoned and are reverting to forest. On the areas being farmed at present, hay and grain are the principal crops. Other areas are used for pasture. The open, porous nature of these soils tends to make them droughty and it is necessary to maintain a fair supply of organic matter to hold the moisture. In areas where the texture of the soil is somewhat heavier, better results are obtained with less effort, but it is necessary to continually maintain a good level of fertility if good crops are to be produced. Without the addition of organic matter or the use of fertilizers, yields of hay and grain are low.

Westbrook soils are suitable for potatoes and small fruits in places where the soil contains more body than usual. They are also easily eroded and some severe erosion has already occurred on these soils. In general, the steeper slopes should remain in forest. The more level areas may be brought under cultivation if proper management practices are followed, but these soils require considerable quantities of fertilizer to maintain profitable production and if other suitable soils in the area are available they should be used in preference to the Westbrook soils.

B. SOILS DEVELOPED FROM WATER-DEPOSITED MATERIALS

The soils developed from water-deposited materials in Pictou county occupy 32,550 acres. All of these materials have been deposited either during the last great glaciation or by subsequent streams since that time. Deposition is still taking place. Deposits laid down by streams flowing from the glacial ice occur in the form of outwash plains. The material is usually sorted and stratified, being coarser in texture nearer its source. Other deposits formed by streams flowing on or within the ice sheet take the form of long narrow gravel ridges known as eskers, gravel terraces or isolated gravelly knolls, known as kames. These are gravelly, poorly sorted deposits, but show some stratification. These deposits form the parent materials of the Hebert soils.

The materials deposited by subsequent streams are more recent that those from glacial streams. They consist of the materials deposited along the stream courses in the valleys. The sediments are usually of local origin and in general are finer textured than the glacial outwash material. The Cumberland and Stewiacke soils are developed from this type of material. These soils are described in detail below:

B. 1. Sandy loam to gravelly sandy loam parent material

HEBERT ASSOCIATION

The soils of the Hebert Association are widely scattered throughout the county. The largest single area occurs as a large outwash plain near Lower Barney River and extends to Avondale and up the Piedmont Valley. Another large area forms a broad terrace along the base of the Cobequid Mountains in the vicinity of Millsville. Other smaller areas in the form of terraces, kames and eskers are scattered throughout the county. The total area occupied by these soils is 22,758 acres. The parent materials of the Hebert soils are derived principally from igneous and metamorphic rocks of the upland plain. The

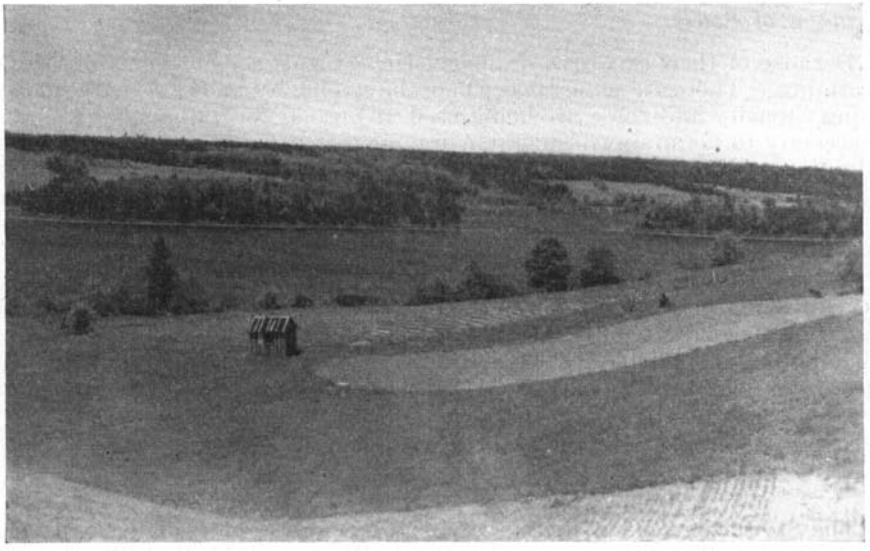

FIG. 11—View of Eden Lake in southeast Pictou county. Farming in this area is confined to the gravelly Hebert soils shown in the foreground. The hills in the background are occupied by stony Cobequid soils.

materials are sorted and vary in size from fine sand to cobbles and boulders, the general texture being a gravelly sandy loam. Topography varies with mode of deposition as mentioned above. The outwash plains are very gently undulating to level and the terraces have fairly steep outer slopes. Kames and eskers have a typical relief. Drainage is usually excessive, but where the sand is finer, the moisture-holding capacity of the soil is improved. In a few places lenses of till or clay in the gravel may restrict the internal drainage and wet spots develop. Vegetation consists mainly of spruce, fir, pine, poplar and wire birch.

In places where it has been undisturbed, the profile has a thin layer of needles and leaf mould on the surface. The underlying grey leached layer is often deep and is loose and porous. Cultivation of these layers results in a brown sandy loam surface that is loose and structureless. Often the entire leached layer is

not all turned up by the plough because of very severe leaching. The subsoil is yellowish brown sandy loam, loose and structureless and often contains considerable gravel. It becomes darker in colour, somewhat firmer and usually more gravelly with depth. The lower part of the subsoil may be indurated or weakly cemented. The parent material is greyish brown sand with considerable gravel. It may be very loose and structureless or it may be weakly cemented and full of large cobbles.

Two classes, the gravel and the sand class were mapped in the Hebert soil Association.

The following is a description of a Hebert profile.

Horizon	*Depth*	*Description*
A_0	0 – 2 inches	Black needles, leaf litter and semi-decomposed organic matter; loose fluffy and porous; held together by numerous roots.
A_2	2 – 6 inches	Pinkish grey (7·5 YR 7/2) loam; fine granular structure; porous; some gravel. pH 3·4
B_1	6 – 14 inches	Brown (7·5 YR 5/5) gravelly sandy loam; fine granular structure; very friable; porous, numerous roots. pH 3·9
B_2	14 – 24 inches	Brown (7·5 YR 4/4) loamy sand; weakly cemented; crushes to a loose mass; porous; gravelly; some roots; pH 4·4
C	Below 24 inches	Very dark greyish brown (10 YR 3/2) loamy sand; firm; porous, gravel and cobbles. pH 4·5

Utilization of Soils

Because of their excessive drainage, Hebert soils are not generally suitable for farming. There are some areas where the soil has a somewhat better moisture holding capacity and these are being used at present for various crops. It will be necessary to maintain considerable organic matter in these soils for profitable production. Without organic matter the porous nature of the soil makes fertilizer application of doubtful value, since it is easily washed out of the soil. The soil is better suited to market garden crops or small fruits than to hay or grain.

Hebert soils have a low natural fertility, consequently anyone farming these soils must be prepared to apply proper management practices if profitable returns are expected. The soil is suitable for early crops and if a market is available that will make heavy expenditures of fertilizers on these soils profitable, they are excellent for this purpose. Otherwise tree growth should be encouraged.

B. 2. Silty clay loam to clay loam parent materials

STEWIACKE ASSOCIATION

The Stewiacke soils in Pictou county are confined to a single small area in the vicinity of Plainfield, along the Black River and McKay Brook. They occupy a total area of 2,054 acres, over half of which is poorly drained. Stewiacke soils are developed from fine textured alluvial material derived principally from local sources. Most of this material has been washed from the till underlying the Queens soils. It has a reddish colour and varies from a silty clay loam to clay in texture.

The topography of Stewiacke soils varies from level to very gently undulating, with occasional slight depressions. Drainage of these soils in Pictou county varies from good to poor. Very small areas are well drained and the larger proportion is poorly drained. Stewiacke soils are generally free from stone. Vegetation consists of a spruce, willow and alder.

Due to the nature of their origin, the Stewiacke soils have not developed profile characteristics which are common to other soils of the area. They are immature soils which have not had time to reach equilibrium with their environmental conditions. Consequently the well defined horizons which are present in the soils developed from till are absent in the Stewiacke soils. In places

where they are well drained, the soils have a dark brown silty clay or clay loam surface, which has a friable crumb structure. This overlies at a depth of 4 to 6 inches, a brown to light reddish brown silty clay loam that is moderately cohesive but friable and permeable to roots and water.

At a depth of 12 to 15 inches the soil becomes heavier in texture, develops a slightly blocky structure and becomes more plastic. Below this there is little change of character to a depth of 30 inches or more.

In most of the well drained areas, the soil contains enough fine sand to make it permeable to water. In the poorly drained areas the soil tends to have a mucky surface and is somewhat heavier in texture throughout. The water-table remains at a high level throughout the year. There are a few areas which are subject to periodic flooding but they are usually suitable for crop production during the growing season.

A general description of a Stewiacke profile is given below.

Depth	*Description*
0 – 4 inches	Dark brown to greyish black silty clay loam; granular, crumbly; friable; moderately cohesive; pH 4·3.
4 – 14 inches	Dark brown to brown silty clay loam; coarse granular structure; moderately cohesive; friable; permeable; no stones; pH 4·6.
14 – 32 inches	Brown to reddish brown clay loam; fine to medium blocky structure; firm; plastic; permeable; pH 5·3.

Utilization of Soils

The Stewiacke soils are not of great agricultural importance in Pictou county. In Colchester county where they cover a considerable area they are among the most important soils of the county. Where they are well drained they are very productive and are suitable for all crops grown in the area. Drainage, however, is the factor limiting their use and well drained areas are often interspersed with poorly drained ones making crop production unprofitable. Often the lack of an outlet makes drainage difficult since the Stewiacke soils lie along the river courses. Proper drainage of an area requires a large scale operation such as deepening the main river channel and the establishment of drainage ditches or tile drains leading into it.

Another factor limiting the use of these soils is flooding. This can also be remedied to some extent by deepening of the river channel, but some method of controlling the run-off from the watershed drained by the river is also necessary. Hence the development of these soils involves considerable co-operation and expenditure.

B. 3. Sandy loam to fine sandy loam parent materials

CUMBERLAND ASSOCIATION

The soils of the Cumberland Association are found along the stream courses and river valleys throughout the county. There are no large single areas and the total acreage occupied by these soils is 7,737 acres. Cumberland soils are derived from alluvial deposits of sand and gravel which have been carried down and deposited by the present drainage system of the county. The material is derived from a variety of sources and may have a variety of textures and sequence of textures in the profile. Lenses of gravel in sand or of sand in gravel may occur. The topography of these soils is generally level or very gently undulating. Drainage is generally good and in some cases they may be droughty in dry seasons, particularly where they contain considerable gravel. They are stone free, except in a very few cases when occasional boulders have been deposited on the surface. Like the Stewiacke soils they are subject to flooding. Vegetation consists of spruce, fir and maple or occasional pine.

The Cumberland soils are immature and show no definite profile development. The surface soil consists of an 8- to 10-inch layer of dark brown fine sandy loam to loam, very loose and porous. This is underlain to a depth of 25 to 28 inches by a brown to reddish brown sandy loam, which shows a weakly laminated structure due to variation in rate of deposition. It is very porous and may contain some gravel. This layer rests on sand or gravel at depths varying from 25 to 30 inches. Two classes were mapped, the gravelly class (224 acres) in which gravel forms the major proportion of the deposit and increases with depth, and the sand class in which the subsoil is sandy as described above. The poorly drained associate was also separated.

A description of a profile of the Cumberland soil is given below:

Depth	*Description*
0 – 11 inches	Dark reddish brown (2·5 YR 3/4) fine sandy loam; fine granular to fine crumb structure; loose; porous; good root development. pH 4·8
11 – 25 inches	Reddish brown (2·5 YR 4/4) sandy loam; granular structure; weakly laminated; porous; some roots; pH 5·2
Below 25 inches	Sand and gravel; firm to compact; pervious. pH 5·2

Utilization of Soils

The factors governing the use of the Cumberland soils are somewhat similar to those of the Stewiacke soils, but drainage is usually second in importance to flooding. The better agricultural areas are those in which the profile contains sufficient fine materials to give body to the soil and to hold sufficient moisture during dry periods. The ease of clearing and their accessibility made these soils amongst the first to be cultivated in the county. Where they are well drained, the sandy phase soils are suited to a variety of crops and particularly to market garden crops. Hay and grain give fair yields on these soils and they are quite responsible to fertilizers. It is necessary to maintain a good supply of organic matter through the use of manure or by ploughing down cover crops. The gravelly areas are not suitable for crop production because of their droughty nature.

C. MISCELLANEOUS SOILS.

Swamp

The areas mapped as swamp are widely scattered throughout the county. They occur wherever the nature of the topography, the character of the till or the nature of the bedrock restricts drainage. The total area occupied by this type of soil is 4,493 acres. The soils may be found on any type of parent material. The topography is usually depressional. Stones may or may not be present and most of the areas are covered with vegetation consisting of black spruce, tamarack, poplar and fir. Open areas are covered with sedges, reeds and water-loving plants.

The surface soil is usually peaty, consisting of poorly decomposed organic matter. The underlying mineral material is usually firm or compact and has a high water-table. Most of the areas of swamp are unfit for agricultural use.

Salt Marsh

The areas mapped as salt marsh are found in scattered positions along the coast of Northumberland Strait. They occupy a total area of 492 acres. Salt marsh areas consist of sediments deposited by the tides and which are now flooded by recurring tidal waters. The deposits are reddish brown heavy textured materials, free from stone and covered with a vegetation of salt marsh grass, sea blite and spurrey. Occasionally this grass is cut for hay, but it has low value as a feed. Salt marsh soils are not of much agricultural importance in Pictou county.

AGRICULTURE

History and Development of Agriculture

The early agriculture of Pictou county centred around Pictou, New Glasgow and the area along the shore. The first settlers arrived in Pictou in June, 1767. In September, 1773, thirty-three families and twenty-five unmarried men reached Pictou in the ship "Hector" from Scotland. This marked the beginning of Scottish immigration to Nova Scotia. Due to the lateness of the season and their unfamiliarity with conditions, the settlers suffered many hardships during the first winter. Food was scarce and severe cold made living conditions very severe.

At this time Pictou county was covered with forest and the land had to be cleared in order to grow crops. Corn, grain and potatoes were among the first crops grown and this was on a subsistence basis. Fortunately the area possessed excellent timber resources, the district between Toney and Caribou rivers being noted for its white pine. About this time also, England needed timber to build ships and large quantities of timber were loaded at Pictou. Ship building also made rapid strides. In 1798 coal was discovered near Stellarton and the town of New Glasgow grew into a ship building centre. Early agriculture was primarily concerned with the growing of food for immediate needs. Lumbering was a more profitable enterprise and the development of farm lands did not receive much impetus. Agricultural development made its greatest strides between 1820 and the end of the century, reaching a peak about 1891. This was in common with agricultural development in the rest of the province and coincided with the development of manufacturing and better methods of transportation. One of the first agricultural societies in the province was formed at West River in 1817. The first meeting was devoted to a discussion on "the best method of preparing and increasing manure". The following year a ploughing match was held here. Fish and game were abundant in the early days. Bears were so plentiful as to be a menace to livestock and a bounty was paid for destroying them.

The writings of "Agricola" which appeared during the early days of settlement had considerable influence on the improvement of agricultural methods, the use of manure and lime and the introduction of better tillage implements. The growing of oats and their use as meal and flour was very widespread. Turnips were grown quite extensively also. Other crops included wheat, rye and barley. By far the largest acreage was devoted to hay and much hay was sold from the province during the early days.

Agriculture first developed along the shore and up the river valleys on the most fertile soils. With increasing population, the less suitable areas were occupied.

At the present time less than half of Pictou county is occupied by farms. The average size of farms is 126 acres but about 35 per cent of the farms are 50 to 100 acres and 34 per cent 100 to 200 acres in size. On the average about 40 acres per farm is improved land under cultivated crops, 50 acres in woodland and 30 acres in rough pasture. This varies greatly on individual farms and in different parts of the county. In general the farms along the shore have the largest areas of improved land. The area and condition of farm land in Pictou county is given in Table IV. On nearly 50 per cent of the farms in Pictou county, over half of the farm produce is used on the farm. These farms are classed by the census as subsistence farms. On farms where more than 50 per cent of the income is derived from products sold off the farm, mixed farming is the leading occupation. This is followed in turn by dairying, part-time farming (lumbering and fishing), potato, forestry, livestock and poultry farming. During the war years the increased market for dairy products led to the raising of more dairy

animals and an accompanying increase in the number of swine and poultry. The raising of poultry for meat and eggs seems to be expanding at the present time. In Table V a comparison of the livestock population is given for the years 1941 and 1946. The decrease in horses on farms has been offset by an increased use of tractors and farm machinery. Some 190 farms reported tractors and 1,107 had automobiles.

The principal field crops grown in the county are hay, oats, barley, potatoes, roots, mixed grain and wheat. The acreage of potatoes is being increased at present, but this may only be due to a temporary good market. Hay and oats make up over 85 per cent of the area in field crops and barley ranks third in importance. Some corn is grown but the acreage is small. Recently the growing of peas for canning has become quite important and will no doubt increase considerably. Table VI shows the acreage occupied by the principal field crops. Pictou county ranks fourth in the acreage of field crops in the province. Excellent herds of cattle are found in Pictou county and the production of milk is a primary farm enterprise. The county ranks third in milk production and contains some of the finest creameries in the province, the Scotsburn Creamery being outstanding. Prices paid for butterfat varied from 38 to 44 cents per pound in 1945 and 1946. In the New Glasgow area there were 7 distributors and 28 producer distributors of milk in 1946. The urban population centred around New Glasgow offers an excellent market for this product. Dairy production is mainly concentrated along the shore and up the river valleys. On the rougher areas of the county the raising of sheep and the production of wool is important. Pictou county ranks third in the province in wool production.

Forest products consist chiefly of firewood, logs for lumber, pit props, pulpwood and railway ties. The value of these products in 1941 was about $230,000 of which $95,000 worth was used on the farm. There are several small orchards scattered throughout the county comprising some 27,000 apple trees and about 9,000 other fruit trees - plums, pears and cherries. Considerable lime and fertilizers are used in the county and the amount is increasing. The value of all farms in 1941 was estimated at $6,559,555. Of the occupied farms about 94 per cent are owner operated, the remainder being occupied by tenants. The total value of farm products in 1940 was $2,376,837, of which 43 per cent came from field crops and 32 per cent from animal products. The 1941 census shows that there were 232 abandoned farms in the county.

TABLE IV.—AREA AND CONDITION OF LAND IN PICTOU COUNTY, 1941

Total land area	719,360 acres.	Unimproved land	221,503 acres.
Total occupied land	327,480 "	Woodland	152,573 "
Improved land	105,977 "	Natural pasture	57,087 "
Field Crops	56,678 "	Marsh and wasteland	11,843 "
Pasture	40,661 "	Number of farms	2,597 "
Other Crops	8,638 "	Average area per farm	126 "
		Average improved acre per farm	40·8 "

Dominion Census 1941

TABLE V.—LIVESTOCK POPULATION. PICTOU COUNTY. 1941 AND 1946

	1941	1946
Horses	4,119	3,240
Cattle	18,771	19,770
Milk Cows	11,415	11,950
Sheep	12,226	11,170
Swine	3,325	3,900
Poultry	115,904	204,660

N.S. Dept. of Agriculture. Annual Report 1946.

TABLE VI.—ACREAGE OF FIELD CROPS IN PICTOU COUNTY, 1941 AND 1946

	1941	1946
Hay	37,545	43,020
Oats	11,976	11,340
Barley	2,129	2,140
Potatoes	1,655	2,360
Roots	802	600
Mixed Grain	746	260
Wheat	530	370

N.S. Department of Agriculture. Annual Report 1946

Land Use and Management of Pictou County Soils

The climatic conditions encountered in Pictou county are favourable for the growing of most of the common farm crops found in humid temperate climates. The acreage and distribution of these crops within the county will depend largely on soil conditions most favourable for their growth. These conditions are governed by a number of interrelated factors such as drainage, topography, fertility, stoniness and erosion. Probably the most important single factor determining the growth of crops in Pictou county is drainage.

Cropping practices within the county do not vary widely. Farming methods are still basically those introduced by early settlers. The use of modern machinery has speeded up operations and the use of new varieties and better seed has improved crop quality, but soil management has not been given sufficient attention. Rotations are generally long and fields near the farm buildings receive more attention that those farther away. This is particularly true in the shore areas where available manure is applied to the "front" fields and the back fields are neglected.

The soils best suited to agriculture are found on the lowland plain. Of these, the Cumberland, Stewiacke, Tormentine, Pugwash, Nappan, Queens, Londonderry, and Merigomish soils are probably the most productive and make up the largest proportion of cultivated land. With the exception of some of the better areas of the Tormentine and Pugwash soils, which are adapted to cash crops, no soil is especially suitable for any particular crop. Apart from drainage considerations, all of the soils have much the same general requirement—the maintenance of organic matter, the use of lime, shorter rotations and the use of commercial fertilizers—in order to produce good crops. Natural fertility of the soils varies from fair to very low. Other things being equal, tillage practices will depend largely on the texture of the soils.

The Nappan, Queens, Londonderry and Joggins soils contain considerable clay and are the heaviest textured soils of the county. They are slow to drain, both externally and internally and the use of tile drains or open ditches is necessary. They must be ploughed when the moisture content is right or they will become puddled. These soils are usually acid and have a low content of organic matter. The use of lime and manure or green manuring crops will reduce the acidity and improve their physical condition. A four- or five-year rotation is desirable on these soils. Lime may be applied at the rate of 2 tons per acre when the land is ploughed for grain and harrowed in. Commercial fertilizers can be applied to the grain crop. The general fertilizer recommendations are given below. The Nappan, Queens and Londonderry soils are among the best in the area for hay and grain. Good permanent pasture is also found on the Queens and Nappan soils. Recent work has shown that Nappan soils are not responsive to potash, but complete fertilizers give good returns on all of these soils. The growing of legumes is beneficial, but unless the soil is very well drained, a stand is not maintained because of winter killing and frost heaving. The Joggins soils are usually not suitable for crop production. Their natural fertility is low and good drainage is difficult to establish even under the best conditions.

The Tormentine, Pugwash, Merigomish, Woodbourne and Millbrook soils are medium to light textured and usually have fair to good drainage. Consequently, the same care in tillage operations is not so necessary as on the heavier soils, but some care is required with the Merigomish, Woodbourne and Millbrook soils. These soils are suitable for growing most of the crops grown in the county. Tormentine and Pugwash soils are especially adaptable to the growing of vegetable and canning crops and are being used to a small extent for this purpose. The Woodbourne and Millbrook soils have areas in which the slopes are long or steep and these are subject to erosion. Such areas should be left in sod and the steeper slopes allowed to revert to forest. The same requirements are necessary for these soils as for the heavier soils. The maintenance of organic matter, especially in the lighter Pugwash and Tormentine soils is essential. The soils are all acid and require liming. Probably the Woodbourne soils will not be so responsive to lime as some of the others. A four- or five-year rotation is recommended, but this may have to be modified in the case of canning crop production. The Pugwash and Tormentine soils have shown good response to treatment with complete fertilizers and this will probably be true of the other soils of this group.

The soils of the Hebert Association, developed from gravelly and sandy outwash materials are usually too droughty for agricultural purposes. If they contain sufficient fine materials to hold the moisture and have a fairly level topography, they are suitable for the growing of cash crops. They require maintenance of organic matter supply and heavy fertilizer applications. Where suitable markets are available, the use of these soils for cash crops may be profitable.

The Cumberland and Stewiacke soils of the river valleys are among the most productive soils of the county. They were among the first soils to be cultivated. Their principal disadvantage is their susceptibility to flooding. They are free from stone, relatively fertile and suitable for all crops grown in the area. Their chief use at present is for hay or grain, but where they do not flood, market garden crops may be grown successfully. The gravelly phase of the Cumberland soil is not suitable for crops, because of its poor moisture-holding capacity. These alluvial soils are very responsive to fertilizer. They are usually highly acid and benefit from applications of lime. While they have a fair supply of organic matter it is necessary to keep a good supply in the soil to improve the tilth and furnish a medium for microbiological activity.

The soils of the Westbrook, Barney, Kirkhill, Hansford, Shulie, Kirkmount, Thom, Halifax, Gibraltar and Cobequid Associations are generally unsuitable for agricultural purposes, because of rough topography or stoniness. Considerable areas of the Westbrook and Thom soils have been cleared and farmed in former years, but many farms are now abandoned and the land is used for grazing or reverting to forest. The soils are well drained but shallow and crops suffer from lack of moisture. Pastures are poor and weedy and suffer severe erosion on the steep slopes. Present pasture areas on the smoother topography may have their carrying capacity increased by fertilization, but there are usually better areas of land on the farm on which fertilization would be more profitable. Some areas of the Westbrook soils, particularly where the slopes are not too steep, are suitable for crop production. Hay and grain give fairly good yields, but it often happens that this soil is very late in the spring.

With the exception of the light sandy soils such as the Hebert, practically all of the soils suitable for cultivation are capable of being built up and maintained in a fairly productive state. In many cases, particularly along the north shore, crop production could be greatly increased by proper soil management. The bringing of old fields into production, shortened rotations and the use of lime and fertilizers are the main requirements for higher production.

Fertilizer mixtures recommended by the Maritime Fertilizer Council include 3-15-6, 2-12-6, 4-12-6 or 5-10-10 fertilizer at a rate of 500 to 700 pounds per acre for pastures the first two mixtures being suitable for low lands or late spring pastures and the latter two recommended for upland and early spring pastures. For grain, a 3-15-6 on average soils or 4-12-6 on poor soils at the rate of 300 to 500 pounds per acre is recommended. Potatoes will require 4-8-10 or 5-8-10 at 1,200 to 2,000 pounds per acre and 400 to 500 pounds of 4-12-6, 4-8-10 or 5-10-10 per acre on permanent or semi-permanent pastures. When the field is to be ploughed in the fall 100 to 125 pounds of nitrate of soda, ammonium sulphate or cyanamid applied early in May is beneficial. These recommendations are published annually and are available to the farmer.

Some erosion is taking place on all the sloping soils in the area. It is, of course, particularly severe on the cleared steeper slopes. The heavier textured soils are more easily eroded, but usually their topography is such as to decrease erosion processes. Where the soils have slopes over three per cent, considerable erosion takes place with intertilled crops. The lighter textured soils such as the Tormentine, Pugwash, Merigomish, Shulie, Hansford and Hebert allow water to percolate downward quite readily and erosion is not severe unless slopes of 5 to 7 per cent are cultivated. The Barney, Woodbourne, Kirkhill, Millbrook, Kirkmount, Cobequid, Thom, Halifax and Gibraltar soils often have slopes exceeding 10 per cent. These should be left in forest.

The principal crops grown in the county are hay and grain. Timothy is the most common hay plant with brown top, red top, fescue and clover occurring in mixtures. Occasional fields of alfalfa are seen, but it does not seem to stand up well. Oats and barley form the bulk of the grain crop. Some corn is grown and some good stands have been seen in the north shore area, but the acreage is small. The growing of peas and tomatoes on the Tormentine and Pugwash soils is increasing and the acreage of potatoes is also on the increase. The north shore area is usually late in the spring and this retards crop growth in this area. Many pastures could be improved by fertilization and the carrying capacity increased. The application of fertilizers to the existing sod is the simplest method of improvement. Care must be exercised to see that the soils have a sufficient moisture supply throughout the grazing season. Brush and moss hummocks in pastures should be removed. Fertilizers should be applied in the fall or very early spring, the fall application being preferable. Care should be taken that the pastures are well grazed, but not overgrazed. In some of the north shore areas it would be wiser to put the back fields into crop production and to have the pasture area closer to the buildings. Pasture improvement gives rapid returns for the investment and there is usually a carry-over of fertility for two or three years after treatment.

Land Use Capability and Productivity Rating

The soil associations mapped in Pictou county have been grouped according to their suitability for use. It is necessary to point out that this grouping is general, rather than specific and applies only within the province. It is based primarily on the characteristics of the soil itself and its ability to produce crops under good management. The factors taken into consideration are drainage, natural fertility, ease of cultivation, topography, stoniness, adaptability to a variety of crops and erodability. Economic considerations such as distance to market, ease of access, prices of farm products or land values play no part in the present rating. The most accurate rating is obtained when crop yields are available for all of the soils, but this is not the case in Pictou county, hence soil characteristics and field observation play an important part in the selection.

Management is an important factor in the use of the soils. Good management on a poor soil may produce yields equal to or better than those obtained on a good soil with poor management. Some soils are especially adapted to certain

crops, but may have a low general rating and this does not show up in the classification. Similarly, some soils will contain small areas that are better or poorer than the average, but these are too small to be mapped out on the scale used. In general the heavier soils are best suited to hay, grain or pasture, while the lighter textured soils are less suitable for hay, but are adapted to roots, potatoes and vegetable crops. The stonier soils and those of the rougher areas are more suitable for forest because of their topography, stoniness and ease of erosion. The poorly drained soils are of no use unless drainage is improved.

In Table VI the soils are classified according to their suitability for several crops. In the absence of yield data they have been classed as excellent, good, fair or poor. The approximate distribution of the five Land Use Capability classes in Pictou county is shown in Figure 5. The different classes are discussed in somewhat more detail in this section.

TABLE VII.—LAND USE CAPABILITY OF PICTOU COUNTY SOILS

Soil Association	Hay	Grain	Potatoes	Roots	Vegetable Crops	Pasture
Class I—Good Crop Land						
Cumberland	E	G	E	G	E	E
Stewiacke	E	G	G	G	G	E
Tormentine	G	G	E	G	E	G
Pugwash	E	G	G	G	G	G
Merigomish	G	G	G	F	G	F
Class II—Good to Fair Crop Land						
Nappan	E	E	F	F	F	E
Queens	E	G	P	P	F	E
Londonderry	G	G	P	P	P	G
Class III—Fair Crop Land						
Woodbourne	G	G	F	F	F	G
Millbrook	G	F	F	F	F	G
Westbrook	G	G	P	F	F	FP
Class IV—Fair to Poor Crop Land						
Barney	F	F	G	G	G	F
Hansford	F	F	F	F	F	FP
Shulie	F	F	P	P	P	FP
Joggins	F	F	P	P	P	F
Hebert Sand	P	P	FG	F	FG	P
Class V—Poor Crop Land						
Hebert Gravel	U	U	U	U	U	U
Cumberland Gravel	U	U	P	U	P	U
Gibraltar	U	U	U	U	U	U
Cobequid	F	P	U	U	P	F
Kirkmount	U	U	U	U	U	U
Halifax	U	U	U	U	U	U
Thom	FP	P	U	U	U	F
Kirkhill	F	F	P	P	P	F
Swamp	U	U	U	U	U	U
Salt Marsh	U	U	U	U	U	U

Poorly drained associates of:

Cumberland	Hansford	Generally unsuitable
Hebert	Shulie	
Stewiacke	Thom	
Nappan	Londonderry	
Queens	Joggins	
Pugwash	Kirkmount	
	Halifax	

E—Excellent. G—Good. F—Fair. P—Poor. FP—Fair to Poor. FG—Fair to Good. U—Unsuitable.

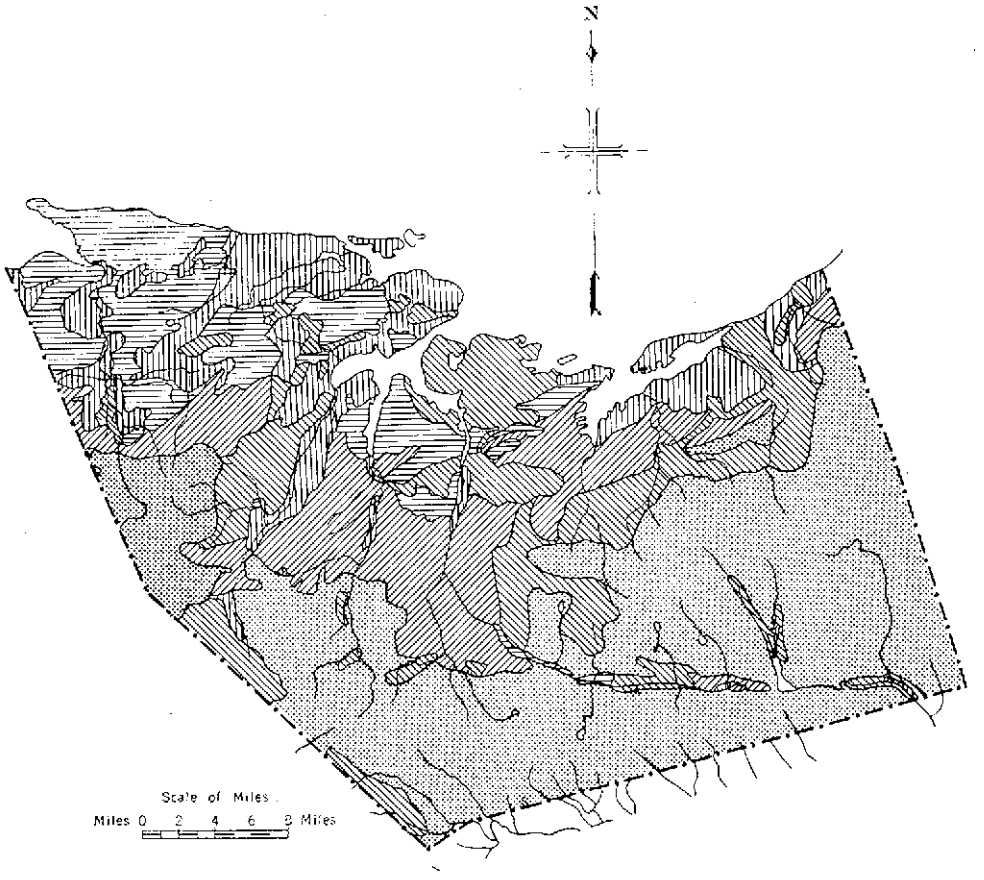

Figure 12. Land Use Capability Classes in Pictou County

Class 1. Good crop land

Class 2. Fair to good crop land

Class 3. Fair crop land

Class 4. Fair to poor crop land

Class 5. Poor crop land

LAND USE CLASS I	Acres	% of Total
Cumberland	7,417·6	1·05
Stewiacke	915·2	0·13
Tormentine	2,489·6	0·35
Pugwash	48,947·2	6·84
Merigomish	18,323·2	2·56
	78,092·8	10·93

The soils in this class are rated as good crop land. Under the common practices of management they will produce good yields more economically than the other soils of the area. They have good drainage, freedom from stone and are easily cultivated. The Cumberland and Stewiacke soils have the disadvantage that they are subject to seasonal flooding, but they are usually suitable for crops during the growing season. These soils are more suitable for cash crops than some of the heavier soils, but good yields of hay and grain may also be obtained. They are responsive to fertilization and require a good supply of organic matter for best results. Surface erosion is not serious except on some of the steeper parts of the Tormentine and Pugwash soils. Under present conditions they are well adapted to mixed farming.

LAND USE CLASS II	Acres	% of Total
Nappan	17,542·4	2·45
Queens	53,068·8	7·42
Londonderry	5,747·2	0·80
	76,358·4	10·67

This group is classified as good to fair crop land. They may produce yields of some crops equal to or better than the soils of Class I, but they are not so generally suited for as wide a variety of crops as the soils of Class I. These soils are heavy textured and they have a slow external and internal drainage. Open ditches or tile drains are necessary to remove the excess water. The soils require careful handling and will puddle if ploughed when they are too wet. Ordinarily they do not contain enough stone to interfere with cultivation and all types of farm machinery may be used on them. The soils are well suited to the production of hay and grain and are responsive to fertilization. Lime and organic matter are needed to reduce the acidity and improve the physical condition. Large areas are cleared and could be more productive with better management. The soils in this class are more easily eroded than those in Class I.

LAND USE CLASS III	Acres	% of total
Woodbourne	61,049·6	8·53
Millbrook	22,822·4	3·19
Westbrook	24,915·2	3·48
	108,787·2	15·20

These soils were classed as fair cropland. While they may be capable of producing nearly as good yields as the soils of Class I or II, their stoniness, topography or both limit their use. The soils have fairly good drainage, which may be excessive in the Westbrook soils. The Millbrook soils retain more moisture than the Woodbourne or Westbrook. Large areas of the Woodbourne soils have sufficient stone to interfere with cultivation and this is accompanied by steep slopes. There are small areas of the Woodbourne soils which are quite sandy and are suitable for cash crops, being equal to the Pugwash soils in this respect. Westbrook soils are very gravelly and tend to be droughty. All of these soils have steep slopes which are subject to severe erosion, and should be left in forest. The smoother areas of the Millbrook soils could be used as permanent pasture. Lime and organic matter are required for increased crop production. With the exception of special areas, the cleared land is most suitable for hay or pasture.

LAND USE CLASS IV	Acres	% of total
Barney	41,593·6	5·81
Hansford	21,337·6	2·98
Shulie	29,920·0	4·18
Joggins	10,982·4	1·53
Hebert Sand	428·8	0·06
	104,262·4	14·56

These soils have been classed as fair to poor crop land. Certain factors such as topography, excessive stoniness, poor drainage or low fertility limit their use and make crop production unprofitable. Shulie and Hansford soils are very stony yet some areas are being farmed at present. The soils tend to be droughty and it is doubtful if any further expansion will take place on these soils. Some of the present areas would be better under forest. Joggins soils are heavy textured and difficult to drain. Small local areas are cultivated but crop yields are low. Some of the present cleared areas might make good pasture with careful management, but most of this soil should be allowed to revert to forest. The Barney soils contain some large areas formerly cleared but now abandoned. Steep slopes, shallowness and stoniness limit the use of these soils. Small smoother areas are suitable for cultivated crops and produce fair yields. Drainage is fairly good on these soils. The Hebert sand is a droughty soil, but it usually has a fairly level topography and there are small localized areas where the sand is fine enough to retain sufficient moisture for crop production. In these places Hebert soils are quite suitable for potatoes or cash crops provided the organic matter is kept up and heavy fertilization is practised. Probably the best use of the soils of this group in general is a combination of forestry, agriculture and grazing.

LAND USE CLASS V	Acres	% of total
Hebert Gravel	22,106·0	3·08
Cumberland gravel	224·2	0·03
Gibraltar	544·0	0·08
Cobequid	97,766·4	13·66
Kirkmount	36,172·8	5·06
Halifax	79,692·8	11·14
Thom	73,056·0	10·21
Kirkhill	25,305·6	3·54
Swamp	4,492·8	0·63
Salt Marsh	492·8	0·07
Cumberland (Poorly drained associate)	96·0	0·01
Hebert "	313·6	0·04
Stewiacke "	1,139·2	0·16
Nappan "	256·0	0·04
Queens "	204·8	0·03
Londonderry "	153·6	0·02
Pugwash "	1,881·6	0·26
Hansford "	89·6	0·01
Shulie "	262·4	0·04
Thom "	76·8	0·01
Joggins "	12·8	0·00
Kirkmount "	204·8	0·03
Halifax "	3,500·8	0·49
	347,955·4	48·64

The soils in this group are submarginal crop land. Because of combinations of topography, poor drainage, stoniness or ease of erosion, the cultivation of these soils will not give profitable returns.

Some areas of the poorly drained Nappan, Queens, Pugwash, Stewiacke and Cumberland soils have potential possibilities if it could be found profitable to drain them, but the present availability of more suitable land makes the use of these areas impractical. The Gibraltar, Cobequid, Kirkmount, Halifax, Thom and Kirkhill soils support a good forest growth and are most suitable for this type of culture. The swampy areas are useless at present. Small areas of salt marsh furnish hay of poor quality, but are not suitable for cultivation because of recurrent flooding.

DISCUSSION OF THE ANALYTICAL DATA

The physical and chemical composition of some of the major soil associations in the county are given in Tables VIII and IX. These figures give some indication of the relative potential fertility of the various soil associations and serve as a guide to field studies of these soils. The prediction of crop success or failure cannot be based on these figures alone and great care is needed in their interpretation. Many factors, which have been discussed in the text, must be taken into consideration when assessing the crop values of these soils. A brief discussion of the principal nutrients is given below.

Reaction

All the soils are acid in reaction and require liming for successful crop production. There is little correlation between the lime requirement and the acidity of the various soils, but it is evident that those soils showing a high requirement for lime also contain considerable organic matter. The fact that those soils which have a high lime requirement also contain the most calcium emphasizes the care necessary in interpreting analytical results.

Nitrogen

The nitrogen content of the soils varies considerably, but is greater in the Woodbourne, Millbrook, Barney, Kirkhill, Thom and Hebert soils. In general, the heavier textured soils have the nitrogen high in the surface and low throughout the rest of the profile, while in the lighter textured soils the nitrogen is associated with the high organic content of the B horizon as well as the surface layer.

Phosphorus

The soils are low in phosphorus content, particularly in the readily available type of phosphorus. The Woodbourne, Barney and Millbrook soils appear to be best supplied with this element and it is probable that much of this is in organic form. The lighter soils such as the Shulie, Hansford, Thom and Hebert, contain very little available phosphorus.

Potassium

The potassium content of all the soils is low, but the Millbrook and Woodbourne soils are better supplied with this element than the other soils. Availability of this element varies widely in different soils and in different horizons of the same soil.

Calcium

The lighter textured Hebert, Thom and Shulie soils seem to contain the most total calcium among the Pictou county soils, but the availability of this element in these soils is low compared with the heavier textured Woodbourne, Queens, Londonderry and Millbrook soils. In some instances the calcium is bound up in the mineral grains and is unavailable while in other cases the calcium is combined with the organic matter in the soil.

Magnesium

The Woodbourne, Millbrook and Barney soils have considerable magnesium in the lower horizons, while the other soils are comparatively low in this element. The amount of available magnesium in the various soils shows considerable difference, but in general, the heavier soils are better supplied with this element.

TABLE VIII.—CHEMICAL AND PHYSICAL ANALYSIS OF REPRESENTATIVE SOIL SAMPLES

Horizon	Depth in Ins.	Loss on Ignition %	pH	Lime Req. $CaCO_3$ tons/A	Total C %	Total N %	Total P_2O_5 %	Total SiO_2 %	Total R_2O_3 %	Total CaO %	Total MgO %	Exchangeable Bases m.e./100 gms. Soil				Gravel %	Very Coarse Sand 2-1 mm. %	Sand 1-·05 mm. %	Silt ·05-·002 mm. %	Clay below ·002 mm. %
												H	Ca	Mg	K					
Queens Association																				
A2	1–5	4·47	4·1	5·6	1·03	0·057	0·045	78·9	14·0	0·128	0·142	11·56	0·72	0·16	0·023	3·5	3·1	29·8	48·4	21·8
B1	5–10	3·15	4·2	3·1	0·34	0·038	0·036	78·6	16·1	0·149	0·220	7·80	0·17	0·28	0·030	1·5	1·5	28·0	49·4	22·6
B2	10–19	4·12	4·4	3·9	0·21	0·039	0·036	70·0	22·3	0·123	0·209	8·06	0·78	0·31	0·032	8·0	3·0	19·8	46·0	34·2
C	19–	3·87	4·6	3·5	0·09	0·031	0·053	72·3	20·4	0·144	0·286	7·39	0·72	0·52	0·063	6·2	2·7	34·4	35·2	30·4
Nappan Association																				
A2	2– 7	1·73	4·1	2·4	0·26	0·061	0·037	89·1	8·2	0·133	0·073	6·07	0·52	0·14	0·030	4·2	1·6	47·0	43·6	9·4
B1	7–13	3·71	4·3	6·0	0·35	0·049	0·114	72·5	19·7	0·122	0·459	10·68	0·38	0·45	0·030	8·8	4·2	22·2	53·4	24·4
B2	13–23	4·02	4·4	4·2	0·26	0·042	0·047	66·2	22·1	0·112	0·567	8·95	0·23	0·38	0·033	15·4	2·3	20·8	48·2	31·0
C	23–	3·56	4·5	3·1	0·12	0·034	0·059	69·4	21·9	0·128	0·403	7·64	0·20	0·31	0·066	16·0	2·8	36·2	36·2	27·6
Londonderry Association																				
A2	2– 5	2·08	3·7	5·3	0·44	0·031	0·025	88·7	7·6	0·117	0·189	8·08	0·17	0·32	0·032	0·3	0·4	19·2	62·4	18·4
B1	5–11	3·83	4·1	7·8	0·48	0·045	0·031	73·3	17·9	0·149	0·564	13·21	0·20	0·20	0·052	0·7	3·6	15·8	53·6	30·6
B2	11–19	3·84	4·4	6·7	0·25	0·042	0·040	70·0	21·0	0·128	0·596	12·44	0·58	0·51	0·084	8·3	4·5	18·2	49·2	32·6
C	19–	3·64	4·6	6·0	0·10	0·033	0·058	70·0	20·4	0·188	0·894	10·14	1·80	0·62	0·053	12·5	4·5	21·8	55·6	22·6
Woodbourne Association																				
A0	0– 2	75·13	4·6	35·8	.....	1·469	0·351	18·2	8·7	0·750	0·070	52·51	6·47	1·93	1·610	.....	.....	.....	.....	.....
A2	2– 4	6·72	4·1	15·0	2·46	0·125	0·094	78·2	14·2	0·130	0·660	20·01	2·12	0·69	0·114	34·9	3·2	22·4	50·2	27·4
R1	4– 9	10·44	4·6	11·3	2·91	0·188	0·183	63·5	20·5	0·130	1·200	21·35	1·04	0·43	0·109	42·9	5·8	27·4	46·6	26·0
B2	9–16	8·19	4·7	8·3	1·86	0·129	0·147	60·1	23·4	0·130	1·730	17·01	0·64	0·27	0·073	34·6	6·8	32·4	39·0	28·6
C	16–	4·20	4·5	5·4	0·42	0·046	0·098	59·8	24·9	0·110	1·690	9·56	0·84	0·73	0·109	42·7	7·2	29·8	39·0	31·2
Merigomish Association																				
A2	2– 4	3·08	4·1	3·9	0·89	0·043	0·046	87·7	7·0	0·108	0·101	8·14	0·37	0·30	0·019	3·9	1·5	50·6	40·4	9·0
B1	4–10	4·87	4·3	3·9	1·42	0·076	0·100	80·3	11·3	0·093	0·206	10·79	0·20	0·33	0·030	11·0	4·9	52·8	34·0	13·2
B2	10–20	2·35	4·4	2·1	1·35	0·025	0·040	80·3	12·9	0·103	0·307	7·26	0·11	0·23	0·021	11·9	2·6	54·6	33·8	11·6
C	20–	2·70	4·6	2·1	0·14	0·021	0·066	77·0	15·2	0·097	0·476	7·22	0·20	0·50	0·052	17·2	1·5	44·4	40·8	14·8

TABLE VIII.—CHEMICAL AND PHYSICAL ANALYSIS OF REPRESENTATIVE SOIL SAMPLES—*Concluded*

Horizon	Depth in Ins.	Loss on Ignition %	pH	Lime Req. $CaCO_3$ tons/A	Total C %	Total N %	Total P_2O_5 %	Total SiO_2 %	Total R_2O_3 %	Total CaO %	Total MgO %	Exchangeable Bases m.e./100 gms. Soil				Gravel %	Very Coarse Sand 2-1 mm. %	Sand 1-·05 mm. %	Silt ·05-·002 mm. %	Clay below ·002 mm. %
												H	Ca	Mg	K					
Millbrook Association																				
A0	0- 3	53·89	4·6	27·7	.....	1·140	0·262	36·6	6·7	0·930	0·470	44·35	6·90	2·08	0·638					
A2	3- 6	5·01	4·2	12·0	1·79	0·086	0·064	80·8	11·9	0·200	0·380	15·59	1·10	0·53	0·161	13·2	2·7	21·6	57·6	20·8
B1	6-12	11·01	4·8	14·5	3·70	0·202	0·118	62·8	21·7	0·220	0·850	22·52	1·79	0·43	0·254	15·6	2·0	23·2	46·4	30·4
B2	12-23	6·57	4·8	8·1	1·63	0·114	0·079	67·8	21·1	0·245	1·180	11·79	0·61	0·33	0·102	24·5	3·7	28·4	49·2	22·4
C	23-	3·65	4·9	4·0	0·38	0·043	0·063	69·6	22·3	0·210	1·340	7·33	1·04	0·53	0·024	20·2	2·9	27·6	43·2	29·2
Barney Association																				
A0	0- 3	72·73	3·8	47·9	.....	1·223	0·314	17·6	3·6	0·490	0·330	70·37	5·33	0·78	1·151					
A2	3- 6	3·42	4·4	6·0	1·41	0·069	0·057	83·4	8·2	0·090	0·250	10·21	1·34	0·27	0·087	15·2	1·7	30·4	55·4	14·2
B1	6-13	12·54	5·0	9·8	3·60	0·243	0·181	58·3	23·6	0·100	0·720	20·41	0·86	1·09	0·083	21·8	8·9	33·6	48·6	17·8
B2	13-22	7·11	5·2	5·6	2·13	0·130	0·115	68·2	20·3	0·090	0·830	11·14	0·72	0·65	0·073	37·0	5·6	31·6	52·4	16·0
C	22-	3·66	5·3	3·1	0·76	0·062	0·066	68·7	17·9	.....	1·230	11·10	0·68	0·37	0·062	22·5	8·1	36·8	49·6	13·6
Kirkhill Association																				
A2	1- 4	5·61	4·1	5·6	1·89	0·161	0·056	76·9	14·5	0·097	0·133	9·66	0·87	0·37	0·039	29·0	7·0	24·6	55·4	20·0
B1	4-14	10·77	4·5	9·8	3·17	0·196	0·134	63·0	22·9	0·164	0·270	17·51	0·29	0·21	0·015	40·6	9·0	43·2	49·4	7·4
B2	14-20	9·25	4·5	6·7	2·66	0·157	0·112	62·6	23·2	0·138	0·179	13·56	0·14	0·16	0·019	46·5	9·5	41·2	49·2	9·6
C	20-	7·96	4·9	5·3	1·99	0·123	0·104	62·7	25·2	0·133	0·395	10·39	0·14	0·20	0·021	60·2	9·8	53·2	37·2	9·6
Tormentine Association																				
A2	2- 6	0·79	3·8	1·5	0·18	0·015	0·019	87·6	4·9	0·113	0·041	4·92	0·06	0·13	0·017	7·0	10·0	71·2	23·4	5·4
B1	6-11	8·64	4·8	6·2	2·67	0·105	0·142	69·4	16·9	0·126	0·141	12·90	0·17	0·12	0·039	5·6	8·5	69·2	22·4	8·4
B2	11-20	3·64	5·0	1·0	0·71	0·042	0·049	77·4	13·4	0·169	0·176	6·22	0·29	0·12	0·30	9·5	7·6	60·2	31·0	8·8
C	20—	2·06	4·7	4·6	0·23	0·075	0·037	79·8	13·1	0·179	0·271	6·68	0·29	0·15	0·48	8·6	6·0	53·2	28·0	18·8
Hansford Association																				
A2	2- 8	1·24	3·8	1·5	0·34	0·025	0·017	90·3	6·5	0·092	0·031	4·97	0·14	0·25	0·019	2·4	2·2	58·6	33·4	8·0
B1	8-13	6·42	4·5	6·5	2·13	0·099	0·094	72·3	17·1	0·097	0·151	12·33	0·17	0·16	0·021	12·0	4·2	48·4	38·2	13·4
B2	13-19	2·52	4·7	2·4	0·41	0·034	0·030	79·5	13·6	0·113	0·224	5·61	0·32	0·23	0·025	8·4	3·0	56·0	29·8	14·2
C	19-	2·44	4·7	2·4	0·18	0·027	0·050	76·0	17·5	0·106	0·180	6·62	0·20	0·32	0·070	9·5	2·3	46·4	30·8	22·8

Shulie Association																			
A2	1– 4	2·64	3·6	4·2	1·36	0·074	0·032	90·1	5·1	0·126	0·050	7·81	0·35	0·07	0·041	5·5	2·0	66·8	26·6	6·6
B1	4– 9	8·13	4·5	7·4	3·81	0·143	0·099	75·9	12·4	0·267	0·118	14·40	0·14	0·17	0·027	24·7	2·5	69·2	25·6	5·2
B2	9–18	4·43	4·7	3·5	1·42	0·078	0·073	78·9	13·0	0·285	0·198	8·89	0·32	0·22	0·019	26·8	4·0	69·2	23·6	7·2
C	18–	2·71	4·8	1·7	0·54	0·038	0·56	78·8	13·3	0·380	0·353	6·03	0·14	0·02	0·025	13·6	4·0	65·2	27·6	7·2
Thom Association																			
A2	2– 5	3·48	3·6	4·6	1·25	0·116	0·035	82·8	12·4	0·133	0·101	8·89	0·43	0·44	0·071	38·0	10·0	38·6	49·4	12·0
B1	5–11	15·08	4·2	14·5	4·96	0·295	0·151	59·6	21·3	0·188	0·302	29·52	0·46	0·57	0·037	53·5	8·5	51·6	40·6	7·8
B2	11–23	7·68	4·4	8·1	2·05	0·130	0·105	67·1	18·1	0·215	0·286	13·67	0·23	0·16	0·025	43·3	9·0	42·8	49·2	8·0
C	23–	4·81	4·8	4·2	0·98	0·066	0·077	67·5	21·4	0·215	0·630	7·64	0·14	0·08	0·029	48·0	9·2	44·0	44·4	11·6
Hebert Association																			
A2	2– 6	4·11	3·4	11·3	1·45	0·057	0·038	80·1	12·5	0·248	0·244	18·55	0·38	0·43	0·061	34·9	9·3	40·8	43·0	16·2
B1	6–14	10·80	3·9	10·6	3·43	0·108	0·071	66·3	19·2	0·405	0·344	21·62	0·12	0·16	0·039	54·6	14·0	67·2	25·4	7·4
B2	14–24	13·06	4·4	8·1	3·70	0·125	0·163	58·2	23·9	0·426	0·545	15·09	0·49	0·25	0·023	54·5	12·0	81·0	14·6	4·4
C	24–	6·56	4·5	3·9	1·49	0·067	0·159	66·8	20·5	0·492	0·652	8·14	0·26	0·16	0·025	59·0	11·8	87·2	9·2	3·6

TABLE IX.—AVAILABLE NUTRIENTS IN POUNDS PER ACRE

Association	Horizon	Available			
		Ca	*Mg*	*K*	*P*
Queens	A2	285	38	18	4
	B1	67	67	23	4
	B2	308	74	25	2
	C	285	125	49	9
Nappan	A2	203	33	23	4
	B1	150	108	23	27
	B2	91	91	2	15
	C	79	75	52	13
Londonderry	A2	67	77	25	5
	B1	79	48	40	3
	B2	234	125	66	2
	C	710	149	41	17
Woodbourne	A0	250	45	123	44
	A2	840	160	89	16
	B1	400	103	85	22
	B2	254	65	57	20
	C	332	175	85	22
Merigomish	A2	146	72	14	4
	B1	79	79	23	5
	B2	44	55	16	2
	C	79	120	41	12
Millbrook	A0	266	48	49	26
	A2	430	120	125	6
	B1	710	112	195	10
	B2	240	79	80	7
	C	410	120	19	5
Barney	A0	206	18	88	47
	A2	530	65	68	10
	B1	340	262	68	11
	B2	254	155	57	10
	C	270	89	44	10
Kirkhill	A2	344	89	32	4
	B1	115	52	12	4
	B2	55	38	14	5
	C	55	48	16	4
Tormentine	A2	24	31	13	4
	B1	67	29	30	7
	B2	115	29	23	3
	C	115	36	37	14
Hansford	A2	55	60	15	2
	B1	67	38	16	5
	B2	125	55	19	6
	C	79	48	55	7
Shulie	A2	138	16	32	9
	B1	55	29	21	6
	B2	125	53	15	6
	C	55	5	19	15
Thom	A2	170	105	55	5
	B1	182	135	29	4
	B2	91	38	19	4
	C	55	19	22	18
Hebert	A2	150	103	47	5
	B1	43	38	30	2
	B2	195	60	18	2
	C	103	38	19	8

SUMMARY

Pictou county lies in the north shore area of Nova Scotia and has a total land area of 715,456 acres or 1,118 square miles. The greatest distance from east to west is 48 miles and from north to south, 34 miles. The county can be roughly divided into two physiographic divisions—an undulating lowland plain along the coast and a highly dissected upland plain occupying the central and southern part of the county. Elevations vary from sea level to about 1,100 feet in the interior. Most of the larger rivers rise in the upland and flow northward across the lowland plain into Northumberland Strait. The principal vegetation consists of mixed stands of maple, beech, birch, spruce, fir, hemlock and poplar, with the hardwoods predominating on the higher ridges. About 70 per cent of the land is still covered with trees, the principal cleared areas being along the shore and in the river valleys. The climate of the area is humid temperate. Annual precipitation averages 40 inches with about 16 inches falling during the growing season. The length of the growing season varies from 180 to 190 days.

Pictou county is underlain by rock formations belonging to various ages. The lowland plain is underlain by sedimentary rocks of the Carboniferous age. These rocks are younger and weather more easily than the rocks of the upland plain which are harder and contain igneous and metamorphic formations. This results in considerable variation in relief. The whole area has been glaciated and the present day soil materials have been derived from the underlying rocks, crushed, mixed and redeposited as till or outwash material by the receding glacial ice. The depth of the drift varies from a thin mantle to 10 or 15 feet on the average.

Under the climatic conditions prevailing in the area the soils are considerably leached and develop the characteristics of the Podzol soil group. These soils have a grey, leached layer under forest cover and a yellowish brown B horizon resting on greyish brown to reddish brown unweathered parent material. About 95 per cent of the soils are developed from till, about 3 per cent on outwash and the remainder on recent alluvial deposits.

The soils of the area were separated into associations, each association including all the soils developed from the same parent material. Twenty-two associations were mapped and are described in the report.

The soils best suited to agriculture are the Cumberland, Stewiacke, Tormentine, Pugwash and Merigomish soils. They are well drained, medium to light textured and are suitable for all crops grown in the area. Their general freedom from stone and ease of tillage make them desirable. They are particularly suitable for cash crops and Tormentine soils are used for canning crops. The Nappan, Queens and Londonderry soils are heavy textured and require drainage but are very productive and especially suited to hay and grain production. They are not so easily tilled as the soils mentioned above and some care in handling them is required. The Woodbourne, Millbrook and Westbrook soils are less suitable for agriculture, but considerable areas are cleared and farmed. Their main disadvantage is their topography and stoniness. They are fairly well drained, but much of these soils has steep slopes and erosion is generally severe. Small areas of the Woodbourne soils are suitable for cash crops. The remainder of the soils are generally not suitable for agriculture because of rough topography, stoniness, steep slopes and susceptibility to erosion. They do produce good forest stands and their use for this purpose should be encouraged. About 21 per cent of the area is suitable for arable land and another 15 per cent is suitable for cultivation, if proper care is taken to prevent erosion.

Pictou county was first settled in 1767. Early agriculture was of the subsistence type and more attention was paid to lumbering and shipbuilding. Agriculture first developed along the shore and up the river valleys. Mixed farming and dairying is the leading occupation and the county ranks third in the province in milk production. The production of wool and forest products is also important. Several good creameries are located in the area. About 45 per cent of the county is occupied by farms. The average size of farm is 126 acres of which about 40 acres is improved land. Some abandoned farms are seen, particularly in the rougher areas of the county. Hay and oats are the principal crops with barley, potatoes, roots, mixed grain and wheat occupying small acreages. Small local areas of corn, clover and alfalfa are grown also. The chief problems on the arable soils of the area are fertility and drainage. Practically all of the arable soils have the same general requirements—maintenance of organic matter, the use of lime and commercial fertilizers and prevention of erosion. Little or no attention is paid to erosion or its control in the area, but considerable sheet washing is taking place particularly on the heavier Nappan, Queens, Londonderry and Joggins soils. This could be easily controlled by good crop and soil management. Many areas in the county are capable of producing considerably more than they are at present. Shorter rotations, more attention to fields farthest from the farm buildings and improved pasture would greatly increase production and make farming more profitable in this area.

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